The Dynamics of Teacher Salary Expense

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Selected Papers in School Finance

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Introduction

Much has been made of the budgetary impact of the so-called baby boom enrollment echo on school districts. It is estimated that the nation will need an additional 190,000 teachers by the year 2006 and that to maintain current service levels public schools will need to spend an additional $15.1 billion dollars just to keep pace with increasing enrollments.[1]

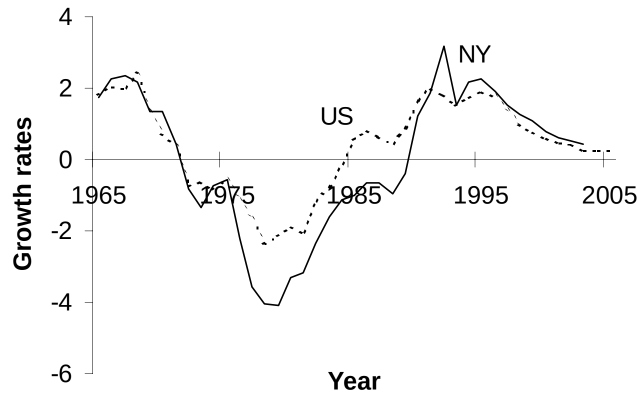
Indeed, over the period from 1985 to 2005 enrollments in elementary and secondary schools are estimated to increase by just under 25 percent, with most of this growth occurring before 1997. Figure 1 shows the annual enrollment growth for the United States over the 1969–2005 period. From 1970 to 1984 U.S. enrollments fell, reducing fiscal pressure in many school districts. Since 1984, fiscal pressure has been increasing, with growth rates peaking during the mid-1990s.[2] Although growth rates are expected to decline somewhat during the late 1990s and early next century, enrollment increases and the accompanying budgetary pressure will continue. Although school district budgets do not increase proportionately to enrollment increases, research indicates that there are few economies of scale with respect to enrollment increases. Thus, enrollment increases are a real and sizable source of concern for many school districts.

Another, less noticed trend has the potential to offset the fiscal effects of increased enrollment. In many school districts, teachers who were hired to teach the students from the baby boom have recently begun to retire. These retirements will continue over the next 10 years. As these teachers retire, they will be replaced with new, substantially lower paid teachers. Figure 2 shows the experience dis-

[1] U.S. Department of Education (1996).

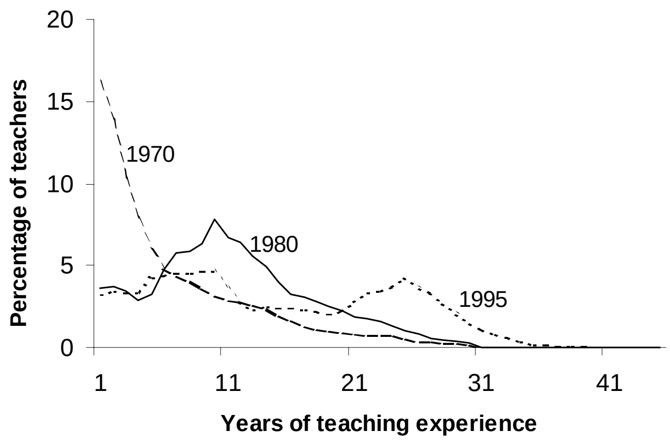
[2] For a detailed analysis of the effect of school district enrollment trends on school district budgets in the U.S., see Hanushek and Rivkin (1996). Grissmer and Kirby, in a series of papers, analyze teacher supply in Indiana and the nation (1987, 1991, 1992, 1993). For an analysis of these trends in New York, see Lankford and Wyckoff (1995).

Figure 1.—Annual school enrollment growth rates for the United States and New York



SOURCE: U.S. Department of Education, National Center for Education Statistics, Digest of Education Statistics 1995 and Projections of Education Statistics to 2006.

Figure 2.—Years of teaching experience of New York state teachers



SOURCE: Based on calculations by authors using New York State Education Department Personnel Master File (NYSED PMF).

tribution for all New York state teachers in 1970, 1980, and 1995.[3] The 1970 spike of teachers with 1 to 5 years of experience hired in response to the baby boom enrollment surge gradually worked its way through the system. By 1995, the cohort of teachers with 20 to 30 years of experience (veterans) accounted for one-third of all teachers in New York. Teachers with similar experience in 1970 accounted for only 6 percent of all teachers. This is a dramatic shift in the experience distribution of teachers.

The aging teacher workforce offers the potential for substantial salary savings. An example of a district's salary schedule is shown in figure 5. Since teacher salaries are largely determined by experience in the school

[3] Information on the age distribution for a national sample of teachers is provided by the Schools and Staffing Survey (SASS). In addition, there is limited age information provided by the American Federation of Teachers regarding the teachers in its unions. The information from both sources is consistent with that provided for New York State. For example, information from the SASS (U. S. Department of Education, 1996a) indicates that the average age of teachers has increased between 1987–88 and 1993–94. In addition, the portion of New York teachers who are at least 50 years old is only slightly greater than the national average. Many school districts across the United States find themselves with an aging workforce in which a large number of teachers are at or near retirement.

district, the cohort of aging teachers represents a substantial portion of school district salary expense. Table 1 shows the salaries paid to entry level teachers and teachers at the top end of the experience distribution for the United States and New York. As the veteran teachers retire, their replacements will earn from $15,000 to $30,000 less. With such a large percentage of the teacher population in this cohort, the potential savings are substantial.

