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QUANTIFYING AND EXPLAINING THE DECLINE IN PUBLIC-SCHOOL TEACHER RETIREMENT BENEFITS

Nino Abashidze
Robert L. Clark
Lee A. Craig

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ABSTRACT

In recent decades, many states have reduced future retirement benefits for newly hired teachers. We estimate that in 2020 the average initial monthly retirement benefit, for teachers retiring with 30 years of service, is 11.2 percent lower than that of teachers retiring in the same plan with the provisions that were in place in 2000, implying a lower annual benefit of over $3,000. We examine why state plans that cover only teachers, along with plans in which teachers are not included in Social Security, have made smaller reductions in the generosity of their pension benefits in recent decades.

Nino Abashidze
University of Wyoming
Laramie, WY 82071
nabashid@uwyo.edu

Robert L. Clark
Poole College of Management
Box 7229
North Carolina State University
Raleigh, NC 27695
and NBER
robert_clark@ncsu.edu

Lee A. Craig
Department of Economics
North Carolina State University
Raleigh, NC 27695-8110
lee_craig@ncsu.edu

Quantifying and Explaining the Decline in Public-School Teacher Retirement Benefits

Over the past two decades, in response to the rising fiscal burdens of public-sector pension plans in the United States, state pension plans for teachers have significantly reduced future retirement benefits for newly hired teachers. We measure the decline in future pension benefits by comparing the initial pension benefit for teachers retiring under the 2020 benefit formulas to teachers retiring at the same age under the 2000 formula. Our measure of benefit decline is based on comparisons of teachers with the same earnings in their final year of employment ($50,000) and the same number of years of service at two points in time. The mean monthly benefit at retirement for teachers retiring with 30 years of service, under benefit formulas in place in 2020, is 11.2 percent, or $280, lower than that of teachers retiring in the same plan with the provisions that were in place in 2000. In other words, the representative retiring teacher whose final salary was $50,000 in both years would receive a lower annual benefit of roughly $3,300 in the first year of retirement. However, the reduction in future retirement benefits is far from uniform across the 50 states; some states have made no changes in their benefit formulas while in other states, reforms have reduced the benefits at retirement by over 50 percent for teachers retiring at the same age using the 2020 benefit formula. One should also recognize that the impact on initial retirement benefits for teachers hired in 2020 is many years in the future as many teachers hired in 2020 will begin to start retiring between 2040 and 2050. Benefit reductions in initial retirement benefits in defined benefit (DB) plans for teachers have come through a variety of methods, including reductions in benefit multipliers, increases in the number of years used to calculate final average salary, and increases in the age and service requirements for normal retirement.[1] Changes in these plan provisions by employees covered by the plan are shown in

Appendix Tables A1, A2, and A3. It is easy to see that reductions in the benefit multiplier directly lower initial benefits, with rising earnings during the final years of work. Increasing the number of years in the calculation of final average salary reduces this factor and therefore leads to lower initial retirement benefits. Increases in the age of normal retirement mean that teachers must have more years of experience in order to qualify for unreduced benefits. Increases in the retirement age also imply that retiring at earlier retirement ages is associated with larger reductions in initial retirement benefits. Our calculations of initial retirement benefits for teachers hired under the 2020 rules compared to those covered by the 2000 includes the impact of each of types of changes.

A more comprehensive measure of the decline in the value of pension coverage would be to calculate the net present value of pension coverage. This measure would require knowing the contributions paid by the employee throughout her working years, the promise of post-retirement increases in nominal benefits, and how higher employer contributions affect the annual salaries of teachers. While most of the changes that directly affect the initial retirement benefits have been limited to new hires, increases in employee contributions and reductions in COLAs have applied to both current and future employees.[2] It is easy to see that an increase in employee contributions of one or two percent of salary has an immediate negative impact on current household wellbeing. Holding the benefit formula constant, higher employee contributions reduce the lifetime present value of pension coverage. Reduction in or the elimination of COLAs lower the present value of pensions in retirement with the decline being a function of future rates of annual inflation (Munnell, Aubry, and Cafarelli 2014). Changes in these two plan provisions reduce the lifetime value of participating in teacher pension plans but do not affect the initial retirement benefit. However, the impact of changes in these provisions on net present

value of pension coverage is clear – they lower the value of participating in a pension plan. Thus, our measure indicating the decline in initial retirement benefits is an underestimate of the change in the lifetime present value of pension coverage. During our sample period, annual employer contributions to the pension system have also increased. Higher employer contributions may also impact annual earnings and whether pension provisions are modified in a manner to reduce initial retirement benefits.[3] None of these changes are included in our indicator of the decline in retirement benefits. In general, all of the changes in these factors have tended to reduce the lifetime present value of pension coverage which implies that our measure of the change in the value of pension coverage is an underestimate of the value of pension coverage for teachers between 2000 and 2020.

Changes in pension provisions often have different effects on the value of initial retirement benefits based on the length of service of individual teachers. We recognize that all teachers are not long-term employees with many leaving after only a few years of service. Because of this heterogeneity in length of service, we examine the impact on initial retirement benefits for three lengths of tenure, 15, 20, and 30 years of service. Teachers that terminate employment prior to vesting under the old rules are not impacted by changes in the retirement benefits,[4] since they will not receive any future benefit from the plan.[5] In contrast, the impact on teachers who have attained vested status can and does vary by the length of their employment. Our analysis indicates this variation for the three tenure profiles.

Finally, we should note that a number of states have terminated their traditional DB plans and introduced new defined contribution plans and/or hybrids plans (NASRA 2020a). Depending on the provisions of new plan compared to the previous plan, the value of future retirement benefits could increase or decrease. We have not attempted to do a benefit analysis of these

plans. Thus, our measure of the decline in initial retirement benefits is based only on the 41 states that had defined benefit plans in both 2000 and 2020.

The history and analysis of teacher pension plans (Clark et al., 2003; Clark and Craig, 2010; Clark et al., 2011) suggests that changes over time in public pension plans are related to the characteristics of the workers covered by the plans and whether participants are included in Social Security. Table 1 shows the distribution of the 50 state-wide teacher pension plans by the types of workers included in public plans covering teachers and whether employees are covered by Social Security. Plans that cover only teachers are found in 27 states; while in the other states, teachers are included in plans that also cover other state and/or local government employees. An important component of our analysis is whether the composition of employees included in these plans has affected the magnitude of the decline in the generosity of future retirement benefits.

[Insert Table 1 here.]

Another important aspect of public retirement systems is that participants in these plans have been allowed to remain outside the Social Security system. Table 1 shows that employees in 13 plans covering teachers are not covered by Social Security. Moreover, most public employees who are not covered by Social Security are in plans that cover only teachers; relatively few employees in state-managed plans covering other types of public employees remain outside the Social Security system. Of the 13 plans where employees are not covered by Social Security, ten are plans that cover *only* teachers; while the other three plans cover state and local employees in addition to teachers. Thus, there is substantial correlation between plans covering only teachers and whether participants in these plans are covered by Social Security.

In order to understand the recent reduction in the generosity of teacher pensions, one must know how the creation and evolution of retirement plans for teachers continues to influence current policy decisions. Past decisions on coverage continue to influence the development of teacher plans in the twenty-first century. We begin in Section I by examining why teachers were usually the first state and local workers to be covered by pension plans, and how the same economic and political factors have led states to maintain teacher-only plans in over half of the states, even as the states established plans covering other state and local employees. Next, Section II examines why some states decided to keep teachers outside of the Social Security system and why these same states continue to reject including their teachers in Social Security.

We then develop, in Section III, a method of comparing the impact of pension reforms on the initial retirement benefit of teachers hired after 2020 compared to those employed under pension rules that were in place in 2000. We calculate the pension benefit at retirement for teachers retiring with 15, 20, and 30 years of service at the normal retirement age using the 2000 formulas, and compare this benefit to that for teachers retiring at the same age and final salary using the 2020 formula.[6] Section IV reports the decline in benefits at retirement for all of the 41 states that offered DB plans to new teachers in both 2000 and 2020. In Section V, we estimate the percent change in initial retirement benefits as a function of the following variables: whether the plan covers only teachers, whether teachers are included in Social Security, the role of collective bargaining in the state, and the current funding status of the plan. Our findings suggest that plan coverage and participation in Social Security are important in the adoption of pension reforms that reduce future retirement benefits of teachers. In Section VI, we examine the nine states that did not offer DB plans to newly hired teachers in 2020. Most of these states had moved from DB plans to hybrid plans for new employees.

Important contributions of the paper include quantifying the reduction in pension benefits at retirement for teachers retiring under benefit formulas in effect in 2020 compared to those covering teachers in 2000, and documenting the substantial variation in the reduction of generosity across the states. Our analysis supports the importance of the development of teacher retirement plans concerning whether the state continued to maintain separate plans for teachers, even as the states established plans for other state employees, and the importance of keeping teacher plans outside of the Social Security system.

I. Why Did So Many States Create and Retain Teacher-only Plans?

Primary and secondary school teachers, along with municipal police officers and firefighters, were the first state and/or local public employees to be covered by employer-provided pension plans (Clark et al. 2003). Many of the larger cities in the United States began establishing retirement plans for their public-school teachers near the end of the nineteenth century. For example, New York City and Brooklyn formed the first plan for teachers in 1887, which was formally known as the "Old-Age and Disability Annuity Association." New Jersey followed with a statewide plan for its teachers in 1896. The first teacher retirement plan in the state of Michigan was the Detroit Teachers' Retirement Fund established in 1895. Other major cities soon established teacher retirement plans.

As individual municipalities increasingly created plans for their teachers, a number of states created, or consolidated, plans for the remainder of their teachers. In 1917, the Michigan Teachers' Retirement Fund was organized to pay benefits to retired teachers with 30 years of experience, and, eventually, the Michigan and Detroit plans merged. In 1907, the Indiana legislature created a plan for teachers in Indianapolis; the state followed with a plan for other

teachers in 1915. Similarly, the Illinois legislature created a plan for Chicago in 1907, and a plan for other teachers in 1915 (Clark et al. 2011, Table 4-5). With the exception of New York City's plan, the early municipal plans in New York were incorporated into the state pension plan for teachers in 1921.[7]

By the 1929-30, 21 states had formal retirement plans for their public-school teachers (Clark et al. 2003, Table 10-5); 40 percent of all state and local employees were schoolteachers; and of the roughly 400,000 state employees covered by a pension plan, 370,000 were teachers (Clark et al. 2003, p. 200).[8] While public-sector pensions at the state and local level were far from universal, because so many state workers were teachers, and so many local workers were firefighters and police officers, a substantial proportion of public-sector workers were covered by a plan, and that proportion was growing rapidly in the early and middle decades of the twentieth century.[9] By 1940, 1.5 million (or 46 percent of 3.25 million) state and local employees were covered by an employer-provided retirement plan (McCamman 1943 and 1951) and nearly 60 percent of school system employees were covered. (The figure was 38 percent for non-school employees.)[10]

We offer two complementary explanations for why teachers were typically the first state workers to receive pension plans.[11] One revolves around the cost of teacher turnover. It is a well-known feature of defined benefit pension plans that, through vesting requirements and the late-career accumulation of pension wealth, they will tend to reduce turnover.[12] If teacher turnover is especially costly, then the pension contract could be used to tie teachers to the state school system. Today, teacher turnover *is* relatively costly. A recent study by Carver-Thomas and Darling-Hammond (2017) highlights those costs, putting the average figure at around $20,000 per teacher, which, as a percentage of salary is substantially higher than that of other

entry-level state workers (Merhar 2020).[13] Although, we do not have estimates of the turnover costs for teachers from the early-20th century, the turnover costs for many other public-sector employees may well have been negligible or even negative, as it was a not uncommon feature of the patronage systems in operation at the time for workers to, in essence, purchase their positions.[14] Changes in the political party in power led to wholesale turnover of non-teaching employees; so there was little incentive to invest in human capital by either the worker or the government employer, and thus little incentive to fund a pension plan. Conversely, patronage was not generally a feature of the labor market for school teachers, suggesting turnover was costly relative to other public-sector positions. In addition, Perlmann and Margo (2001, pp. 110-115) argue that the strict pay schedules adopted by late-nineteenth and early twentieth-century school systems, and school bureaucratization more generally, may have been related to complex turnover issues associated with the female dominance of the teaching profession.[15]

The second explanation for the early teacher plans is also related to turnover but revolves around the gender composition of the teacher work force. Women have made up the largest share of public-school teachers since such data were first collected in 1860. As shown in Figure 1, the share of teachers who were women peaked in 1920 at 85 percent; and the share has not been below 75 percent since the nineteenth century.[16] In the 1940s, the *Social Security Bulletin* observed the importance of women in the profession and commented on their high turnover rates, often resulting from marriage or pregnancy (Altmeyer 1945, p. 4; Goldin 1990, pp. 160-174). More recently, Midthun argues that, the gender composition of the teaching labor force played an important role in the progressive movement's quest for pensions for school teachers, because women were viewed as vulnerable in ways that men were not: "Historically, teachers were primarily young, underpaid, single women who earned low salaries, were faced with a

rising cost of living, and were bound to a location by family ties, thus unable to pursue higher salaries elsewhere" (2021, p. 19), a point supported by Perlmann and Margo (2001, Chap. 5). Thus, the economic status of teachers, female teachers in particular, became a component of the progressive movement, and pensions were a key plank in the progressive platform. As Graebner puts it, "single, female, and poor, the average public-school teacher was a perfect candidate for aid" in the eyes of progressive leaders (1980, p. 104; see also Hansen 2010). Goldin notes the "genuine concerns of [progressive] reformers about work conditions of all Americans," which "ultimately benefited women workers" (1990, p. 192).[17]

[Insert Figure 1 here.]

