The Changing Structure of Teacher Compensation, 1970–94

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Abstract—This paper considers how the structures of teacher salaries in public school districts have changed over the last quarter century and whether salary increases have been allocated so as to achieve the greatest gain in educational quality. Using New York state data for the 1970–94 period, we find that even though some districts appear to behave in ways consistent with the often expressed goal of recruiting and retaining the most able college graduates, most districts do not. The vast majority of districts have inefficiently allocated a disproportionately large share of resources to veteran teachers for whom job tenure is only marginally affected. This finding has important implications for the policy debate regarding whether increased spending on education will, or could, improve educational performance as well as the design of alternative compensation schemes. [JEL 121, 330] ©1997 Elsevier Science Ltd

1. INTRODUCTION

Researchers focusing on educational policy continue to debate whether "money matters" in the determination of educational outcomes. While there are many subtleties to the debate, the core question is whether there is evidence that additional spending on K-12 public education results in improved educational outcomes, somehow measured. Those who question whether money matters point out that even though school spending increased dramatically over the last 20 yrs, student achievement improved little, if at all. Researchers on the other side of the debate argue that studies based on correctly measured inputs and outputs do find that spending on some inputs leads to improved achievement. The debate has largely focused on studies which attempt to identify the statistical links between educational inputs or expenditures and outputs, with little discussion of how dollars are actually being spent.

It is our belief that a better understanding of how dollars are spent is needed for a fully informed discussion of whether additional educational expenditures do, or could, improve educational outcomes. In this paper we examine how school districts allocate money to teacher salaries and whether the observed salary expenditure patterns are consistent with what is known about using teachers to improve the learning of students. Questions regarding the efficacy of teacher salary expenditures are important for at least three reasons. First, the magnitudes of the dollars involved are quite large, as expenditures for teacher compensation are the single largest expense of school districts. Numbers for New York are illustrative. The $10.8 billion expenditure for teacher salaries and fringe benefits during the 1991–92 school year accounted for over 50% of all public school expenditures in the state. Second, total and average teacher salaries in most school districts have increased substantially, in part due to the research and commission studies in the mid 1980's citing low teacher salaries. Between 1980 and 1992, total teacher compensation in New York increased 32% in real terms. Finally, as many researchers and some policy makers consider revisions in compensation schemes so that pay better reflects the skills or performance of teachers, it is important to evaluate past policies and understand the political forces leading to these policies.

Since 1980, average teacher salaries have experienced a 20% real increase nationally, as shown in Figure 1. This large increase follows a decade in which average teacher salaries fell by 10%. The general decline in real teacher salaries during the 1970's

![Figure 1. Real average teacher salaries, 1993–94 dollars.](image-url)

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was accompanied by a significant decline in the average academic achievement of those choosing careers in teaching. These trends together with more general concerns regarding the decline in the quality of public education resulted in a series of educational proposals in the 1980's urging greater effort in attracting and retaining teachers of outstanding quality. Proposals to improve the professional stature of and work environments for teachers were forwarded. Efforts to increase teacher salaries, especially the salaries of beginning teachers, gained wide support. The resulting political consensus led to the substantial increases in average teacher salaries that occurred across the country after 1980.

Increasing the financial reward to school teachers is important in making teaching a more attractive career alternative. However, because average teacher salaries may not reflect the experience of all teachers, it is important to consider how the increases in real salaries have been distributed and whether salary policies have been efficiently designed to achieve the greatest gains in educational quality. More specifically, have the salary increases been structured to best achieve the expressed goal of recruiting and retaining the most able college graduates? These questions are important as the allocation of salary expenditures across teachers has received little scrutiny by researchers and virtually no attention in policy discussions related to teacher compensation. We address the questions using New York state data for the 1970-94 period. Our major finding is that even though some districts appear to behave in ways consistent with attracting and retaining the best teachers, most districts do not. The vast majority of districts are likely to have inefficiently allocated a disproportionately large share of resources to veteran teachers for whom job tenure is only marginally affected. This finding has important implications for the policy debate regarding whether increased spending on education will, or could, improve educational performance. It also helps us understand where a good portion of the large increase in school district spending that occurred during the 1980's has gone. Finally, understanding how salary patterns have evolved and the forces leading to these changes will also be of value in the design of new compensation schemes, as both incentive effects and political realities need to be taken into account.