In this paper we examine the potential salary savings from teachers aging through the experience distribution and compare this to the salary costs associated with the increasing enrollment from the baby boom echo. In general, we find that few districts are likely to experience meaningful salary savings as a result of the retirement of the baby boom cohort of teachers. Thus, the increasing enrollments of the baby boom echo are likely to continue to force difficult decisions in most school districts.

Teacher Retirement

The literature on teacher retirement generally examines two issues—work describing the structure of teacher retirement programs[4] and statistical models of the factors relevant to the retirement decisions of teachers.[5] Through the collective bargaining process, teachers have won generous retirement increases over the last 20 years. Until recently, the vesting requirements and a lack of portability of many of these plans had the effect of tying teachers to particular districts. During the period of declining enrollments from 1970 until the mid-1980s, many districts employed early retirement incentive programs to replace highly paid veteran teachers with entry level teachers. While the research regarding retirement programs provides a useful understanding of teacher retirement policies, the analysis is largely descriptive and aggregative. It is not intended to examine the behavioral responses to policy changes.

Statistical models of teacher quits typically employ data for a sample of teachers over time to understand the individual and school-level variables that cause some teachers to leave teaching. This work largely focuses on teacher retention during the early years of teaching careers, rather than factors relevant to retirement decisions.

The Dynamics of Teacher Salary Expense

Teacher compensation in most districts is based on salary schedules in which salaries largely reflect teacher in-district experience and educational attainment. Thus, total teacher salary expense is determined by the number and education-experience distribution of teachers[6] together with the salary matrix. The number of teachers is given by the desired student-

Table 1.—Teacher salary structure

	Entry level	Veteran
United States	$23,956	$40,517
New York	30,289	56,125

SOURCE: U.S. salary information comes from U.S. Department of Education (1996a) and reflects 1993–94 averages for public school teachers with a master's degree and no experience and highest step of the schedule. New York information from the New York State Education Department Personnel Master File (NYSED PMF) represents state averages in 1994–95 for the same categories.

4 Examples of this type of research include Auriemma, Cooper, and Smith (1992), and Tarter and McCarthy (1989).

5 Recent examples include Brewer (1996), Theobald and Gritz (1996), Mont and Rees (1996), and Murnane and Olsen (1990).

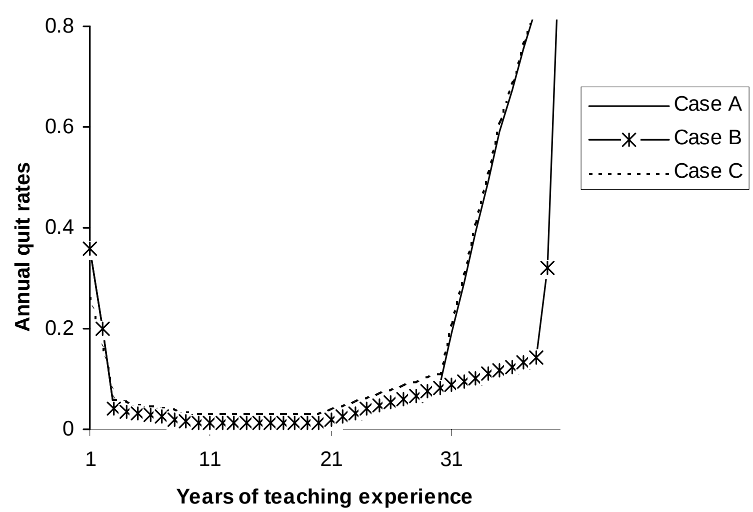
6 Although teachers in a district receive compensation associated with other factors, such as extra-curricular activities, their salaries largely reflect their educational attainment and years of experience.

teacher ratio and enrollments. Throughout the following analysis we take student-teacher ratios as given by the actual district level value for historical years (1987–88 through 1994–95), and we assume the 1994–95 values hold constant through 2003–04 when making projections. With regard to the salary matrix, we assume that the rewards to experience are as given in the 1987–88 salary matrix for each district.[7] As we age and replace the teaching workforce, we assume that the education levels of teachers in each district remain constant throughout.

Within a district, our analysis turns on two variables, enrollment changes and an aging teacher workforce. Enrollment changes directly affect the number of teachers hired. An aging workforce produces higher salaries as teachers move up the salary schedule. It also produces teacher quits which produce salary savings through the substitution of new teachers for veteran teachers. The analysis of changing enrollments is straightforward. For example, increasing enrollments in any given year lead to new hires, who then begin to work their way through the salary schedule.[8] Understanding the effects of the evolving teacher experience distribution is more complicated.

How the experience distribution of teachers changes over time is a function of teacher quit rates, the initial experience distribution, and whether the total number of teachers changes. A district's annual quit rate for teachers in a particular experience category is defined to be that proportion of the teachers who retire, resign or are terminated in a year.[9] The three hypothetical cases shown in figure 3 illustrate several features typical of teacher quit rates. Quit rates are relatively high for new teachers. After declining over approximately

Figure 3.—Examples of quit rates, by years of teaching experience



SOURCE: Hypothetical cases constructed by authors.

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[7] Alternative assumptions (e.g., using the 1994–95 salary schedule for experience) has almost no effect on the results.