Given the relatively high turnover costs and the progressive movement's quest to protect the women who dominated the teaching profession, it makes sense that the early state-level pension plans were concentrated among school teachers. Still, an early start in and of itself does not necessarily explain why, even today, so many teacher plans continue to include *only* teachers. After all, one could make the case that the marginal cost of adding additional state and local workers, that is non-teachers, to the already-established teachers' plans would have been relatively inexpensive compared to the cost of establishing and managing separate plans for those workers. So why did more than half of the states decide to continue operating separate retirement systems for teachers, even after creating a plan for other state employees?

Public choice theory suggests that the probability of success in bargaining over pension wealth would be enhanced by being in a stand-alone plan.[18] Well-defined, and/or more homogeneous, groups tend to be more successful than heterogeneous groups in many economic situations in general and in securing the organizational quasi-rents associated with public-sector employment in particular.[19] These rents are derived from the high cost of monitoring or

measuring government output, or from free riding, which would limit an individual citizen's inclination to bear the costs of attempting to replace legislators, executive officers and/or their appointees.[20] Consistent with this hypothesis are the examples of public support for higher teacher pay and support for retirement plans, while there is considerably less obvious public support for raises for general state employees.[21]

In his theoretical model of negotiating over and contracting for property rights, Libecap emphasizes the importance of low organizational (i.e. transaction) costs in facilitating exchange in the political arena; he notes specifically that as "groups become larger, organizational costs rise" (1989, p. 17). While that argument supports the perpetuation of teacher-only plans, holding other factors constant, the reductions in organizational costs in bargaining from maintaining a teacher-only plan would need to be weighed against the reduction in administration costs from administering a combined plan.[22] The literature contains numerous examples of situations in which a particular group is successful in bargaining because of group homogeneity and the pursuit of a well-defined goal. For example, Olson (1965) and Olson and McFarland (1962) illustrate the point through the interaction of monopoly power, the profits that accrue to it, and by implication, the willingness of the monopolists to employ those profits in the perpetuation of their monopoly power.[23] Similarly, Alexander and Libecap argue that the presence of "homogeneous" producers insured the successful cartelization of some agricultural markets under the New Deal's Agricultural Adjustment Act relative to the failure to cartelize other markets under the National Recovery Act (2000, p. 124). Heckelman et al. summarize the point: "small groups may expect greater net benefits from using their resources to lobby for benefits for themselves" (2000, p. 2).

Thus, public choice theory suggests that, controlling for other social and economic factors, we should, in at least some and perhaps many cases, see teachers pursuing the perpetuation of their own plans, separate from those for other state employees. This is in fact what we find. As noted above, more than half the states continue to maintain a separate plan for their teachers. Teachers would only be expected to support the maintenance of a separate plan if, on net, that option yielded quasi-rents greater than they expected to receive from one combined with other public employees.[24] The most obvious manifestation of that outcome would be if teachers received higher pension replacement rates and have lower employee contributions when they are in plans that do not include other state employees. Clark and Craig (2010) investigate and formally test this hypothesis. In short, they find that, over the course of late-20th and into the early-21st centuries, teachers in teacher-only plans did receive higher replacement rates than any other sub-group of state workers. For example, in 1982, the replacement rates in teacher-only plans were, on average, 5.9 percent greater than those for "combined" plans that included other workers, and in 2006, the teacher premium was 8.7 percent.[25]

So, public choice theory and, more specifically, the bargaining power of relatively homogeneous groups, explain why teachers continued to remain in separate plans once other state workers began receiving pensions. Accordingly, we would predict that the decline in initial retirement benefits, which we estimate below, will be smaller in teacher only plans.

II. Why Did So Many Teacher-only Plans Not Join Social Security?

Initially, public employees were not allowed to be covered by Social Security; however, legislation in the 1950s allowed but did not require states to join the Social Security system. Over the next two decades, most public employers decided to extend Social Security coverage to

their employees; however, as noted above, 13 of the 50 state plans covering teachers decided not to adopt Social Security coverage including 10 of the 27 teacher-only plans. A review of the history of Social Security legislation and the desire of state systems to enter Social Security provides several important insights into the continuing evolution of public retirement plans.

Title II of the Social Security Act of 1935 created the federal old-age insurance (OAI) plan. The initial exclusion of public workers was at least partly a response to concerns about the constitutionality of including them, and thus forcing their state and local government employers to contribute the employers' share of the payroll tax. The creators of Social Security were concerned that the federal courts would interpret the employers' share of the payroll tax as a direct federal tax on the states, which at the time was considered unconstitutional (Myers 1975, p. 33).[26] In addition, the Supreme Court, in *Railroad Retirement Board v. Alton Railroad Co* and *United States v. Butler*, had rejected the structure of earlier New Deal legislation related to federal pensions (*Alton*) and taxation (*Butler*).[27] For this reason, in addition to omitting state and local workers from the system, the taxing and funding functions of the Social Security Administration were contained in separate titles of the act. In addition to the benefits, Title II created the Reserve Account, within the U.S. Treasury, for holding the payroll tax; while the tax itself is imposed under Title VIII.

Not surprisingly, a test case on Social Security soon found its way into the federal courts in the form of *Helvering v. Davis*, with the Supreme Court hearing arguments during its spring 1937 term; the ruling was issued later that year.[28] Unlike its rulings in *Alton* and *Butler*, the court found nothing objectionable in the structure of the Social Security system. Unlike it had in *Butler*, the court did not consider old-age security an issue exclusively reserved for the states, and the court clearly dispensed with the general welfare issues raised by both *Alton* and *Butler*.

Thus, with respect to the status of state and local employees, one could interpret *Helvering* in one of two ways: Either the court was in effect saying that the act's prohibition against state and local employees' participation in the system was not a constitutional issue, or the payroll tax *would* have been an issue, but the exclusion of those workers rendered the point moot. The subsequent evolution of case law on the matter of Congress's taxing and spending powers, through the end of the 1930s, into World War II, and beyond dispensed with the now-quaint, New Deal concerns about the exercise of federal power in general and, more specifically, the taxing and general welfare issues raised in *Alton* and *Butler*. In the years that immediately followed the *Helvering* decision, Congress added millions of Americans to the list of those destined to receive a Social Security retirement benefit (Clark et al. 2011, pp. 59-64).

Although Congress continued to omit state and local workers from Social Security through the 1940s, a number of state and local governments petitioned for legislation permitting them to add their employees to the system, surrendering to this pressure, and no longer troubled by constitutional issues outlined above, in 1950, Congress further amended the Social Security Act and permitted states to enter into voluntary agreements with the Social Security Administration through which public employees not covered by an employer-provided retirement system could participate in Social Security (Mitchell et al. 2001).[29] The 1950 amendments extended coverage to the 1.4 million state and local employees who were previously without an employer-provided pension plan. Under the act, agreements were to be negotiated between the respective states and the Social Security Administrator; however, before a state executive branch agency could enter into such an agreement, its state legislature had to pass enabling legislation.[30]

The 1950 amendments still prohibited state and local employees, who were covered by a pension plan, from participating in Social Security. However, the Virginia state legislature found a loop-hole in the amendments. There was no provision that prevented a state from simply abolishing its current plan, placing its now-uncovered workers in the Social Security system, and then creating a new plan that incorporated Social Security into its calculus. In fact, it appears that the Virginia legislature negotiated a coverage agreement with the Social Security system before abolishing its old plan and creating a new one. Mississippi made a similar move the following year (McCamman 1951, p. 9). Once Virginia and Mississippi established the precedent of violating the spirit of the 1950 amendments, which were designed by Congress to aid state and local employees without a pension plan, other states quickly followed, initiating "the cumbersome, but necessary, procedure of abolishing existing staff retirement systems in order to get old-age and survivor's insurance coverage plus protection under a supplementary staff system" (Marquis 1955, p. 4).

Rather than fight the states on this issue, in 1954, Congress passed additional amendments allowing state and local employees who were covered by an employer-provided retirement plan to obtain Social Security coverage at the request of the state and its public-sector employees, whose collective decision was based on a referendum.[31] Thus, Congress made a good-faith effort to cover most state and local workers. Also, importantly, the amendments make clear that it was the intent of Congress that the total pension wealth accumulated by workers currently covered by a plan could not be reduced if they joined the Social Security system. (In the language of the day, their pension wealth could not be "impaired".) [32] By 1956, more than 1.25 million additional state and local government employees were covered by Social Security under the agreements made possible by the 1950 and 1954 amendments, of which

roughly 500,000 received both a pension plan from their public-sector employers and Social Security (McCamman 1956, p. 15).[33] By 2007, all 50 states had signed Section 218 agreements with the Social Security Administration, allowing some or all of the public employees in each state to be covered by Social Security. However, even today, the majority of public employees who do not participate in Social Security are police officers, firefighters, and teachers. According to recent estimates, approximately 40 percent of the nation's K-12 teachers remain outside the system (Aldeman 2019, p. 1; Liu and Aubry 2021, p. 4).[34]

With respect to adding workers to Social Security, if the pre-Social Security plan supplied the optimal level of benefits given the state's human resources objectives, employee preferences, and the cost of providing these benefits, then the introduction of Social Security would tend to encourage the states to reduce the generosity of their retirement benefits and reduce the employer contributions to their pension plans, despite the intention of Congress that they not do so following the 1954 amendments. From the workers' perspective, however, the calculation is not trivial: They have two benefits to consider, a Social Security benefit and a pension benefit; but both have costs, the payroll tax and the employee's contribution to the employer-provided retirement pension, respectively. Only with the knowledge of the relative magnitudes of these variables – or at least a reasonable estimate – could the worker make an optimal choice about the tradeoffs between the two benefits.[35]

This history allows us to address the question: Why did some states decide to keep some or all of their public employees outside of Social Security? For states honoring the no-impairment rule, which meant no reduction in wages or benefits, if a state included Social Security coverage in an *existing* state plan, then workers currently covered by the plan would unambiguously be better off, as long as the Social Security benefit, net of payroll taxes, yielded a

competitive rate of return.[36] For the initial cohort of public employees covered by the amendment it most likely did (Clark et al. 2011, pp. 62-63). However, from the perspective of the other parties to the public-sector pension bargain, such as legislators and plan administrators, adding state workers to the Social Security system, with no other changes to the labor contract, generated no new quasi-rents. An example of this logic is shown in the final report of the Special Commission to Study the Massachusetts Contributory Retirement Systems (2009): "The Commission agreed from the outset that, as a matter of fiscal policy, Massachusetts should continue to oppose Social Security coverage of its public employees, because the costs would exceed the benefits. While Massachusetts employers and employees each would be required to pay 6.2 percent of payroll to Social Security, only three quarters of that amount would pay for benefits; at least one quarter would go to cover Social Security's legacy costs, associated with having provided benefits in excess of contributions to early generations."[37] Thus, the state would incur the costs of the payroll tax with little or no benefit to non-participant stakeholders. As a result, there would have been little political support for joining the system among these other stakeholders.[38]

Note that this would not be the case for pension plans created *after* the passage of the 1954 amendments. For example, if workers were willing to accept a lower wage profile for the additional retirement benefit offered by Social Security, then the other stakeholders would have been willing to support the move, because they could now compete for the quasi-rents freed by the reduction in the wage profile, which could be covered by the creation of a new plan. In creating a new plan, with Social Security as an option, bargaining over the distribution of quasi-rents would simply include Social Security as one of the initial factors to consider. While Social Security might be an additional complicating factor in the bargaining process, with workers

accepting lower future pension benefits relative to what they might have received in the absence of the Social Security option, there would have been no additional prohibitive costs in arriving at an optimal contract.[39] Thus, we would expect plans created after 1954 to disproportionately include their teachers in Social Security, and that is what we see in the data. Ten of the eleven state teacher plans that were created or substantially revised after 1954, included their teachers in Social Security (Clark et al. 2011, Table 4.5). Other stakeholders would have supported this move as long as the additional bargaining costs resulted in a reduction in pension benefits and/or an increase in their share of the quasi-rents, or some combination of the two.[40]

A related question is: Why are most of the plans in which employees are not covered by Social Security teacher-only plans? While the no-impairment rule explains why newer, post-1954 state and local plans would tend to include their workers, including their teachers, in Social Security, by itself, it doesn't explain why the older plans would necessarily remain out of the system, especially after it became clear that states were not honoring the no-impairment clause.[41] The older plans did in fact disproportionately remain out of Social Security. The theory of prior possession explains this outcome. As Libecap notes, prior possession can be a key criterion when contracting for property rights in the public sector: Prior possession "is politically attractive, because it reflects the existing distribution of property and wealth" (1989, p. 23). It follows that disturbing the existing allocation of rents is costly, and decision makers, in this case primarily the state legislators who would initiate the move to Social Security, would only incur those transaction costs if the rents, and more specifically their share of the rents, were large enough to warrant the costs. As noted above, the opportunity to move state teachers, with their own pension plans, into the Social Security system, simply did not, in many cases, present the

relevant parties with enough new wealth to incur the bargaining costs that would be required to distribute that wealth.