2. THE AMBIGUOUS LINK BETWEEN AVERAGE SALARY AND SALARY STRUCTURE

As is generally the case, the structure of salaries in each school district in New York is reflected in a salary schedule which depends upon the education and experience of teachers in the district. An example of a district's 1970 salary schedule is shown in Table 1. Note that gains in both experience and education result in a teacher moving through the salary sched-

ule, thereby receiving salary increments. In New York, as in most other states, salary schedules are determined at the district level so that the rewards for additional education and experience differ across districts. Districts also compensate teachers for other qualifications (e.g., prior teaching experience outside district) but typically these are less important than are either education or experience.

Average teacher salaries for districts or states are frequently central in discussions of teacher compensation. However, depending upon the question asked, district or state-wide average salaries can provide relatively little pertinent information. For example, even though the average real salaries of public school teachers in the U.S. have increased over 20% since 1980, the second leading reason for new teachers to consider leaving the teaching profession is a need to earn more money (National Center for Education Statistics, 1993, p. 83). This can be explained, at least in part, by the fact that percentage increases in starting salaries have been substantially smaller than the percentage increases in average salaries. As discussed below, the real salaries of starting teachers in many districts have actually fallen even when average salaries have risen substantially.

At any point in time, the average salary paid to teachers in a district will be determined by the reward structure and the distribution of the teachers' education and experience in the district. Similarly, changes in the average salaries of teachers can result from shifts in the salary schedules or changes in the education-experience composition of the teaching force. Therefore, changes in average teacher salaries as shown in Figure 1 likely reflect changes in salary schedules as well as changes in the composition of the teacher population.

There have been striking shifts in the distribution of teachers' education and experience since 1970. As shown in Figure 2, the experience of teachers in New York has increased dramatically. Whereas over half of those teaching in 1970 had fewer than 5 yrs of in-district experience, over half of the teachers in 1994 had at least 15 yrs of in-district experience. The educational attainment of teachers also increased. The proportion of teachers in New York having at least a BA plus 30 credit hours increased from less than 50% in 1970 to more than 90% in 1994.

These changes in the characteristics of teachers help us understand some of the increases in average teacher salaries. However, increases in average teacher salaries resulting from a larger portion of teachers having more education and experience do not necessarily imply that the financial reward to teaching has increased. Education and experience are also rewarded in most other professions. When deciding whether to choose teaching as a career, or whether to leave teaching after having taught, the pattern of salaries that the individual can expect over their career is most important. Changes in the salary schedule
Table 1. Example of a district’s 1970 salary schedule

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Figure 2. Distribution of teacher experience in district.

An observed increase in the average salary of teachers would provide little information regarding changes in the structure of salaries even if the education-experience distribution of teachers was fixed. Consider the example shown in Table 2 for a hypothetical school district employing 300 teachers who are divided evenly into three salary categories based on experience. Suppose that real salary expenditures in the district increased $600,000 (5%). Four alternative salary allocations are shown in the table: (1) an equal proportionate increase in which each teacher receives a 5% real salary increase; (2) an extreme frontloading increase in which each of the novice teachers receives a 20% real increase; (3) a backloading increase in which each of the veteran teachers receives a 12% real raise; and (4) an extreme backloading case where each veteran teacher receives a 16% real salary increase that is partially funded by a $2000 reduction in each novice teacher’s real salary. Frontloading districts drive a disproportionate share of the salary increase to new teachers, while backloading districts allocate the salary increase unevenly to benefit teachers with substantial seniority. The example illustrates several simple points: (1) equal percentage increases result in smaller dollar increases for novice teachers than for veteran teachers; (2) there are a variety of ways to allocate a given total salary increase; and (3) the average salary, and average salary increase, can be the same with very different allocations of the additional salary dollars. Thus, average salaries can mask potentially important differences in salary structures and changes in those structures. In the extreme, the real salaries of teachers in a particular range of experience can fall even when average real salaries rise. As discussed below, this has been the case in many districts.