[8] A portion of the initial new hires quit and are replaced by other new hires. Others continue teaching, thereby gaining experience and higher salaries. It follows that the salary expenditure associated with the teachers hired to teach the additional students will increase over time as these teachers move through the experience distribution.

[9] Quit rates are defined in terms of separations from a particular district. Alternative measures could be based on individuals leaving teaching altogether, leaving the public sector, or leaving the public sector, in a particular state. The appropriate definition depends upon the questions of interest. Since salary schedules in individual districts are based on in-district experience, and we are interested in budgets at the district level, district-level quit rates are employed in this analysis. To allow for the common practice of teachers taking leaves of absence, a quit is operationally defined to be a teacher not returning to teach in the district within 3 years. In reality, the rates at which teachers in a district quit will be subject to random fluctuations. The deterministic quit rates represent average quit patterns.

the first 10 years of teaching, the rates remain relatively constant over a range of years and then rise.[10]

When the total number of teachers in a district is constant over time, the number of teachers quitting at a point in time determines the number of new teachers that must be hired. Thus, the number of replacement teachers needed depends upon the initial experience distribution and teacher quit rates, since these determine the number of quits. For example, with a large number of highly experienced teachers having relatively high quit rates, the number of replacements will be larger than if the experience distribution is such that the bulk of teachers are in stages of their careers where quit rates are relatively low (i.e., the middle range of experience). In general, the number of new hires in a year together with the number of returning teachers in each experience category imply the new experience distribution.

Figures 4a and 4b show the hypothetical case of a district initially having the experience distribution labeled "year-00". This is the actual experience distribution for all New York public school teachers in 1970, and is roughly characteristic of the experience distributions found in districts across the county at the end of the baby-boom era. Consider how the experience distribution would change over time for the case where the total number of teachers hired remains constant and annual quit rates were as represented by case-C in figure 3. Those teachers hired around year-00 who continue to teach (i.e., the year-00 cohort) have a marked effect on the teacher distribution in subsequent years. This is certainly true for the distribution in year-10, although the relatively high quit rates for inexperienced teachers have altered the shape of the distribution of teachers who remain from the year-00 cohort. Between years 10 and 20 the "boomer" cohort continues to move through the experience distribution, with no change in the shape of the bubble, and only a modest reduction in its size. This results from teachers in this range of experience having quit rates which are both relatively constant and low. As shown in figure 4b, the change between year-20 and year-30 is more marked as a result of those remaining from the "boomer" cohort having experience levels such that quit rates are relatively large and increasing.

The dark solid line in figure 4b shows the asymptotic distribution of experience. "Asymptotic" is used to describe this distribution since the actual experience distributions of the district asymptotically approach this distribution over time, provided that the total number of teachers and the set of quit rates remained unchanged.[11] Higher quit rates, especially for low levels of experience, would result in faster convergence. As is shown in figure 4b, the evolving experience distribution is relatively close to the asymptotic distribution even as the last of teachers in the year-00 cohort reach retirement. Once achieved, the asymptotic distribution would be self perpetuating; at each experience level, the number of teachers employed in year t+1 would be the same as the number employed in year t.

Even if the set of quit rates were constant over time, changes in the total number of teachers—due either to enrollment changes or changes in pupil-teacher ratios—would "shock" the system, thereby perturbing the convergence to the asymptotic distribution.

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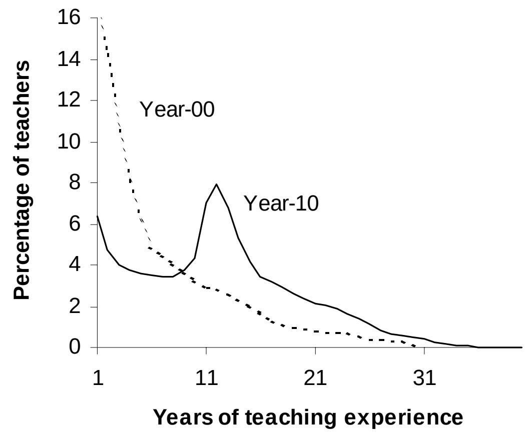
[10] This pattern has important implications. For example, the quit rates for case A in figure 3 imply that only 42 percent of those teachers newly hired will be teaching in the district after 10 years. However, 89 percent of those teachers who have already taught in the district for 10 years continue to teach there another 10 years. For teachers with 20 years of experience, 61 percent continue to teach another 10 years.

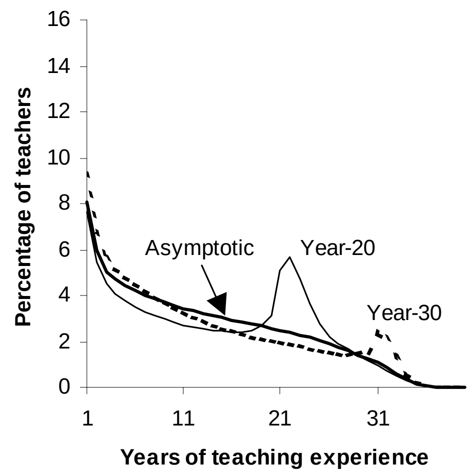
[11] It is possible that convergence will not occur. Consider the case where there is a zero quit rate for all teachers having less than T years of experience and a quit rate of one at experience level T. In this case, any bulges in the experience distribution would cycle through unchanged over time. In contrast, non-zero quit rates over a wide range of experience levels have the effect of "stirring-up" the distribution, resulting in bulges being dissipated and the actual experience distribution converging to the asymptotic one. The dampening of the "boomer bubble" is clearly seen in figures 4a and 4b.