Also, as noted above, government employment typically yields quasi-rents that are shared among a diverse collection of parties, in this case including, but not necessarily limited to: teachers, other state employees, and legislators, and with respect to the pension component of the workers' contracts, pension plan administrators and any financial firms that handle pension funds. The older, teacher-only plans would have had a *deeper* more diverse set of rent-seekers.[42] For example, older plans would have participants spread over the life cycle, including retirees, who by definition would not have been a party to the creation of new plans. Plan administrators would be well imbedded in the state's bureaucracy; investment advisors would have established relationships with plan administrators; legislators would have longer-standing ties to members of all of these groups.

Contracting theory predicts that the number, diversity, and size of the claims of bargaining parties will, along with prior possession, drive up the costs of bargaining over any changes in the rent pool. As Libecap summarizes the issue: "The greater the number of competing interest groups with a stake in the new definition of property rights, the more claims that must be addressed by politicians in building a consensus on institutional change" (1989, p. 21), and thus the higher the transaction costs in achieving a new allocation of rents. In a related point, North notes exchange in this context can only "be accomplished at a low enough cost of transacting to make [the transaction] worthwhile" (1990, p. 109).[43] So, the problem with the older plans was not that they were old, but that over time, the number of parties, their diversity, and the number and complexity of the relationships between them were such that the costs of

renegotiating the distribution of quasi-rents among the various parties simply mathematically overwhelmed any gains expected from that effort.

Taken together, the theories of contracting for property rights and institutional change suggest that the combination of the value of prior possession and the number and diversity of the parties associated with the older teacher-only plans helped to keep those plans out of Social Security, and, as we have seen they remain disproportionately out of the system to this day. We now turn to a review of the recent and current status of those plans, and, in particular, focus on the recent changes to them relative to the plans that have joined the Social Security system.

III. Measuring Reductions in Initial Retirement Benefits

Many public pension plans have reduced retirement benefits for future retirees since 2000, and many of these reductions have been substantial. As we noted in the introduction, initial retirement benefits have been reduced by modifications to the benefit formula, such as reducing the benefit multiplier; increasing the number of years in the averaging formula; raising the age for normal retirement; and increasing the reduction in benefits for retirement prior to the normal retirement age. In addition to expecting lower retirement benefits, public employees are being required to make higher contributions to support the retirement plan, and lifetime benefits have been further reduced by caps on COLAs and changes to how COLAs are calculated. In this section, we describe the primary methods used to reduce future retirement benefits by public sector retirement systems and the impact of these plan changes on the initial retirement benefit.

Of the 50 state retirement plans for teachers, 41 retirement systems maintained DB plans that were open to newly hired teachers in both 2000 and 2020; while nine other states did not offer DB plans for new hires in one or both of the years. Our analysis begins by determining the

decline in initial retirement benefits in each of the 41 state-managed plans that include teachers and that retained traditional defined benefit plans between 2000 and 2020.[44] To examine the impact of pension reforms on retirement benefits, one must make a series of assumptions concerning employment history, wage growth, and the timing of retirement. Our measure of changes in plan generosity is the percent decline in initial retirement benefits implied by the benefit formula in each state plan in 2000 compared to the replacement rate in 2020. Therefore, we determine the benefit at retirement for teachers retiring under plan provisions in effect in 2000 and 2020 for teachers with 15, 20, and 30 years of service and then calculate the change in initial benefits. Initial retirement benefits in traditional defined benefit plans depend on the benefit formula and the work history of the retiree. We measure the impact on the benefit reductions using the following assumptions to calculate pension benefits at retirement.

- First, we calculate a retirement benefit for teachers retiring from each of the 41 plans using the formula in place prior to the post-2000 changes in the formula for retirees at the normal retirement age with a final annual salary of $50,000.[45] We assume a salary increase of 2.0 percent per year during the employee's final working years. This means that the final average salary used in our calculation is a function of the number of years in the averaging period. Using this assumption and the benefit multiplier of the plan, we calculate the initial benefit at retirement for an individual with 15, 20, and 30 years of service.
- Second, we calculate the benefit at retirement using the same salary assumption but now use the formula in place for teachers hired after 2020. A key assumption is that the teacher retired at the normal retirement age specified in the 2000 plans. If the normal retirement age has been increased and the employee retires at the normal retirement age

in the 2000 plans, early retirement benefit reductions are applied as specified in the 2020 plan document.

- Thus, our measure of the decline in retirement benefits is based on the changes in the benefit formula (lower multiplier, more years in salary averaging period) and increases in the normal retirement age and larger early retirement penalties.

Based on these assumptions, we calculated the percent change in benefits for each of the 41 state teacher plans that retained a traditional defined benefit plan. To illustrate this methodology, we present two examples describing how estimates for retirement benefits are calculated separately for the pre- and post-reform periods. The retirement benefit calculation is based on the following formula:

$$Benefits = Early * M * YOS * FAS$$

where, $Early$ denotes the early retirement reduction factor that is applied to individuals claiming benefits prior to attaining the normal retirement age and years-of-service requirements for unreduced benefits, M is the benefit multiplier, YOS refers to years of service at retirement, and FAS is the final average salary. These components and the normal retirement age vary across state retirement plans.[46]

Based on these assumptions, we calculate the initial benefit at retirement for teachers retiring under the 2000 and 2020 pension provisions. We then determine the percent decline in initial retirement benefits between 2000 and 2020. For example, a pre-reform member of the teacher's retirement system of Illinois is eligible to retire at age 60 with 10 years of creditable service and receive unreduced benefits. In the retirement plan, the multiplier is 2.2 percent and the final average salary is the average of the highest four consecutive salaries. To calculate retirement benefits, we assume a teacher who retires at age 60 with 15 years of service and with

an annual salary of $50,000. Upon retirement, she will receive a $1,335 (=1*0.022*15*$48,549/12) monthly benefit.[47] The monthly payments will increase with the years of service to $1,780 and $2,670 for 20 and 30 years of service, respectively. For teachers with 30 years of service, this implies a benefit that is 64.1 percent of the final annual salary of $50,000.

In the post-reform period, the normal retirement age has increased to 67 with 10 years of service. In case of early retirement, the benefit is reduced by 6 percent for each year before the normal retirement age. For example, the early retirement reduction factor is 0.58 (= [1-(0.06*7)]) for an employee who retires at age 60 with at least 10 years of service. The final average salary is defined as the average of the highest eight consecutive annual salaries. At retirement, a 60-year-old employee with 15 years of service will receive a $745 (=0.58*0.022*15*46,700/12) monthly benefit, which is a reduction of $590 from the pre-reform regime. Similarly, the estimated monthly benefit will be $993 ($1,490) for a 60-year-old employee who retires with 20 (30) years of service. The benefit of $1,490 for retirees with 30 years of service under the 2020 plan provisions is now only 35.8 percent of final annual salary. For teachers with 30 years of service retiring at age 60 with a final annual salary of $50,000, the initial retirement benefit is $1,490 per month instead of $2,670 per month or a decline of 44.2 percent.

In our second example, the case of the teacher's retirement system of Kentucky, for both pre- and post-reform periods, the normal retirement age is 60 with at least 5 years of service, and the final average salary is the average of the highest five salaries until an employee attains 27 years of service and age 55, after which the average of the highest three annual salaries is used. In the pre-reform period, the benefit multiplier was 2.5 percent, while in the post-reform period, it varies with years of service. To estimate the monthly benefits, we assume a pre-reform teacher

retires at age 60 with 15 years of service and a salary of $50,000. At retirement, she will receive a $1,502 (=0.025*15*48,077/12) monthly benefit or a replacement rate of 36 percent. Alternatively, if she retires with 20 or 30 years of service, the monthly retirement benefit will increase to $2,003 or $3,064, respectively.

In the post-reform period, the benefit multiplier is 1.7 percent per year for the first 10 years, 2 percent for the next 10 years, 2.3 percent for the next 6 years, 2.5 percent for the next 4 years, and 3 percent thereafter. Therefore, the monthly benefit for a 60-year-old teacher who retires with 15 years of service will be $1,082 (=0.018*15*48,077/12) or a reduction of 28.0 percent. In contrast, benefits for teachers with 20 or 30 years of service the monthly benefit will be $1,482 or $3,064, respectively. The Kentucky example shows how the benefit reductions are a function of years of service, as a 60-year-old retiree with 30 years of service has the same initial retirement benefit before and after the pension reforms while those with fewer years of service have substantial reductions in their retirement benefit.[48]

It is important to note that there are other methods of assessing the impact of pension reforms on the value of teacher pensions. For example, one could attempt to determine the lifetime present value of being covered by the retirement plan by examining total lifetime employee contributions compared to the discounted value of benefits paid from retirement until death. The present value of pension coverage in most states will have been reduced over the past 20 years as many states have increased employee contributions even as initial retirement benefits were reduced. In addition, many states have reduced or eliminated COLAs for retirees which has a significant impact on the real present value of the pension. It is important to recognize that changes in these plan provisions are often applied to current employees while provisions related to the determination of initial benefits are usually fixed when the employee is hired. Thus, any

attempt to calculate a lifetime net present value of pension coverage would have to make a series of assumptions concerning future decisions by state legislators on employee contributions and COLAs. We do not attempt to measure this broader measure of the impact of change in pension provisions on the lifetime value of pension coverage.

One could also examine the impact of increases in the number of years needed for teachers to become vested in DB pensions. Increases in the vesting requirements adversely affects the value of pensions for teachers that leave the plan prior to becoming vested. Changes in vesting impacts only those teachers with more years of service based on the old requirement but few years than the new vesting standard. The number of individuals affected by vesting standard is likely to be relatively small; however, it is also possible that changes in the vesting standards might reduce termination rates for affected teachers. For teachers with more years of service above the number required for vesting, changes in this requirement would have no impact on their retirement benefits.

In sum, our measure of the decline in the generosity of initial retirement at the normal retirement age for career teachers will be an underestimate of the decline in the real lifetime present value of teacher pensions in the United States that has occurred since 2000.

IV. Quantifying and Explaining the Reduction in Initial Retirement Benefits

Using the methodology described above for the 41 DB plans, we calculate the initial retirement benefit for teachers retiring using the 2000 benefit formula and for teachers retiring under the 2020 plan provisions. Table 2 shows the percent benefit decline (for teachers with 30 years of service) for each of the 41 plans that retained their traditional defined benefit plans. (See Appendix Table A4 for similar results for teachers with 15 and 20 years of service.) The

variation in changes to the pension benefits across the states is striking with 16 plans having no change in their initial retirement benefit while the decline in the replacement ratio in four states exceeds 40 percent: Arizona has a benefit decline of 56.9 percent, Colorado 51.9 percent, South Dakota 48.1 percent, and Illinois 44.2 percent. The mean decline in the initial benefit for all 41 plans is 11.2 percent for teachers with 30 years of service.[49]

[Insert Table 2 here.]

The benefit declines presented in Table 2 can be interpreted as the "benchmark" difference in initial retirement benefits between two employees with 30 years of service, one retiring in 2000 and the other in 2020. However, the data indicate substantial variation across the states. We posit that this variation is due in part to five important factors: whether the plan covers only teachers, whether teachers are included in Social Security, whether collective bargaining is required in the state, the funding ratio of the plan, and the extent of Republican control of the state government.

Above we provided a review of why teacher-only plans might yield more generous benefits than plans that also included other state employees. The data from Table 2 provide support for this conjecture. Table 3 shows that the average (and median) decline in initial monthly benefits in the 23 teacher-only plans is substantially smaller ($204 or 8.0 percent of the $2,550 monthly benefit for pre-2000 retirees) compared to teachers in the 18 other plans in our study, which include teachers and other state employees ($378 lower monthly benefit or a 15.4 percent decline in initial benefits). Note that the median figures for each entry are lower than the means, which reflects the impact of the 16 states that made no change to their benefit formulas.