Figure 4a.—Teacher experience distributions over time



SOURCE: New York State Education Department Basic Education Data System (NYSED BEDS), 1970, and simulation by authors.

Figure 4b.—Teacher experience distributions over time



SOURCE: Simulation by authors.

What is relevant here is that the experience distribution subsequent to a shock will evolve over time following a pattern dictated by the initial distribution of quit rates.

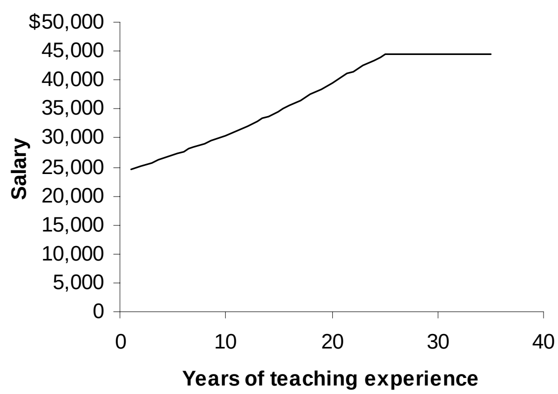
As a result of the experience distribution changing over time, the total expenditure on teacher salaries in the district will typically change even if the total number of teachers in a district and its salary schedule are constant. Reconsider figures 4a and 4b, which provide snap shots of the evolving experience distribution. This along with the salary schedule shown in figure 5 implies the pattern of average salaries shown in figure 6.

If the asymptotic experience distribution had been in place in year-00, average salary expenditure would have remained constant at $33,068 through time, shown by the horizontal line in figure 6. However, as a result of the relatively large cohort of new teachers hired just prior to year-00, the average salary expenditure of $28,771 in year-00 is 13 percent smaller. How average salaries change as this cohort retires is more pertinent here. In the simulation, salary expenditures in year-30 are almost 5 percent lower than that associated with year-20, even though the number of teachers remains unchanged. A comparison of the experience distributions for these years in figure 4b reveals why. Many of the teachers having 20+ years of experience and salaries exceeding $40,000 in year-20 are replaced with inexperienced teachers having salaries of approximately $25,000 in year-30.

The example demonstrates how teacher retirements can lead to reductions in salary expenditures. Savings occur after the average salary initially over-shoots its asymptotic value. The extent to which there are savings will depend upon the experience distribution in place as the boomer cohort approaches retirement, the set of quit rates (e.g., the rates at which they retire), and the salary schedule in place. Before considering these factors, it is pertinent to note that the experience distribution at any point in time reflects past quit rates.

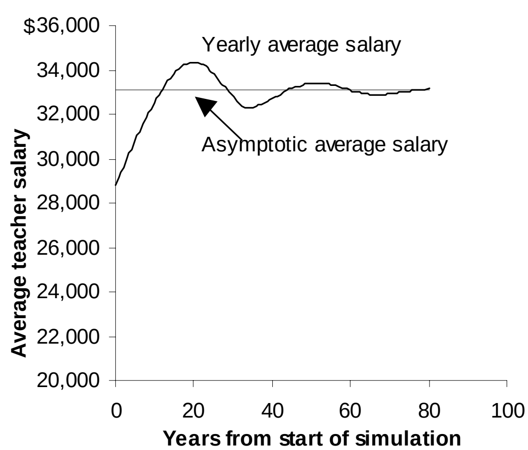
Both experience distributions shown in figure 7 were generated with the initial experience distribution in year-00 shown in figure 4a. The cases differ as a result of assumed differences in quit behavior, represented by cases A and C in figure 3. Because of the cumulative effect of higher quit rates, figure 7 shows that relatively fewer teachers are close to retirement in case C. It follows that any subsequent salary savings associated with retirements will be smaller, other things equal. Again, this results from the high quit rates dissipating the bulge more quickly, which in turn reduces the extent to which the average salary overshoots and subsequently falls. In terms of the situations currently faced by public school districts, the extent to which there will

Figure 5.—Example of a district salary schedule



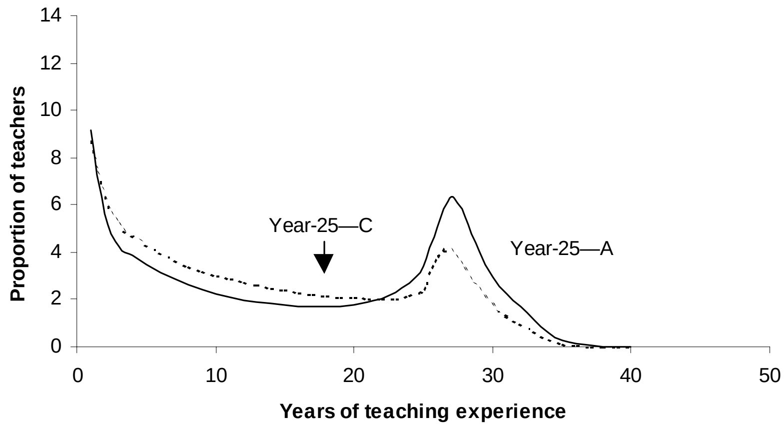
SOURCE: Hypothetical case.

Figure 6.—Average yearly and asymptotic (real) salaries



SOURCE: Simulation by authors.

Figure 7.—Experience distributions resulting from quit rates A and C



SOURCE: Simulation by authors.

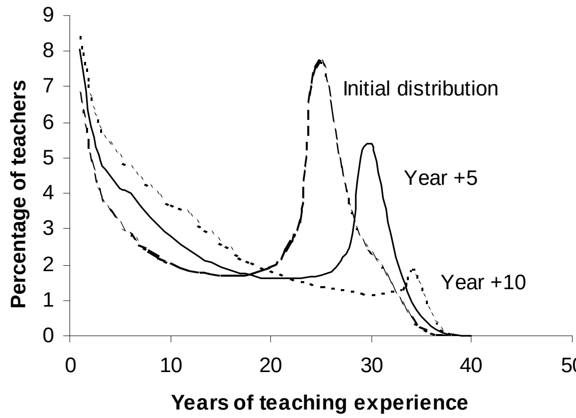
be savings associated with boomer-teachers retiring depends upon the extent to which the boomer bulge dissipated before the teachers reached retirement, which in turn depends upon quit rates.

For a given experience distribution in place at a point in time (e.g., year-25), quit rates also have a direct effect on the extent to which total salary expenditures fall in subsequent years. Suppose that the current experience distribution is as shown in figures 8a and 8b. The experience distributions for the two cases in 5 and 10 years out differ as a result of differences in quit rates, cases A and B, in figure 3, respectively. The sets of quit rates are the same for teachers having no more than 20 years of experience. The retirement pattern in case A corresponds to the case where few teachers teach beyond 30 years. In case B, relatively more teachers continue teaching beyond that experience level. As shown in figure 8a, the relatively higher rates of retirement in case A result in the "boomer bulge" dissipating more quickly. This has important implications for the change in salary expenditures. Figure 9 shows how the average salary expenditures in both cases would change over time.

Over the first 10 years, salary expenditures in case A fall at a rate of approximately 1 percent annually. The expenditure reduction in case B is smaller so that by the end of 10 years annual salary expenditures for case A are over 5 percent lower than for case B. This would be expected for the early years given that the retirement of the boomer cohort is more concentrated in case A. To some extent the savings due to the retirements in case B are only delayed. Annual salary expenditures continue to fall between years 10 and 15 in case B but bottom out and then rise slightly in case A. However, it is striking that at each point in time the average salary for case A is either approximately equal to or below that for case B. Even though the initial experience distribution is the same in the two cases, the interaction of this distribution with the two sets of quit rates leads to accumulated salary savings that are systematically different.

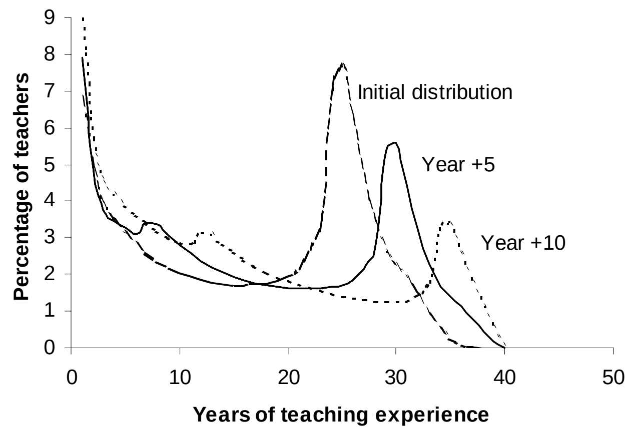
The horizontal lines in figure 9 show the average salaries for the asymptotic experience distributions implied by the quit rates in cases A and B. The average salary in case A is lower than that in case B by approximately $500 as a result of quit rates for teachers approaching retirement being relatively higher in case A; the higher quit rates imply an asymptotic experience distribution with relatively fewer experienced teachers. A less obvious result relates to the short-run salary difference. For much of the initial 15 year period, average

Figure 8a.—Simulated distributions of experience: Case A



SOURCE: Simulation by authors.

Figure 8b.—Simulated distributions of experience: Case B



SOURCE: Simulation by authors.

teacher salaries in the two cases differ by more than the asymptotic salary difference, due to the dynamics of the salary adjustments process in the short-run. For example, after 10 years average teacher salaries for case A are nearly $2,000, or 5 percent, lower than those under case B.

How salary expenditures change over time also depends upon the salary structure. Consider the situation identical to case A with the exception that the salary schedule is as shown in figure 10, rather than figure 5. With the alternative salary schedule, the reduction in salary expenditures are only half as large.

The above examples have all maintained a constant number of teachers in order to isolate the factors affecting salary expenditures through the "aging" of an existing experience distribution. In each example, new teachers were hired only to replace those quitting. Extending the analysis to allow for an increase in the total number of teachers is straightforward. Suppose that the number of teachers employed increased from N_t in period t to N_{t+s} s periods later. With a fixed salary schedule, the total change in salary expenditures can be represented as follows:

$$S_{t+s} - S_t = N_t\left(\overline{S}_{t+s} - \overline{S}_t\right) + (N_{t+s} - N_t)\overline{\overline{S}}_{t+s}$$

The variable $\overline{S}_{t+s}$ is the average salary in year $t+s$ with the number of teachers held constant at N_t. Thus, $N_t\left(\overline{S}_{t+s} - \overline{S}_t\right)$ has been the focus of the above examples. $\overline{\overline{S}}_{t+s}$ is the mean salary of those teachers hired to increase the total number of teachers from N_t to N_{t+s}. In the case where s=1, $\bar{\bar{S}}_{t+s}$ equals the salary for starting teachers. When s>1, $\bar{\bar{S}}_{t+s}$ is a weighted average of the salaries in the first s steps of the salary schedule. The weights depend upon the number of “expanders” at each step, either teachers hired to increase the total number of teachers or to replace hired expanders who quit.