[Insert Table 3 here.]

In Section II, we provided a history of Social Security coverage of public employees and how changes in legislation affected teacher plans. Clark and Craig (2010) found that teacher plans which included their employees in Social Security had smaller reductions in initial retirement benefits compared to plans outside of the Social Security system.[50] Mean reductions in pension benefits, shown in Table 3, are consistent with this finding. The average decline in benefits in the 29 plans in which teachers and other state workers were covered by Social Security saw smaller reductions in their initial monthly retirement benefits between 2000 and 2020; 10.1 percent (or $238 per month) compared to 13.9 percent (or $382 per month).

The ability of teachers to bargain for compensation through a union or employee association may have moderated the decline in the generosity of teacher pensions. In April 1948, the National Labor Relations Board ruled that pensions were a mandatory issue in collective bargaining, and the ruling was subsequently upheld by the Supreme Court.[51] Union membership is substantially higher in the public sector than it is in the private sector, 34.8 percent compared to 6.3 percent (BLS 2021). Given this relatively high proportion of the public labor force enrolled in unions, one could reasonably expect that collective bargaining might have moderated the decline in retirement benefits.

There is an extensive literature in labor economics concerning the effect of union power and collective bargaining on wages and benefits.[52] To assess whether unions have been successful in preventing or reducing cuts in pension benefits, we include a measure of union power – called the "duty to bargain" – in state plans covering teachers. This measure was developed by Valletta and Freeman (1988) and updated by Reuben to 1996, as presented in Lovenheim and Willen (2019, Table 1, page 296). Table 3 shows that retired teachers in states

with bargaining experienced a 9.8 percent (or $230 per month) decline in initial benefits compared to a reduction of 13.7 percent (or $368 per month) in the "non-union" states.

In addition to the type of worker covered, Social Security coverage, and collective bargaining, the financial status of retirement plans is expected to influence the ability and willingness of states to maintain existing levels of benefits. Novy-Marx and Rauh (2014) document the funding shortfalls in pension plans covering state and local workers. They note that, for long-term solvency, on average, plans will need to either increase contributions substantially or cut benefits. The 2000-2020 period was marked by sub-periods of growth-recession-growth-recession. Anzia and Moe (2017) highlight the importance of the 2007-09 crisis and show that the majority of the state-level legislation negatively impacting public-sector pension plans was proposed during and after that period. Indeed, before that episode, there were more state-level bills expanding pension benefits than cutting them (Anzia and Moe, Figure 1, p. 40).

The Great Recession negatively impacted the values of assets held in state pension funds. While the exact timing of the changes in asset values are not our focus, it does follow that plans that are substantially underfunded are expected to be more likely to consider benefit reforms that reduce future costs of maintaining the plan. States typically have a number of different plans for alternative groups of public employees. In an overall budget of the state, there will be linkages across the various plans as expenditures come from the general revenues of the state. To measure the pressure of underfunding, we include the funding ratio of all the plans in the states. This measure "combines the assets and liabilities of each state's pension plans in order to calculate each state's pension funding ratio". The funding ratios are for plan year 2019 as reported by the states. Table 3 shows that plans with a funding level of less than 75 percent had

substantially greater benefit declines ($379 or 14.8 percent) than plans with a funding ratio of greater than 75 percent ($176 or 7.5 percent).[53]

Finally, as Munnell et al. (2008, p. 8) and Bagchi (2020) document, for recent decades, the role played by the political composition of the state legislatures and governorships in the changes in state and local public-sector pension plans. In particular, Munnell et al. estimate that Republican control of the governor's office and the state legislature increased, by 6 percentage points, the probability the state would introduce a defined contribution plan. Thus, we include a political variable reflecting the extent of Republican control of state political power, specifically, the percentage of years between 2000 and 2020 the Republican Party controlled both houses of the legislature and the governorship.[54] Although the figures in Table 3 show that teachers in states in which Republicans had greater power, on average, experienced larger declines in initial pension benefits, there are a number of exceptions. Illinois had zero Republican control, but a relatively large decrease in initial benefits (-44.2 percent); similarly Colorado is a heavily democratic state with a large decline (-51.9 percent). Whereas in Idaho, Republicans controlled the state government throughout the era, and in Georgia most of the era, but teachers in those states saw no decrease in their initial retirement benefits.

Overall, it is important to recognize that there is considerable variation in the benefit reductions within each of the two groups of states in each of the categories shown in Table 3. Table 4 provides the state-by-state data for the explanatory variables used in our analysis, for the 41 states that maintained DB plans in 2000 and 2020.

[Insert Table 4 here.]

V. Estimating the Decline in Initial Replacement Ratio in Teacher Pensions

As noted above, the type of employees covered; participation in Social Security; collective bargaining; funding ratios, and Republican control of state political power are all variables that might be expected to influence the decisions of state legislatures and governing boards of the plans concerning changes in the generosity of the plans, and thus should be included in a multi-variate analysis of the changes in benefits (see Equation 1). Accordingly, we estimate the impact of these factors on the pension reforms that lowered initial retirement benefits. Specifically, the dependent variable in the regressions is the absolute value of the percent change in initial retirement based on the 2020 formula minus the benefit from the 2000 formula divided by the 2000 benefit using the assumptions described above. In the regression analysis, the values of the funding ratio and Republican control variables are as they appear in Table 4.

$$\%\Delta Benefits_i = \beta_0 + \beta_1 * Teacher\ Only_i + \beta_2 * Social\ Security_i + \beta_3 * Bargain\ Power_i + \\ + \beta_4 * Funding\ Ratio_i + \beta_5 * Republican\ Control_i + \varepsilon_i \quad (1)$$

Table 5 reports the regression results from estimating the percent change in the benefits between 2020 and 2000. Because the dependent variable is the absolute value of the decline, negative coefficients imply that the benefit decline between the 2020 and the 2000 benefit formulas is smaller than indicated by the base case (the omitted category for the dichotomous variables). Consistent with our earlier discussion concerning the relative success of more homogenous bargaining groups, the coefficients indicate that teacher-only plans had smaller declines in initial retirement benefits compared to plans covering other types of employees. For employees with 30 years of service at retirement, the estimated coefficient is statistically

significant and indicates that retirees from teacher-only plans had a decline in initial benefits that was 9.4 percentage points (or 83.9 percent of the overall mean decline of 11.2 percent) smaller than plans that included other state employees. The empirical evidence suggests that, over the past twenty years or so, despite facing reductions in their future pension benefits, career teachers, who have their own state pension plans, have been treated more generously than other state and local employees, though the impact of teacher-only plans is smaller for teachers with fewer years of service.

[Insert Table 5 here.]

In addition, plans where teachers are also covered by Social Security had smaller reductions in benefits compared to plans where teachers are not included in Social Security. Once again, the impact varies by years of service with the decline being a significant 8.9 percentage points (or 95.6 percent of the mean) lower for teachers with 20 years of service but a smaller, and statistically insignificant, 4.9 percentage points (or 43.7 percent on the sample mean) for teachers with 30 years of service. Perhaps, this smaller decline for teachers covered by Social Security reflects the fact that Social Security benefits, for individuals claiming benefits after 2000, were also being reduced due to the increases in the normal retirement age imposed on individuals born after 1937. The coefficients on the funding ratio and duty-to-bargain variables are not statistically significant. In general, the signs on the coefficients are consistent with our expectations. The signs on both the funding ratio and a duty to bargain imply smaller declines in initial benefits, though given the small number of observations and large differences in benefit declines within each category, it is not surprising that levels of statistical significance are generally low for these variables.

VI. States with New Plan Types

As for the nine states that did not have a DB plan in 2000 or did not maintain a DB plan through 2020, the same set of variables from Table 4 is shown in Table 6. In six of these states, the retirement plans covering teachers shifted from a traditional DB plan to a hybrid plan that included a substantially smaller benefit from the DB component in the new plan. In addition, these plans also included a relatively small mandatory DC plan with employer and employee contributions. Michigan shifted from a DB plan to a DC plan with an optional hybrid plan while Kansas changed from a traditional DB plan to a cash balance plan. The ninth retirement system in this set is Indiana which had a hybrid plan in both years. (A short discussion of each of these state plans is presented in Appendix B.)

Many assessments of the change in plan types consider the driving force for these changes to be the funding problems associated with the plan. Table 6 shows the funding ratio of each of the other nine retirement systems that changed the type of plan they offered to their teachers. Eight of the nine retirement plans had funding ratios at or below 75%; however, if we consider the funding ratios of all of the 50 state plans covering teachers with funding ratios below 60% (nine plans) only two of these poorly funded plans reformed their systems by changing the type of plan offered. Thus, it would seem that a low funding ratio is not the dominant reason for this type of pension reform. It is important to remember that the funding ratios shown in Tables 4 and 6 are those provided by the state plans and are for 2019. If the earlier change from traditional DB plans to a hybrid plan, a cash balance plan, or a DC plan improved the funding ratio, the causation between pension reform and the funding ratios would run in the other direction.

[Insert Table 6 here.]

We do not attempt to determine the change in the initial retirement benefits when states switched from a DB plan to a DC, a hybrid, or a cash balance plan. To calculate retirement benefits in DC and hybrid plans one needs another set of assumptions concerning the allocation of account balances to various types of investments, how the returns to these products vary over the work life of the teacher, and the investment fees charged by the plan and vendors. In addition, retirement benefits depend on the distribution choices of the retiree.

VII. Conclusion

Over the past two decades, states have instituted substantial changes to pension plans covering teachers. The result of these changes is that initial retirement benefits for teachers retiring under provisions in effect in 2020 tend to be smaller than those for individuals retiring under plan provisions in effect in 2000. We have examined the changes for 41 state DB plans covering teachers, and we calculated the percent decline in the initial monthly retirement benefit due to pension reforms. On average, the benefit at retirement declined by 11.2 percent for teachers retiring with 30 years of service; however, the decline in benefits varied considerably across the states. This implies that teachers retiring under formulas in effect in 2020 received approximately $3,300 less in annual retirement benefits compared to those retiring using the 2000 benefit formulas. In addition to this reduction in initial benefits, increases in employee contributions and reductions in COLAs have further eroded the real value of teacher retirement benefits. In order to explain the variation in the decline in generosity, we reviewed the history of teacher pension plans and the development of Social Security and showed how the differences across the states may be affecting the generosity of retirement benefits.

Primary and secondary public-school teachers were, along with municipal police officers and firefighters, among the first state and local public employees to receive employer-provided pensions. While teacher plans originated at the local level, most were eventually merged with state-level plans. As states added other state workers to their pension rolls, or created new plans for them, many states continued to maintain separate plans for their teachers. Today, there are still 27 stand-alone, state pension plans for teachers only.

Teacher plans started earlier than plans for other state workers because the cost of teacher turnover was substantially higher than that of other entry-level state workers, and teachers were the largest well-defined category of state employees. Furthermore, because well-defined, and/or more homogeneous, groups tend to be more successful than heterogeneous groups in bargaining for organizational rents, teachers successfully managed, in many states, to keep their own plans, separate from other employees, and teacher plans were, on average, more generous than those covering other state and local employees.

When the Social Security Act was passed, because of constitutional concerns, state and local employees were excluded from the system. Through two amendments to the Social Security Act, in the 1950s, state and local workers could be added to the system. However, teachers disproportionately remained out of the system; of the 17 state-managed plans not in Social Security, 13 plans include teachers with 10 of those retirement systems being teacher-only plans. We offer two reasons for the disproportionate number of teacher plans that are not in Social Security. First, the doctrine of prior possession suggests that, as the party with well-defined (early) property rights in an established plan, teachers would be reluctant to renegotiate the prior distribution of rents, and with little net new wealth on the table, other stakeholders would be inclined to go along with this position. Second, successful bargaining can only "be

accomplished at a low enough cost of transacting to make [the transaction] worthwhile" (North 1990, p. 109). Over time, the number of parties, their diversity, and the complexity of the relationships between them were such that the costs of renegotiating the distribution of quasi-rents among them mathematically overwhelmed any gains expected from the activity.

In recent years, in response to the rising fiscal burdens of public-sector pension plans, many state and local governments have decreased the generosity of the benefits promised to the participants of their retirement plans. Benefit reductions in defined benefit plans have come through a variety of methods, including reductions in benefit multipliers, increases in the number of years used to calculate final average salary, and increases in the age and service requirements for normal retirement. We find that the average decline in future retirement benefits, since 2000, is substantially less for teacher-only plans relative to other plans that also cover state and local workers. Controlling for other factors, teachers – with 30 years of service, in teacher-only plans – experienced a mean decline that was nearly 10 percentage points lower than plans that also included other state and local workers. We conclude that the strategy of maintaining separate, teacher-only plans and teacher plans outside of Social Security has paid off for U.S. public school teachers.

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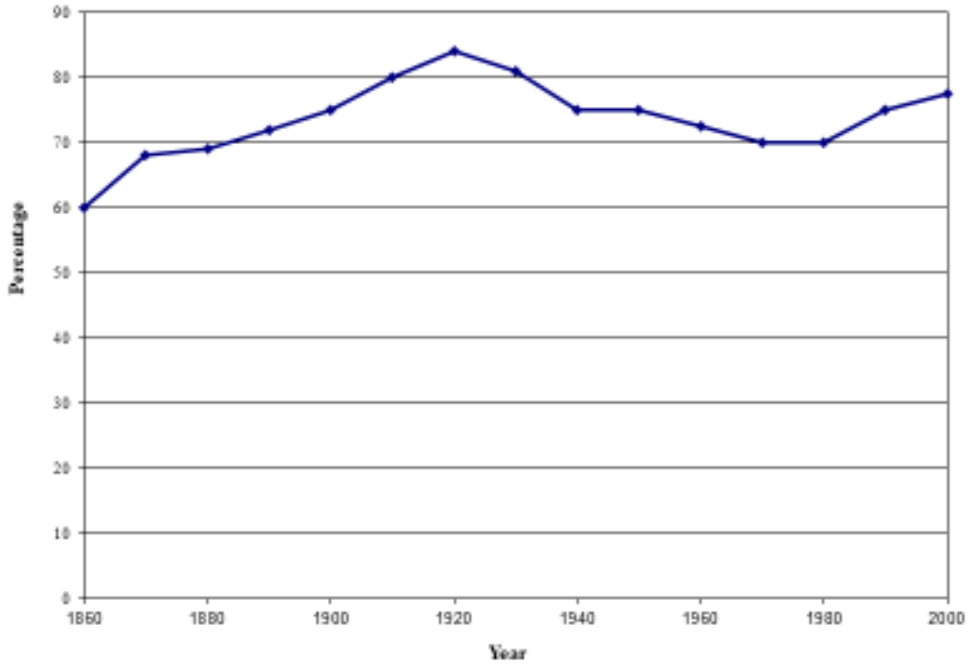
Figure 1: Female Share, U.S. School Teachers, 1860-2000



Source: U.S. Census, various years, as reported in Fitzpatrick (2020, Figure 1).

Table 1. State-Managed Pension Plans for Teachers: Type of Employees Included in Plan and Whether Employees are Covered by Social Security

Employees Covered	Social Security	No Social Security	Total
Teachers only	17	10	27
State, Local, and Teachers	17	3	20
State and Teachers	3	0	3
Total	37	13	50

Sources: Retirement system's websites and Wisconsin Legislative Council.

Table 2. Summary of 50 State-Managed Retirement Plans Covering Teachers*

State	Name of Plan	Employees Covered	Plan Type 2000	Plan Type 2020	SS	Percent Change in Initial Benefit
Alabama	TRS	T	DB	DB	Yes	-19.6%
Alaska	TRS	T	DB	DC	No	NA
Arizona	SRS	S, L, T	DB	DB	Yes	-56.9%
Arkansas	TRS	T	DB	DB	Yes	0.0%
California	TRS	T	DB	DB	No	-21.6%
Colorado	PERA	S, L, T	DB or DC	DB or DC	No	-51.9%
Connecticut	TRS	T	DB	DB	No	-1.9%
Delaware	SEPP	S, T	DB	DB	Yes	0.0%
Florida	FRS	S, L, T	DB	DB, DC or Hybrid	Yes	-17.4%
Georgia	TRS	T	DB	DB	Yes	0.0%
Hawaii	ERS	S, L, T	DB, DC or Hybrid	DB, DC or Hybrid	Yes	0.0%
Idaho	PERS	S, L, T	DB	DB	Yes	0.0%
Illinois	TRS	T	DB	DB	No	-44.2%
Indiana	TRF	T	Hybrid	Hybrid	Yes	NA
Iowa	PERS	S, L, T	DB	DB	Yes	-1.9%
Kansas	PERS	S, L, T	DB	Cash Balance	Yes	NA
Kentucky	TRS	T	DB	DB	No	0.0%
Louisiana	TRSL	T	DB	DB	No	-1.9%
Maine	PERS	S, L, T	DB	DB	No	-18.0%
Maryland	SRPR	S, L, T	DB	DB	Yes	-16.7%
Massachusetts	TRS	T	DB	DB	No	-20.3%
Michigan	PSERS	T	DB	DC or Hybrid	Yes	NA
Minnesota	TRA	T	DB	DB	Yes	0.0%
Mississippi	PERS	S, L, T	DB	DB	Yes	-4.0%
Missouri	PSRS	T	DB	DB	No	0.0%
Montana	TRS	T	DB	DB	Yes	-1.9%
Nebraska	SPP	T	DB	DB	Yes	-1.9%
Nevada	PERS	S, L, T	DB	DB	No	6.8%
New Hampshire	NHRS	S, L, T	DB	DB	Yes	-9.1%
New Jersey	TPAF	T	DB	DB	Yes	-23.6%
New Mexico	ERA	T	DB	DB	Yes	0.0%
New York	TRS	T	DB	DB	Yes	-16.0%
North Carolina	TSERS	S, T	DB	DB	Yes	0.0%
North Dakota	TRF	T	DB	DB	Yes	-17.6%
Ohio	STRS	T	DB, DC or Hybrid	DB, DC or Hybrid	No	-1.9%
Oklahoma	TRS	T	DB	DB	Yes	0.0%
Oregon	PERS	S, L, T	DB	Hybrid	Yes	NA
Pennsylvania	PSERS	T	DB	Hybrid	Yes	NA
Rhode Island	ERS	S, T	DB	Hybrid	Yes	NA
South Carolina	SCRS	S, L, T	DB	DB	Yes	-26.5%
South Dakota	SRS	S, L, T	DB	DB	Yes	-48.1%
Tennessee	CRS	S, L, T	DB	DB or Hybrid	Yes	0.0%
Texas	TRS	T	DB	DB	No	-11.7%
Utah	SRS	S, L, T	DB	DC or Hybrid	Yes	NA
Vermont	TRS	T	DB	DB	Yes	0.0%
Virginia	SRS	S, L, T	DB	Hybrid	Yes	NA
Washington	TRS	T	DB	DB or Hybrid	Yes	0.0%
West Virginia	TRS	T	DB	DB	Yes	0.0%
Wyoming	WRS	S, L, T	DB	DB	Yes	-32.8%
Wisconsin	WRS	S, L, T	DB	DB or DC	Yes	0.0%

Sources: Websites of each plan covering teachers and the Wisconsin Legislative Council. The change in pension benefit is based on our calculation for a retiring teacher with 30 years of service in 2020 relative to a similar teacher retiring in 2000 assuming that the teacher had a final salary of $50,000 and retired at the normal retirement age as specified in the 2000 benefit formula.

Notes: *Plans that did not have DB plans in both years are highlighted in gray. We do not calculate initial retirement benefits for teachers in these plans.

Table 3. Mean and Median Benefit Decline for Teachers by Plan Characteristics*

Group	No. of Plans	Average Change in Monthly Benefit ($) [Median]	Average Percent Decline in Pension Benefit [Median]
All plans	41	-280 [-47]	-11.2 [-1.9]
Teacher only	23	-204 [-47]	-8.0 [-1.9]
All others	18	-378 [-143]	-15.4 [-6.5]
SS coverage			
Yes	29	-238 [-39.5]	-10.1 [-1.9]
No	12	-382 [-195]	-13.9 [-6.8]
Duty to Bargain			
Yes	26	-230 [-47.4]	-9.8 [-1.9]
No	15	-368 [-59]	-13.7 [-1.9]
Funding Ratio			
Below 75%	21	-379 [-186]	-14.8 [-9.0]
or Above 75%	20	-176 [0]	-7.5 [0]
Republican control			
Below 50%	27	-217 [-39.5]	-8.4 [-1.9]
50% or Above	14	-402 [-333.1]	-16.7 [-14.6]

Sources: Authors' calculations based on data from retirement plan websites.

Notes: *Data show the mean and median percent decline in initial pension benefit for teachers retiring under 2020 benefit formulas compared to those in effect in 2000. Data are for teachers with 30 years of service who retire at the normal retirement age, as shown in 2000 plan documents, who earned $50,000 in their final year of employment.

Table 4. Public Retirement Systems with Traditional DB Plans in both 2000 and 2020

State	Employees Covered	Social Security Coverage	Collective Bargaining	Funding Ratio	Republican Control
Alabama	T	Yes	No	68.6%	50%
Arizona	S, L, T	Yes	No	63.1%	60%
Arkansas	T	Yes	No	78.7%	30%
California	T	No	Yes	71.2%	0%
Colorado	S, L, T	No	No	61.5%	10%
Connecticut	T	No	Yes	49.4%	0%
Delaware	S, T	Yes	Yes	85.8%	0%
Florida	S, L, T	Yes	Yes	83.9%	100%
Georgia	T	Yes	No	74.2%	80%
Hawaii	S, L, T	Yes	Yes	54.9%	0%
Idaho	S, L, T	Yes	Yes	89.7%	100%
Illinois	T	No	Yes	47.4%	0%
Iowa	S, L, T	Yes	Yes	81.4%	20%
Kentucky	T	No	No	45.5%	15%
Louisiana	T	No	No	67.5%	25%
Maine	S, L, T	No	Yes	81.9%	10%
Maryland	S, L, T	Yes	Yes	73.3%	0%
Massachusetts	T	No	Yes	58.2%	0%
Minnesota	T	Yes	Yes	79.4%	0%
Mississippi	S, L, T	Yes	No	61.1%	45%
Missouri	T	No	No	80.8%	40%
Montana	T	Yes	Yes	71.8%	20%
Nebraska	T	Yes	Yes	79.9%	70%
Nevada	S, L, T	No	Yes	74.5%	10%
New Hampshire	S, L, T	Yes	Yes	61.9%	20%
New Jersey	T	Yes	Yes	55.1%	5%
New Mexico	T	Yes	No	69.0%	0%
New York	T	Yes	Yes	84.4%	0%
North Carolina	S, T	Yes	No	91.6%	20%
North Dakota	T	Yes	Yes	67.5%	100%
Ohio	T	No	Yes	76.9%	80%
Oklahoma	T	Yes	Yes	80.1%	50%
South Carolina	S, L, T	Yes	No	57.2%	90%
South Dakota	S, L, T	Yes	Yes	100.3%	100%
Tennessee	S, L, T	Yes	Yes	94.0%	50%
Texas	T	No	No	79.8%	90%
Vermont	T	Yes	Yes	64.6%	0%
Washington	T	Yes	Yes	91.2%	0%
West Virginia	T	Yes	No	75.9%	20%
Wisconsin	S, L, T	Yes	Yes	98.9%	35%
Wyoming	S, L, T	Yes	No	76.3%	20%

Table 4. (cont.)

Sources: Information on employees covered and Social Security coverage comes from authors' review of the websites of the individual plans. The collective bargaining data are from Lovenheim and Willem (2019), and the funding ratios are from U.S. Department of Labor (2021).

Notes: S indicates that the plan covers state employees, L indicates the plan covers local government employees, and T indicates the plan covers teachers. For a description of the collective bargaining variable, the funding ratio, and Republican control, see text.

Table 5. Determinants of the Decline in Initial Pension Benefits

	(15 YOS)	(20 YOS)	(30 YOS)
Plan Covers only Teachers (=1 if yes)	0.026	-0.022	-0.094*
	(0.037)	(0.046)	(0.052)
Social Security Coverage (=1 if yes)	-0.020	-0.089*	-0.049
	(0.041)	(0.052)	(0.059)
Union Duty to Bargain (=1 if yes)	0.015	-0.035	-0.021
	(0.037)	(0.046)	(0.053)
Funding Ratio (continues measure)	-0.187	-0.191	-0.276
	(0.146)	(0.183)	(0.208)
Republican Control	-0.040	-0.058	0.100
	(0.055)	(0.068)	(0.078)
Constant	0.216*	0.351**	0.381**
	(0.107)	(0.134)	(0.153)
Adjusted R2	0.028	0.086	0.039
Mean dependent variable	0.076	0.093	0.112
Number of observations	41	41	41

Notes: The dependent variable is the percent change in initial pension benefit based on the 2020 formula minus the benefit from the 2000 formula. In the regression, the decrease in benefits is given in absolute value so that a negative coefficient indicates that the variable decreases the percent decline in initial retirement benefits.