Consider case A discussed above with the modification that the total number of teachers increases by 1 percent per year. It can be shown that the salary expense 10 years out associated with the expanders equals approximately seven percent of the total salary expenditure in the initial period. As discussed above, the “aging” of the initial distribution of teachers would result in salary expenditures 10 years out being lower by approximately 10 percent. In this example, the annual salary savings associated with the retirement of the boomer cohort would more than offset the annual expense of increasing the number of teachers for a number of years.

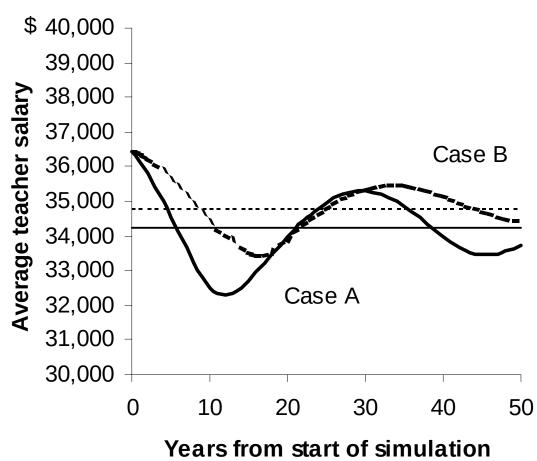
The above examples help clarify the channels through which current trends in student enrollment and teacher retirement could affect school budgets. If the salary schedule and student-teacher ratios remain constant, the net budgetary effect of these trends depends upon a complex interplay of the initial experience distribution of teachers, quit rates and the salary schedule in each district. The remainder of the paper explores how these relationships play out in New York school districts during the period 1987–88 to 2003–04.

Data and Method

The New York state teacher-level data used in this study have been extracted from the Basic Educational Data System (BEDS). The BEDS is an annual census of public school personnel, and provides a snapshot of demographic characteristics, assignments and salaries of teaching and non-teaching staff. Files for the 8 years, 1987–88 through 1994–95, are employed to examine actual behavior historically. Using estimated quit rates, the experience distribution is extrapolated to the year 2005. In a typical year, the file contains data for each of about 200,000 teachers.

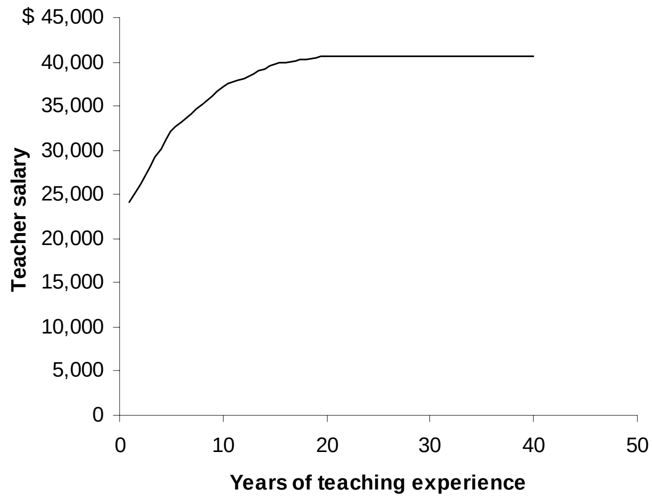
To estimate quitting behavior for extrapolation of the dataset, the files are merged by school district and individual, a quit being indicated if the individual is not present for 3 subsequent years. A quit function by the level of experience in the district is then estimated

Figure 9.—Simulated changes in average salary: Cases A and B



SOURCE: Simulation by authors.

Figure 10.—Alternative salary schedule



SOURCE: Hypothetical case.

for the years 1987–88 through 1991–92, aggregated into seven major location groups: New York City, Rochester, Syracuse, Buffalo, and Yonkers (the large cities), small city and suburban districts, and rural districts. The functions are then averaged and smoothed where necessary using moving averages. As teachers quit and enrollments change, new teachers are hired into the extrapolated districts. To estimate these extrapolated salaries, it is necessary to estimate the total teaching experience outside the district for newly hired teachers. This is done, again by major location group, and averaged over the 8 years of data. For reasons of consistency of the data, 33 school districts involved in mergers or consolidations between 1987 and 1995 have been dropped from the study. To project the number of teachers beyond the year 1994–95, necessary in order to calculate the rate of hiring of new teachers, student enrollment projections are employed (New York State Education Department, 1994). These growth rates, by county, are applied to the teaching staffs of districts in the respective counties, thus implicitly holding teacher-student ratios constant.