Standard errors are in parentheses. *The probability of obtaining a test statistic this large, when the null hypothesis $\beta=0$ is true, is less than ten percent. **The probability of obtaining a test statistic this large, when the null hypothesis $\beta=0$ is true, is less than five percent.

Table 6. Public Retirement Systems without Traditional DB Plans in both 2000 and 2020

State	Employees Covered	Plan Type 2000	Plan Type 2020	Social Security Coverage	Collective Bargaining	Funding Ratio
Alaska	T	DB	DC	No	Yes	70.4%
Indiana	S, L, T	Hybrid	Hybrid	Yes	Yes	61.9%
Kansas	S, L, T	DB	Cash Balance	Yes	Yes	67.5%
Michigan	T	DB	DC or Hybrid	Yes	Yes	63.7%
Oregon	S, L, T	DB	Hybrid	Yes	Yes	75.4%
Pennsylvania	T	DB	Hybrid	Yes	Yes	57.1%
Rhode Island	S, T	DB	Hybrid	Yes	Yes	54.7%
Utah	S, L, T	DB	DC or Hybrid	Yes	No	87.4%
Virginia	S, L, T	DB	Hybrid	Yes	No	76.8%

Sources: Information on employees covered, plan type, and Social Security coverage comes from authors' review of the websites of the individual plans. The collective bargaining data are from Lovenheim and Willem (2019), and the funding ratios are from U.S. Department of Labor (2021).

Notes: S indicates that the plan covers state employees, L indicates the plan covers local government employees, and T indicates the plan covers teachers. For a description of the collective bargaining variable and the funding ratio, see text.

Endnotes

[1] Johnson and Kolasi (2020) examine recent changes to 43 traditional state-managed plans that cover teachers, and find that 20 of those plans increased the normal retirement age; 15 plans increased the number of years in the final average salary (FAS) calculation; 13 plans lowered the benefit multiplier; and 12 increased years for vesting. Brainard and Brown (2018) report that, in recent years, at least 33 states, covering 40 public employee plans, many of which include teachers, increased their retirement requirements – typically, increases in age and service requirements for normal retirement. Aubry and Crawford (2016) also document widespread reductions in benefits by state and local plans. See also Center for State and Local Government Excellence (2014) and NASRA (2019).

[2] Johnson and Kolasi (2020) report that 25 teacher plans have increased recently the employee contribution rate, and Brainard and Brown (2018) report that 40 public plans in 39 states increased employee contributions between 2009 and 2018. . See also, Fitzpatrick and Goda (2020), which examines the impact of COLA changes on the present value of lifetime pension benefits once individuals have retired. See also NASRA (2020b).

[3] Workers often "pay" for their fringe benefits via a reduction in their wages (Smith (1981). Craig (1995) estimates that, beyond their direct contributions, federal employees paid for roughly a third of their pensions via a lower wage profile. A reduction in employer pension contributions, accompanied by an increase in required employee contributions, would unambiguously reduce the "total" wage for workers, in this case teachers.

[4] Of course, a change in the retirement benefit might affect the decision to remain with the school system for additional years in order to become vested.

[5] Teachers that terminate employment prior to being vested are eligible to receive their own contributions plus a specified interest rate return upon leaving the retirement plan.

[6] The replacement rate is calculated by determining the initial retirement benefit for teachers with certain characteristics and dividing the benefit by the salary the year before retirement. While we concentrate on retiring teachers with 30 years of service, we also report similar data for those with 15 and 20 years of service.

[7] New York City and Chicago still maintain their own retirement plans for teachers in their school districts.

[8] The underlying data are from Millis and Montgomery (1938).

[9] Federal employees had been covered by a plan since 1920.

[10] Two states (California and New Mexico) covered one hundred percent of their public-education employees; four (Connecticut, Michigan, Ohio, and Pennsylvania) covered "almost nine-tenths". Only six states had no plan for their teachers (Alabama, Idaho, Missouri, North Carolina, Oklahoma, and South Dakota), and all but one of those states (Idaho) were either in the process of creating a plan for their teachers or soon would create one (Clark et al. 2011, Table 4-5). In the remainder of the states, at least some substantial proportion of teachers, and/or public education employees more broadly, were covered (McCamman 1943, p. 34). By 1952, there were 1.9 million public school employees, including non-instructional staff, in the United States; 75 percent of these workers were covered by a pension plan (McCamman 1951, Table 1).

[11] Clark et al. (2003) and Clark and Craig (2010) note this issue but do not otherwise explore it.

[12] See, for example, Figure 1 in Aldeman (2019), and Figures 2-1 through 2-3, and the accompanying exposition, in Clark et al. (2003).

[13] In addition, Carver-Thomas and Darling-Hammond argue that turnover has a substantial negative impact on student performance; they conclude that "high turnover rates reduce achievement for students whose classrooms are directly affected" (2017, pp. v-vii). In contrast, Fitzpatrick and Lovenheim (2014) find no negative impact on student test scores from teacher turnover due to early retirement. Indeed, they conclude that an early-retirement program in Illinois "led to increased student achievement in most cases" (2014, p. 141). This question ultimately revolves around the productivity of the teachers who leave relative to their replacements. It is likely that productivity differs among new entrants, mid-career movers, and retirees (Rockoff 2004).

[14] Often these monies were laundered as donations to the political machines, and the politicians who ran them, that doled out public-sector jobs. As White notes "remunerative offices provided the kickbacks that funded political parties and politicians" (2017, p. 360). See also Badger (1989, pp. 210-211) and, more generally, Parillo (2013).

[15] While public-sector turnover rates were lower than those in the private sector, and teacher turnover was lower than in other public-sector positions (Owen 1994, 1995; Perlmann and Margo 2001) during that period, this issue is complicated by the labor market discrimination that marked the era in general and the female dominance of the teaching profession in particular (Goldin 1990; Perlmann and Margo 2001; and Rotella 1981).

[16] The authors thank Maria Fitzpatrick for pointing out the importance of women in the labor market for teachers. Perlmann and Margo (2001) review the economics of the gender composition of the teacher labor force.

[17] Though Goldin (1990, pp. 185-210) also notes that such "protective" legislation, when applied solely to women, could be a source of discrimination; on this point, see also Perlmann and Margo (2001).

[18] "Bargaining" here does not necessarily mean "collective bargaining." See Libecap (1989) and North (1990).

[19] See LaCroix (1989) for a good discussion of the role of homogeneity in a different set of economic situations.

[20] For a discussion of organizational quasi-rents, see Aoki (1984). On the presence of these quasi-rents in the public sector, in general, see Mueller (1989); with respect to, specifically, their distribution among public-pension stakeholders, see Craig (1995). While Buchanan and Tullock (1962) and Olson (1965) are often cited as the seminal works on the importance of group homogeneity in the economics of collective action, it is worth noting the James Madison expounded on this point in Federalist #10. Subsequent generations of scholars, with the blessing of hindsight, have emphasized the *political* aspects of Madison's dissection of "factions," projecting them onto the political parties that formed almost immediately after the Constitution's ratification, and which have dominated the U.S. political landscape since. However, in the passages that follow Madison's seminal characterization of factions, he focuses on their *economic* dimensions (Madison 1788 (1982), p. 44).

[21] While teacher compensation fares favorably with comparable *private-sector* occupations (Liu and Aubry 2021), in general, in many states, teachers have been treated more generously than other *state* employees. In North Carolina, to offer just one example, between 1988 and 2008, average teacher pay nearly doubled, increasing by 93 percent; whereas, other state employees received, on average, only a 56 percent increase (Stoops 2009, p. 1).

[22] Lower bargaining costs would generate greater (net) quasi-rents to be shared among teachers, legislators, plan administrators, and so forth (Craig 1995).
[23] Olson focuses on the difficulties associated with organizing larger collections of firms (Olson 1965, p. 48); while Olson and McFarland refer to the creation and maintenance of "obstacles" to competition (1962, p. 622), that are necessary for the perpetuation of monopoly rents.
[24] Our discussion here reads as if the choice is solely up to the teachers. Obviously, in practice, there are other parties (e.g. legislators, governors, plan administrators, and so forth) to whatever bargain is ultimately reached. North (1990, p. 87) highlights the importance of these other parties. Qualitatively our summary here is consistent with his treatment of the basic question.
[25] Authors' calculation from Clark and Craig (2010). These results are for "all" plans in each category. More detailed analysis, such as looking at plans in and out of Social Security, reveals the same qualitative result: Teachers benefited financially from being in their own plans.
[26] Article I, Section 9, Clause 4.1 of the U.S. Constitution prohibits the imposition of direct taxes, "unless in Proportion to the Census or enumeration herein before directed to be taken." In *Pollock v. Farmers' Loan and Trust*, 157 U.S. 429 (1895), the U.S. Supreme Court ruled that the federal government could only impose direct taxes if they were apportioned among the states in proportion to their representation in Congress. This doctrine was circumvented somewhat by the 16th Amendment, which made possible the federal income tax. However, there was no matching employer contribution to the income tax, and thus it remained an open question whether or not Congress could force the states to remit payroll tax revenues to the U.S. Treasury.
[27] As the Social Security Act was working its way through Congress, the Supreme Court ruled, in *Railroad Retirement Board v. Alton Railroad Co.*, 295 U.S. 330 (1935), that the Railroad Retirement Act was unconstitutional on the grounds that the forced contributions from employers were a violation of the "takings" clause of the Fifth Amendment. This issue would, in the following year, at least partly lead the court to reject the administration's main agricultural relief plan, the Agricultural Adjustment Act (*U.S. v. Butler*, 297 U.S. 1 (1936)). The *Butler* decision, which involved a tax on the processors of agricultural products, is often presented, like *Alton*, as one that revolves around the spending power (granted to Congress under Article I, Section 8 of the Constitution) for the *general welfare of the people*, a standard which neither the AAA nor the Railroad Retirement Act could claim to meet (Black 2003, p. 377; and Kennedy 1999, p. 329). However, the majority opinion in *Butler* also focuses on the allocation of power between the federal government and the states, which was, more or less, the concern of the authors of the Social Security Act when they omitted state and local employees from Title II coverage. Badger (1989 p. 160) notes the importance of both issues.
[28] *Helvering v. Davis*, 301 U.S. 619 (1937).
[29] During the 1940s, the legislatures of three States (Utah, Vermont, and Washington) passed legislation that would enable their employees to join the Social Security System, if Congress would amend the Social Security Act permitting state employees to participate in the system. The legislatures of at least eight additional states (Alaska, Arkansas, Delaware, Montana, Oklahoma, Oregon, South Carolina, and Texas; and in Arkansas and Oregon) passed resolutions calling on Congress to amend the Social Security Act to include some or all state employees. The legislatures of two states (Idaho and New York) approved resolutions calling for the expansion of Social Security to previously uncovered occupations in both the public and private sectors. And the mayors or city councils of local governments in at least ten states (Arizona, Colorado, Connecticut, Florida, Missouri, Nevada, New Jersey, North Carolina, Pennsylvania,

and Washington) explicitly petitioned Congress, requesting the extension of Social Security to municipal and county employees. See Altmeyer (1945).

[30] At the time the amendments were passed, twelve states had already passed the relevant legislation: Arkansas, California, Idaho, Kentucky, Massachusetts, North Carolina, Oklahoma, South Dakota, Utah, Vermont, Washington, and West Virginia (Liebowitz 1950, p. 8). The authority allowing voluntary participation in Social Security by public employees is contained in section 218 of the Social Security Act. As a result, these state agreements are referred to as "section 218 agreements." Each state's Social Security Administrator is responsible for managing the state's agreement with the Social Security Administration.

[31] Police officers and firefighters, for whom separate plans were in place at the time, were still prohibited from joining Social Security. They were excluded as a result of lobbying by the associations representing their interests. As Congressman Ray Madden (D-Indiana) noted in the *Congressional Record*, "Also policemen and firemen who have an adequate retirement system have been excluded by reason of the request from the various police and firemen organizations throughout the country" (1954, p. 7418).

[32] The Director Bureau of Old-Age and Survivors Insurance, Victor Christgau, in a memo summarizing the 1954 act, emphasized the bureau's commitment to enforcing this provision (U.S. Bureau of Old Age and Survivors Insurance 1954). While the discussion in the Congressional Record would seem to support the view that Congress did not intend for employee benefits to be reduced as a result of the amendment (U.S Congress 1954, p. 7418-7425), the fact that a vote was required to join the system suggests that workers faced explicit tradeoffs.

[33] At the time the McCamman study was being written, in the fall of 1955, Texas state employees, excluding the state's teachers, had just held a referendum (Texas teachers remain outside the system to this day), and the Michigan State Employees Retirement System (with 23,000 members); the North Carolina Teachers and State Employees Retirement System (65,000 members); the North Carolina Local Governmental Employees Retirement System (8,000 members); and the New Jersey Teachers Pension and Annuity Fund (36,000 members) were either in the process of holding referenda or had one scheduled (McCamman 1956, p. 17).

[34] Streckewald (2005) estimates that 28 percent of *all* state and local workers remained outside of the Social Security system.

[35] In addition, the structure of defined benefit plans is such that teachers working in more than one state incur a financial penalty, which is not present in the Social Security system does not. However, many states have reciprocal agreements that allow teachers to transfer service credits by buying additional years of service. These additional years are typically treated as regular years of employment by the teacher's new state plan. These agreements mitigate or eliminate the mobility cost associated with defined benefit plans.

[36] Initially, among states joining the system, eight made no reductions in the generosity of their own state retirement plans. However, 15 states modified their systems slightly, but in all of these cases, total retirement benefits – that is, Social Security plus employer-provided pension benefits – were greater than the retirement benefits earned prior to Social Security coverage. Finally, another eight states integrated their systems with Social Security and markedly reduced benefits payable under their state systems (Mueller 1961). The Pension Task Force (1978) on public pension systems noted the strategy of terminating and restructuring benefits when public employees were first covered by Social Security.

[37] There is also a legacy cost associated with public-sector pension plans, but the state is responsible for covering this cost. Of course, as this paper suggests more broadly, states can alter their pension contracts. Overall, determining how legacy costs actually affect the pension plan participants (and other stakeholders) is a complex issue, beyond the scope of this paper.
[38] The presence of an efficiency wage premium might generate an increase in productivity and thus, to the extent that output was not fully appropriated by the workers who generated it, some net new quasi-rents would have been on the table. However, one could reasonably expect such a gain to be small compared to the employer's share of the payroll tax.
[39] In fact, holding other factors constant, with a larger potential net benefit on the table (i.e. through the combination of pension and Social Security benefits), contracting theory predicts it would be easier to obtain an agreement: "The larger the expected aggregate gains, the more likely a politically acceptable share arrangement can be devised…" (Libecap 1989, p. 21).
[40] The goals of the various other stakeholders are neither unidirectional nor unambiguous. To give but one example, legislators and pension plan managers are likely to have different views of reductions in pension benefits.
[41] As Clark and Craig (2010) and Clark et al. (2011) show, plans that include their teachers in Social Security have, on average, lower lifetime benefits than teacher plans that do not, and many of these plans existed before 1954.
[42] Not necessarily a larger set; that would have been a function of the plan's size, but certainly a diverse set that was heavily invested in the current plan. See Moe (1990, pp. 22-6-228) on the legislative construction of institutional arrangements to protect current property rights in the face of future uncertainties.
[43] As Heckathorn and Maser (1987, p. 76) note, even when contracting might lead to an increase in efficiency in a private transaction or generate additional quasi-rents in the public sector, the complexity of negotiations might prohibit an agreement.
[44] In the other nine states, teachers were not covered by DB plans in both years, including states that switched from a DB plan to either DC, hybrid, or cash balance plans or states that did not initially have a DB plan. These states are examined below.
[45] When the retirement plan lists several options for the normal retirement age, the selection is based on the minimum age at which an individual qualifies for unreduced retirement benefits. For example, suppose the plan has two options: (1) to retire at age 62 with at least 5 years of creditable service or (2) to retire under the 'Rule of 90'. To calculate the benefits, we use age 62 as the retirement age for retirees with either 15 or 20 years of service, and age 60, for retirees with 30 years of service.
[46] Examples of how retirement systems changed their benefit formulas are shown in Appendix Tables A1 through A3. The tables vary based on which types of employees are covered by a plan and whether or not they are also covered by Social Security.
[47] Salaries for the last four years are $47,116, $48,058, $49,020, and $50,000, following our assumption of the 2.0 percent salary increase per year.
[48] Appendix Tables 1 to 3 illustrate the changes in benefit formulas for teacher-only plans outside of Social Security (Table A1), teacher-only plans where employees are included in Social Security (Table A2), and all other state plans covering teachers (Table A3). The tables show that many states have modified their benefit formulas in several ways to reduce future retirement benefits.

[49] Holding other variables constant, this decline would be unambiguously associated with a welfare loss on the part of teachers. Of course, teachers have the option of working longer to obtain the same initial benefit as their predecessors, or retiring at the same age and accepting a lower benefit, or some combination in between. It is not clear that the welfare loss from one of these options would exceed that of another. The authors thank an anonymous referee for highlighting the welfare implications of these changes.

[50] The seminal empirical investigation of this relationship is Gustman and Segal (1977).

[51] The relevant case was *In re Inland Steel Company and Local Nos.1010 and 64, United Steel Workers of American (CIO)*. See National Labor Relations Board 77 NLRB 1 (1948) and the discussion in Somers and Schwartz (1950).

[52] With respect to teachers' unions, an important early study of this impact is Eberts and Stone (1986); for a more recent analysis, see Winters (2011).

[53] There is debate concerning the appropriate interest rate to be used in the calculation of future liabilities of pension plans. In this analysis we use the interest rates reported by the state plans. Many economists argue that the real interest rate would yield a more accurate measure of future liabilities. In Appendix Table A? we repeat the regression analysis using a funding ration based on estimate from Rauh (2017), as reported in US Department of Labor (2021 Figure 17, Page 82). As Giertz and Papke (2007) note, the funding ratio figures, a reported by the states, are heavily influenced by the rates used to discount future values.

[54] We also included the similar variable that only reflected Republican control of the state legislature. The results were qualitatively similar to those reported in Table 5.

Appendix A. Changes in Benefit Formulas for Teachers

Appendix Table A1. Changes in Benefit Formulas for Teacher-Only Plans not in SS: 2000-2020

State	FAS	Benefit Multiplier	Normal Retirement
Alaska	Changed from DB to DC plan		
California	1 year to 3 years		60 to 62 Ended 50/30
Connecticut	3 years to 5 years		60/20 to 63/25
Illinois	4 years to 8 years		62/5 to 67/10
Kentucky		2.5% changed to 1.7%-2.5%	Increased penalty for early retirement
Louisiana	3 years to 5 years		60/5 to 62/5 (Ended 30 years only)
Massachusetts	3 years to 5 years		55/10 to 60/10 Ended 20 years only
Missouri			
Ohio	3 years to 5 years	Reduced multiplier for 30 plus years (2.5% changed to 2.2%)	33 any age change to 60/35
Texas	3 years to 5 years		Age/service increase

Sources: Retirement system's websites; see main text for details.

Appendix Table A2. Changes in Benefit Formulas for Teacher-Only Plans in SS: 2000-2020

State	FAS	Benefit Multiplier	Normal Retirement
Alabama	3 years to 5 years	2.0125 to 1.65%	60/10 to 62/10 Ended 25 years only
Arkansas		Lower multiplier for less than 10 years and for non-contributory service with more than 10 years	
Georgia	No changes		
Indiana	Hybrid Plan		
Michigan	Changed to DC or Hybrid plan in 2010		
Minnesota			Linked retirement age to SS age up to 66
Montana	3 years to 5 years		Increased any age 25 years to 55/30
Nebraska	3 years to 5 years		Increased min age from 55 to 60
New Jersey	3 years to 5 years	Reduced (Years/55 to years/60)	Increased from 60 to 65
New Mexico		Reduced (2.35% to 1.35% - varies by years)	Increased
New York	3 years to 5 years	Reduced	55/5 to 55/10
North Dakota	3 years to 5 years		Increased rule of 85 to rule of 90 min age 60
Oklahoma			Increased min age 60 to 65, rule of 80 to 90
Pennsylvania	Changed to Hybrid plan in 2019		
Vermont			
Washington			Increased benefit reduction for early retirement (3% to 5%)
West Virginia			Increased (62/5 or 60/20 to 64/10 or 63/20)

Sources: Retirement system's websites; see main text for details.

Appendix Table A3. Changes in Benefit Formulas for Plans that Include Teachers and Other State and/or Local Employees

State	FAS	Benefit Multiplier	Normal Retirement
Arizona	3 years to 5 years		Rule of 80 changed to 60/25 and 55/30; Penalties increased for early retirement
Colorado	3 years to 5 years		60/20 to 64/30; cancelled 50/30; New rule: any age with 35 YOS
Delaware		2% to 1.85%	62/5 to 65/10; 60/15 to 60/20
Florida	5 years to 8 years	Reduced multiplier based on Normal Retirement Age)	62 or 30 YOS to 65 or 33 YOS; Penalties increased for early retirement
Hawaii	3 years to 5 years	2% to 1.75%	62/5 to 65/10; 55/30 to 60/30
Idaho	No Change		
Iowa	3 years to 5 years		Penalty for early retirement increased from 3% to 6 %
Kansas	Changed from DB to Cash Balance		
Maine			62 to 65
Maryland	3 years to 5 years	1.8 to 1.5	62/5 to 65/10; ended any age + 30 YOS and 63 YO + 4 YOS, 64 YO + 3 YOS, 65 YO + 2 YOS; added Rule of 90
Mississippi		2% until 25 YOS (increased to 30 YOS) + 2.5% for years after 25 YOS (for years after 30 YOS)	60/4 to 60/8; or any/25 to any/30
Nevada		2.5% to 2.67%	
New Hampshire	3 years to 5 years	Reduced for retirees between age 60-64 from 0.0166 to 0.01515	60/Any to 65/Any; Penalties for early retirement changed
North Carolina	No change		
Oregon	Changed from DB to Hybrid		
Rhode Island	Changed from DB to Hybrid plan		
South Carolina	12 quarters to 20 quarters		65/5 to 65/8
South Dakota	3 years to 5 years	multiplier increased from a mix of 1.7% and 1.55% to 1.8%	65 to 67; Ended rule of 85
Tennessee	No change		
Utah	Changed from DB to DC or Hybrid		
Virginia	Changed from DB to Hybrid		
Wisconsin	No change		
Wyoming	36 months to 60 months	multiplier decreased from a mix 2.125% & 2.25% to 2%	60/4 increased to 65/4

Sources: Retirement system's websites; see main text for details.

Appendix Table A4. Summary of 50 State-Managed Retirement Plans Covering Teachers*

State	Name of Plan	Employees Covered	Plan Type 2000	Plan Type 2020	%Δ in Initial Benefit for Teachers with 15 YOS	%Δ in Initial Benefit for Teachers with 20 YOS	%Δ in Initial Benefit for Teachers with 30 YOS
Alabama	TRS	T	DB	DB	-19.6%	-19.6%	-19.6%
Alaska	TRS	T	DB	DC	NA	NA	NA
Arizona	SRS	S, L, T	DB	DB	-1.9%	-1.9%	-56.9%
Arkansas	TRS	T	DB	DB	0.0%	0.0%	0.0%
California	TRS	T	DB	DB	-12.0%	-12.0%	-21.6%
Colorado	PERA	S, L, T	DB or DC	DB or DC	-1.9%	-68.8%	-51.9%
Connecticut	TRS	T	DB	DB	-1.9%	-1.9%	-1.9%
Delaware	SEPP	S, T	DB	DB	-12.0%	0.0%	0.0%
Florida	FRS	S, L, T	DB	DB, DC or Hybrid	-17.4%	-17.4%	-17.4%
Georgia	TRS	T	DB	DB	0.0%	0.0%	0.0%
Hawaii	ERS	S, L, T	DB, DC or Hybrid	DB, DC or Hybrid	0.0%	0.0%	0.0%
Idaho	PERS	S, L, T	DB	DB	0.0%	0.0%	0.0%
Illinois	TRS	T	DB	DB	-44.2%	-44.2%	-44.2%
Indiana	TRF	T	Hybrid	Hybrid	NA	NA	NA
Iowa	PERS	S, L, T	DB	DB	-1.9%	-1.9%	-1.9%
Kansas	PERS	S, L, T	DB	Cash Balance	NA	NA	NA
Kentucky	TRS	T	DB	DB	-28.0%	-26.0%	0.0%
Louisiana	TRSL	T	DB	DB	-1.9%	-1.9%	-1.9%
Maine	PERS	S, L, T	DB	DB	-18.0%	-18.0%	-18.0%
Maryland	SRPR	S, L, T	DB	DB	-16.7%	-16.7%	-16.7%
Massachusetts	TRS	T	DB	DB	-28.9%	-28.9%	-20.3%
Michigan	PSERS	T	DB	DC or Hybrid	NA	NA	NA
Minnesota	TRA	T	DB	DB	0.0%	0.0%	0.0%
Mississippi	PERS	S, L, T	DB	DB	0.0%	0.0%	-4.0%
Missouri	PSRS	T	DB	DB	0.0%	0.0%	0.0%
Montana	TRS	T	DB	DB	-1.9%	-1.9%	-1.9%
Nebraska	SPP	T	DB	DB	-1.9%	-1.9%	-1.9%
Nevada	PERS	S, L, T	DB	DB	6.8%	6.8%	6.8%
New Hampshire	NHRS	S, L, T	DB	DB	-9.1%	-9.1%	-9.1%
New Jersey	TPAF	T	DB	DB	-10.1%	-10.1%	-23.6%
New Mexico	ERA	T	DB	DB	-37.0%	-30.7%	0.0%
New York	TRS	T	DB	DB	-8.3%	-19.8%	-16.0%
North Carolina	TSERS	S, T	DB	DB	0.0%	0.0%	0.0%
North Dakota	TRF	T	DB	DB	-1.9%	-1.9%	-17.6%
Ohio	STRS	T	DB, DC or Hybrid	DB, DC or Hybrid	-1.9%	-1.9%	-1.9%
Oklahoma	TRS	T	DB	DB	-20.0%	-20.0%	0.0%
Oregon	PERS	S, L, T	DB	Hybrid	NA	NA	NA
Pennsylvania	PSERS	T	DB	Hybrid	NA	NA	NA
Rhode Island	ERS	S, T	DB	Hybrid	NA	NA	NA
South Carolina	SCRS	S, L, T	DB	DB	-1.9%	-1.9%	-26.5%
South Dakota	SRS	S, L, T	DB	DB	-6.5%	-6.5%	-48.1%
Tennessee	CRS	S, L, T	DB	DB or Hybrid	0.0%	0.0%	0.0%
Texas	TRS	T	DB	DB	-1.9%	-11.7%	-11.7%
Utah	SRS	S, L, T	DB	DC or Hybrid	NA	NA	NA
Vermont	TRS	T	DB	DB	0.0%	0.0%	0.0%
Virginia	SRS	S, L, T	DB	Hybrid	NA	NA	NA