In order to control for changing salary schedules, including the effects of price inflation, in the historical record, and to estimate salaries in the extrapolation beyond 1994–95, two salary schedules are estimated for each district: one based on the years 1993–95 and a second for the years 1987–89. The creation of the 1993–95 schedule is illustrative: starting with 692 major districts from 1994–95, 141 have been set aside due to excessive missing values for salary, 70 districts have been removed due to too few teachers (fewer than 30); and 6 districts are not suitable for our salary regression model (below) due to inadequate distribution of experience levels or college degrees among the teachers, leaving 475 suitable districts. The 141 districts with missing salary information are then examined using 1993–94 data. Of these, 41 districts still had missing salaries, 5 have less than 30 teachers, and 2 suffer problems with experience and/or degrees, adding 93 more suitable districts to the first batch, and resulting in a total of 568 usable districts. A regression model of the salary schedule is estimated by district in a manner similar to that employed in Lankford and Wyckoff (1997). The salary structure is fit to a piecewise-linear function of in-district experience, with adjustments for highest degree obtained (the data limited the estimation to BA plus 30 credits; MA; and MA + 30) and for out-of-district experience. The kink points are set at 5, 10, 15, 20, and 25 years of experience, with a constant salary forced above 25 years. For example, the New York City school district in 1994–95 yields the following: base salaries of $28,319, $29,598 and $34,009 for BA+30, MA, and MA+30 degrees, respectively; plus $960 for each year of experience up to 5 years (the first year counts as 1 year of experience); plus $1,270 for each additional year up to 10 years; plus $918 per year up to 15; plus $759 per year up to 20; plus $454 per year up to 25 years; and finally an additional $550 for each year of prior experience teaching outside of the district.

To control for the effects on district school budgets of changing salary schedules, in order to better view the effects of the changing distribution of experience, a fixed district salary schedule is used to estimate the teaching budget for each of the years 1987–95. To control for the changing number of teachers, in order to ask what might have happened to the budget were the number unchanged, the newly hired and returning teachers are apportioned to the category of "replacer" or "expander," according to the number of teachers leaving the district. The full-time-equivalent (FTE) of each entrant is divided proportionately in this way. A leaving "expander" was always replaced by another "expander."

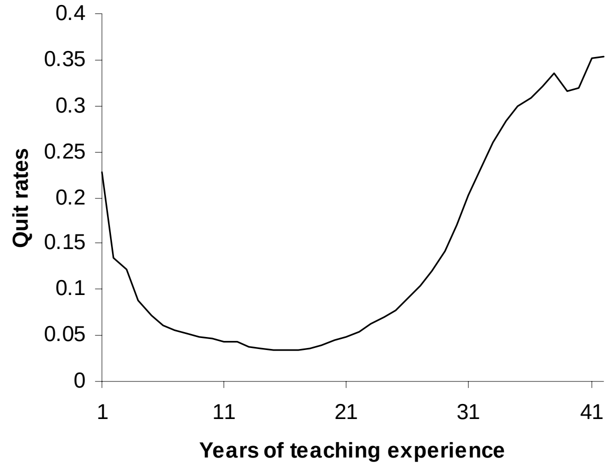
To extrapolate school budgets from 1994–95 out to 2003–04, average quit rates are applied to each teacher FTE. Growth rates are used to calculate the FTE deficit to be made up of created new hires with average characteristics. New FTEs are apportioned between those replacing quits and those expanding the number of teachers. Thus the effect of expansion of the teaching staff can be separated from changing distribution of experience on the budget, as in the historical analysis. Again, a constant salary structure is used to estimate salaries over time.

Teacher Salary Expense in New York Districts

We have divided teacher salary expense into a component attributable to the aging of the original workforce, including replacement of retiring teachers with new teachers, and a component attributable to increased enrollment. As described above, the salary expense attributable to the aging of the workforce depends on the interaction of teacher quit rates, the teacher experience distribution and the salary schedule. On average, teacher quit rates over the 20–35 year experience range are relatively low (see figure 11), and the teacher experience distribution moves a significant number of teachers through relatively steep portions of the salary schedule. Although the baby boom cohort largely works its way through the system by 2003–04 (see figure 12), these retirements do not result in substantial salary savings in most districts.

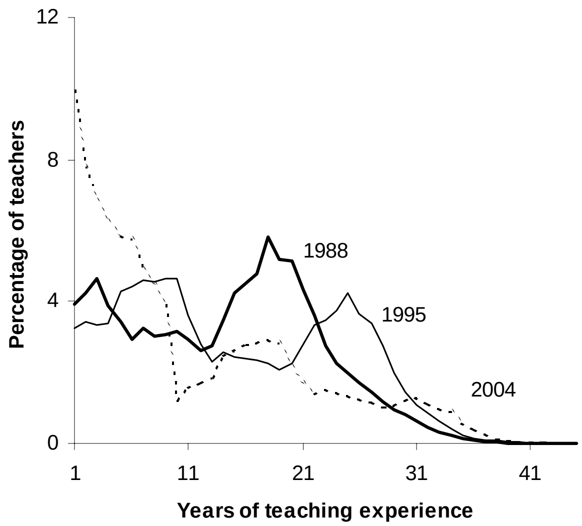
In fact, over the 1987–88 to 1994–95 period, the aging of the original workforce results in an increase in salary expense in the median district of about one half percent per year (see the "without early retirement incentive" columns of table 2). A district at the 10th percentile of salary growth saves about one half percent per year, while districts at the 90th percentile actually see their salaries grow by more than 1 percent per year. Once the enrollment growth that occurred over this period (see figure 1) is included, the total effect on teacher salary expense is 1.7 percent per year in the median district. Salary savings do occur over the 1994–95 to 2003–04 period, although they are quite modest. We estimate that the median district has its teacher salary budget reduced by about one half percent per year, or slightly more than 6 percent over the period. This result is very similar to that implied by Case B in figure 10. Districts at the 10th percentile experience savings of more than 1.2 percent per year, which over the 9 year period amounts to significant savings. However, few districts find themselves in this situation. When the enrollment growth is accounted for, the median district has a salary expense that increases only marginally over the next 9 years.