Washington	TRS	T	DB	DB or Hybrid	0.0%	0.0%	0.0%
West Virginia	TRS	T	DB	DB	0.0%	0.0%	0.0%
Wyoming	WRS	S, L, T	DB	DB	-7.7%	-12.8%	-32.8%
Wisconsin	WRS	S, L, T	DB	DB or DC	0.0%	0.0%	0.0%

Sources: Websites of each plan covering teachers and the Wisconsin Legislative Council. The change in pension benefit is based on our calculation for a retiring teacher with 15, 20, and 30 years of service in 2020 relative to a similar teacher retiring in 2000 assuming that the teacher had a final salary of $50,000 and retired at the normal retirement age as specified in the 2000 benefit formula.

Notes: *Plans that did not have DB plans in both years are highlighted in gray. We do not calculate initial retirement benefits for teachers in these plans.

Appendix Table A5. Determinants of Decline in Initial Pension Benefit – Using Rauh's Funding Ratio

	FR - Rauh Estimates		
	(15 YOS) (1)	**(20 YOS) (2)**	**(30 YOS) (3)**
Plan Covers only Teachers (=1 if yes)	0.032	-0.014	-0.097*
	(0.036)	(0.046)	(0.052)
Social Security Coverage (=1 if yes)	-0.030	-0.103**	-0.045
	(0.040)	(0.051)	(0.058)
Union Duty to Bargain (=1 if yes)	0.029	-0.019	-0.027
	(0.037)	(0.047)	(0.053)
Funding Ratio (FR) (continues measure)	-0.276	-0.259	-0.306
	(0.195)	(0.246)	(0.281)
Constant	0.196*	0.314**	0.367**
	(0.100)	(0.126)	(0.143)
Adjusted R2	0.028	0.075	0.027
Mean dependent variable	0.076	0.093	0.112
Number of observations	41	41	41

Notes: The dependent variable is the percent change in initial pension benefit based on the 2020 formula minus the benefit from the 2000 formula. In the regression, the decrease in benefits is given in absolute value so that a negative coefficient indicates that the variable decreases the percent decline in initial retirement benefits.

Standard errors are in parentheses. *The probability of obtaining a test statistic this large, when the null hypothesis $\beta=0$ is true, is less than ten percent. **The probability of obtaining a test statistic this large, when the null hypothesis $\beta=0$ is true, is less than five percent.

Appendix B. Changes in Plan Type for Teachers

Using information from the retirement system's websites, we provide an overview of changes to the nine state retirement plans covering teachers that did not have a traditional defined benefit (DB) plan in both 2000 and 2020. Six of these plans switched from a traditional DB plan to a new hybrid plan; one changed to a cash balance plan; one changed to a defined contribution (DC) plan; and one remained a hybrid plan.

Alaska Teachers Retirement System (TRS). Employees who first entered the TRS prior to July 1, 2006 are members of the TRS DB Plan; while those who began participating in the system after this date are in the new PERS/TRS Defined Contribution Plan. If retiring under the DB rules in effect in 2000, the normal retirement age was 60, if vested, or any age with 30 years of service, along with early retirement age at 55, if vested. The retirement benefit was based on the following formula: 2 percent multiplied by average base salary (ABS) and service years up to 20, plus 2-1/2 percent times ABS, times service years over 20. Thus, retirees with 30 years of service would have an initial retirement benefit equal to 65 percent of their ABS. Individuals hired after July 1, 2006 are enrolled in the DC plan. The employee contribution rate is 8 percent of gross eligible compensation. Employers of PERS participants contribute 7 percent of compensation to the employee's retirement account, making the total contribution 15 percent of gross salary. At retirement, the participant's account balance would equal total contributions plus the accumulated return over the working life of the employee.

Indiana Teachers Retirement Fund (TRF). Current and past employees are covered by a hybrid plan that requires a 3 percent employee contribution. The employee contribution goes to fund the DC component of the hybrid plan; while employers pay for the DB benefit. Additional voluntary employee contributions to the DC plan are permitted. Employees also have

a choice of enrolling in a DC plan instead of the hybrid plan. The DB component of the hybrid plan is determined by the product of 1.1 percent, final average salary (FAS), and years of service. Retirement from the DB portion of the hybrid plan can be taken at age 60 with 15 years of service, age 65 with 10 years of service or using the "rule of 85", which is an option when the sum of age and years of service equal 85.

Kansas Public Employees Retirement System (KPERS). Teachers and other state and local employees hired before July 2009 participate in a DB plan. Benefits were determined by multiplying (years before 2014) times 1.75 percent, times ABS, plus (years 2014 and thereafter) times 1.85 percent times ABS, which is the average of the three highest years of earnings. Participants contributed 6 percent of pay to the plan. Employees can retire at age 65, with one year of service, or age 62 with ten years of service, or any age using the rule of 85. Employees hired after January 1, 2015 are covered by a cash balance plan that requires an employee contribution of 6 percent of pay. At retirement, PERS calculates both a retirement benefit based on the contribution account balance and the worker's retirement credits, along with some actuarial factors. Employees can retire at age 65 with 5 years of service, at age 60 with 30 years of service, or with reduced benefits at age 55 with 10 years of service.

Michigan Public School Employee's Retirement System (MPSERS). Teachers who were first employed by a Michigan public school before July 1, 2010 participate in a DB plan. Teachers hired after 2010 have had a choice between a DC plan and a hybrid plan. The DB plan pension multiplier used in the benefit calculation depends on employee choices. Depending on plan options, benefits for retirees in 2000 were determined using either a 1.5 percent multiplier, or a combination of 1.5 percent for the first 30 years of service, and 1.25 percent for years over

30. The benefit is the product of the multiplier and FAS, based on the last three years of service. Employees contribute 4 percent of their pay to the retirement plan.

For teachers covered by the hybrid plan effective in 2020, participants and their employers contribute 6.2 percent of pay for the DB component of the plan. The retirement benefit is the product of the pension multiplier of 1.5 percent, the FAS (based on the last five years of service), and years of service. In addition, teachers contribute 2 percent of pay to the DC component of the plan, with the employer contributing 1 percent. Teachers that elect to participate in the DC plan contribute 3 percent of pay; while their employers have a mandatory contribution of 4 percent and up to a 3 percent matching contribution. Additional voluntary contributions are allowed. In both plans, additional employee and employer contributions go to support retiree health benefits.

Oregon Public Employees Retirement System (PERS). Under the DB plan based on 2000 rules, the benefit for teachers and other state and local workers was calculated by the product of 1.67 percent multiplier, FAS, and years of service. Normal retirement was age 60, or any age with 30 years of service, while reduced early benefits were possible at age 55. Members hired after August 28, 2003 participate in the new hybrid plan: the Oregon Public Service Retirement Plan. Employees earning below a threshold level ($2,535/month) contribute 6 percent of pay to their individual savings account; while those earning more than the threshold contribute 5.25 percent. Account balances are invested in a target date fund. The DB pension is determined by the product of a 1.5 percent multiplier, ABS (which is based on the highest three consecutive years), and years of service. The DB benefit is funded by employer contributions. Participants can start a normal retirement benefit at age 65, or at age 58 with 30 years of service. Actuarially reduced early retirement benefits can be started at age 55.

Pennsylvania Public School Employees' Retirement System. Employees retiring under the pension rules in effect for new hires in 2000 were covered by a DB plan. The benefit was determined by the product of a 2.0 percent multiplier, ABS (the highest 3 years), and years of service. Normal retirement benefits were available at age 62, or age 60 with 30 years of service, or any age with 35 years of service. The employee contribution rate is 6.25 percent. After a series of plan changes, the teacher system shifted to a choice between DC and hybrid plans. The DC plan is based on an employee contribution of 7.5 percent of pay and 2.0 percent employer contribution. The hybrid plan has a DB benefit determined by the product of a 1.0 percent multiplier, FAS (5 years of earnings), and years of service. Employees contribute 5.5 percent of pay to support the DB benefit, which can be received at age 67 with three years of service. The DC component of the hybrid plan has an employee contribution of 2.75 percent of pay and an employer contribution of 2 percent.

Rhode Island, Employees Retirement System of (ERSRI). The Rhode Island public retirement benefits for teachers and other state employees were modified in 2012 as the system shifted from a DB plan to a new hybrid plan. Under the old DB plan, prior to 2005, employees were eligible to retire with 28 years of service, or at age 60 with 10 years of service. The benefit was determined by the product of a multiplier – ranging from 1.7 percent of pay for years 1-10, up to 3.0 percent for years 21-30 – ABS (based on the highest 3 years of earnings), and years of service. Employees under the new hybrid plan receive a DB benefit determined by the product of a 1.0 percent multiplier, ABS (based on highest five years of service), and years of service. Employee contributions to the hybrid plan are 3.75 percent to the DB component and 5 percent to the DC component. The employer contribution to the DC plan varies between 1.0 percent and 1.5 percent, depending on years of service. Under the new hybrid plan, the normal retirement

age for benefits is the same as the Social Security normal retirement age for participants not to exceed 67.

Utah Retirement Systems (URS). On July 1, 2011, Utah terminated its DB plan for teachers and other state and local employees and offered newly hired employees the option of enrolling in a hybrid plan or a DC plan. The benefit formula in the DB plan in effect for people retiring under the 2000 plan is determined by the product of 2 percent, FAS, and years of service. Employees could retire with 30 years of service at any age, or age 60 with 20 years of service. This plan did not require any employee contributions. The hybrid plan in effect for employees retiring under the 2020 rules includes a DB benefit determined by the product of a 1.5 percent multiplier, FAS, and years of service. Participants can retire at any age with 35 years of service, or at age 60 with 20 years of service. The employer contributes 10 percent of pay to support this plan. If the required employer contribution is less than 10 percent, the difference is placed in the employee's DC account. However, if the required contribution exceeds 10 percent of pay, then the employee must contribute the difference. Under the DC plan, the employer contributes 10 percent of pay into the employee's 401(k) account. Retirement benefits under the hybrid plan are clearly less generous than the prior DB plan. Initial retirement benefits are lower, and there is a risk of having employee contributions if the pension fund does not have a sufficiently high rate of return (Clark et al., 2016). Most of recent retirees have chosen to participate in the hybrid plan.

Virginia Retirement System (VRS). Teachers and other state and local employees hired prior to July 1, 2010 participate in a DB plan. Members contribute 5 percent of pay to support this plan. Normal retirement age is 65 with at least five years of service credit, or age 50 with at least 30 years of service. The retirement benefit is determined by the product of a 1.7 multiplier,

the average of the three highest years of earnings, and years of service. The retirement system adopted a new hybrid plan for employees first employed after January 1, 2014. The benefit under the DB component of the plan is determined by the product of a 1.0 percent multiplier, an ABS of the five highest years of earnings, and years of service. Members become eligible for an unreduced retirement benefit when they reach their normal Social Security retirement age and have at least five years (60 months) of service credit, or using the rule of 90 (i.e. when the sum of their age and years of service equals 90). The DC component of the plan is based on a mandatory 1.0 percent contribution by both the employer and employee. Voluntary employee contributions are allowed, and the employer matches these contributions up to 2.5 percent of pay.