Figure 11.—New York teacher quit rates, by years of teaching experience



SOURCE: Based on calculations by authors using New York State Education Department Personnel Master File (NYSED PMF) data.

Figure 12.—New York teacher experience distribution



SOURCE: Simulation by authors.

How might these results be altered if districts were to offer early retirement incentives to teachers? Would such incentives entice teachers near retirement, who otherwise would have continued to teach, to retire in sufficient numbers to provide meaningful salary savings to districts? This is a complicated question that requires a behavioral model of teacher retirement decisions and how early retirement incentives would affect retirement decisions. Our data do not support such a model and there has been very little research that has developed such models.[12] We can explore these effects by making some reasonable assumptions about the effect of early retirement incentives on teacher quit behavior.

[12] Grissmer, Eisenman, and Taylor (1995) examine early retirement incentive plans for the military. They develop models to target retirement among specific age cohorts. It is analysis of this sort that is missing for teachers. Their work suggests that such plans are effective cost management tools for the military.

Table 2.—Annual average growth rates in New York teacher salary expense[1]

	Without early retirement incentive		With early retirement incentive[2]	
	Original workforce replacement	Total effect	Original workforce replacement	Total effect
1988 to 1995				
Median	0.49	1.76	—	—
10th percentile	-0.42	-0.48	—	—
90th percentile	1.25	3.98	—	—
1995 to 2000				
Median	-0.45	0.54	-1.18	-0.16
10th percentile	-1.32	-0.83	-2.61	-2.10
90th percentile	0.27	1.81	-0.22	1.30
1995 to 2004				
Median	-0.49	0.11	-0.49	0.09
10th percentile	-1.21	-1.15	-1.29	-1.12
90th percentile	0.09	1.37	0.09	1.38

— Not applicable.

[1] Employs the 1987–88 salary schedule.

[2] Increase the quit rates for teachers with at least 25 years of experience by 25 percent for the 1995–96 year only.

SOURCE: Based on simulation by authors.

New York school districts have offered early retirement plans in 4 of the 6 years from 1991 to 1996. The plans work as follows. Teachers who are at least 50 years old and have 10 years of experience are provided with an extra month of service toward retirement benefits for each year of actual service completed, up to 36 months of extra experience. Thus, a teacher with 24 years of experience could retire under the early retirement incentive with benefits comparable to someone with 26 years of experience retiring without the incentive. During years with early retirement incentive plans, the incidence of retirement among those who were eligible was about 4 percent greater than in years without early retirement incentive plans (an increase from 14.5 to 15.1 percent). These effects may be somewhat muted because plans were offered four times in 6 years and the plans do not have large incentives.

To provide some sense of the effect of incentive plans on salary savings we experiment with a plan that has the effect of increasing quit rates for teachers with at least 25 years of experience by 25 percent, but only for the 1995–96 year. As shown in table 2, the effect of such a plan on district salary expense is modest. Over the first 5 years, the median annual growth in total salary expense is estimated to be about 0.7 percent lower (from 0.54 to -0.16) with the early retirement incentive than without it. Most of these savings accrue in the first few years. For cash strapped districts these savings may be important, although our calculations do not include the increase in retirement payments resulting from the early retirement plan. The effects of early retirement plans on district salary expense is an important issue that deserves additional research attention.

Conclusion

The results of this research surprise us. We had expected that the retirement of most of the teachers hired in the late 1960s and early

1970s would yield considerable savings in many districts, and would offset the additional expense of enrollment increases. Instead there seems, at best, to be only modest savings from retirements. The simulations that examine the interplay of quit rates, experience distributions, and salary schedules illustrate why savings can be very illusive. They also show that relatively small changes in quit rates, especially in the high experience tail of the distribution, can change salary savings substantially. This would suggest that early retirement incentive policies can be effective in delivering salary savings. Even though beyond the scope of this research, it would be informative to explore the determinants of quit behavior and, in particular, the effects that steepness of salary schedules, the changing pool of individuals drawn into teaching, retirement plans, and early retirement incentive policies have on teacher quit rates.

Even though actual data employed in this paper comes from school districts in New York, there is good reason to believe that the results generalize to many other places. First, as noted in the introduction, trends in New York are similar to those in many other areas of the country. Enrollment growth in New York is very similar to that occurring on average throughout the country.[13] In addition, we expect that the New York salary schedule and experience distribution are similar to those found elsewhere. Quit rates, conditioned on experience, may also be similar. Second, the simulations suggest that under a broad range of circumstances sizable salary savings due to retirements are unlikely.

As a result, we are now convinced of the accuracy of the projections that enrollment growth will continue to be a source of fiscal pressure on many school districts. It is likely that in most cases savings from the retirement of an aging teacher workforce will be very small.

[13] Clearly there are many districts in the south and west that are experiencing enrollment growth at a substantially faster pace than that in New York.

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