Monk and Jacobson (1985) compared the salary schedules for a random sample of 43 New York school districts for the 1973-1983 period. Murmane et al. (1987) compared the 1970 and 1980 salary structures for 436 Michigan school districts. These papers make clear that knowledge of how average teacher salaries have changed provides relatively little
information regarding changes in the structure of teacher salaries. Our analysis builds upon these papers by analyzing 539 New York public school districts for the 1970–1994 period. Extending the period of analysis is important because the significant declines in enrollments and relatively tight budgets during the 1970’s gave way to more generous fiscal environments during much of the 1980’s. Furthermore, policy debates in the mid 1980’s concerning the quality of teachers and their compensation could have reversed the earlier salary pattern in favor of policies that would better attract and retain the best teachers.

3. THE DISTRIBUTION OF SALARY INCREASES

How have salary structures changed? To study the changing structure of salaries within districts, one needs the salary schedules, or other detailed data on salaries, for individual districts over time. For example, Figure 3 shows a particular district’s nominal salary schedules for teachers having an MA degree at six-year intervals between 1970 and 1994. Figure 4 shows the same district’s schedules for 1970, 1982 and 1994 expressed in real 1993–94 dollars. The decline of real salaries in the district during the 1970’s was reversed during the 1980’s and early 1990’s. The net effect was that a starting teacher earned slightly less in 1994 than in 1970. In contrast, the real salaries of teachers with 20 or more years of experience were 18% higher in 1994 than in 1970. The changes in the nominal salary schedules together with inflation resulted in significant changes in the structure of real salaries. Thus, information from the salary schedules specified in labor contracts would be sufficient for an analysis of how salary structures have changed.

Acquiring and examining the actual salary schedules of all school districts for multiple years would be extraordinarily time consuming. Instead, we have chosen to use two alternative approaches. First, average salaries for different experience cohorts are compared for individual districts. Second, separate OLS regressions of individual teacher salaries on relevant teacher characteristics are used to mimic the salary schedule for individual districts. The data used in both approaches are drawn from the Personnel Master File (PMF) portion of the New York State Education Department’s Basic Education Data System (BEDS), which includes information on salaries, educational attainment, experience and school district of employment for individual teachers. This allows us to group teachers by district to identify salary structures. Starting with the 694 major districts in New York, we exclude those districts having fewer than 30 teachers as well as a few districts having missing data. Our analysis is based on data for 1970, 1980, 1990 and 1994 for the remaining 539 districts.

After studying the actual salary schedules for a number of districts to learn more about the general features of salary schedules, the regression model in Equation (1) was specified.

\[
SAL_t = \beta_0 + \beta_1 BA_1 + \beta_2 MA_1 + \beta_3 MA_{30} + \beta_4 EXP_0 + \beta_5 EXP_1 + \beta_6 EXP_2 + \beta_7 EXP_3 + \beta_8 EXP_4 + \beta_9 OEXP + \epsilon_t
\]
because of its ability to closely fit the actual schedules. \( \beta_i, \beta_2, \ldots, \beta_p \) are parameters, \( \epsilon \) is a random variable and the explanatory variables are defined as follows:

- **SAL** is the salary of an individual teacher.
- **BA** equals 1 if the teacher has a bachelor's degree or less, zero otherwise.
- **MA** equals 1 if the teacher has a master's degree, zero otherwise.
- **MA30** equals 1 if the teacher has a master's degree plus at least 30 hours of additional study, zero otherwise. (A bachelor's degree plus 30 hours of additional study is the omitted category.)
- **EXP0** is the total years teaching in the district.
- **EXP1** equals EXP0 - 5 if EXP0 > 5, zero otherwise.
- **EXP2** equals EXP0 - 10 if EXP0 > 10, zero otherwise.
- **EXP3** equals EXP0 - 15 if EXP0 > 15, zero otherwise.
- **EXP4** equals EXP0 - 20 if EXP0 > 20, zero otherwise.\(^{11}\)
- **OEXP** equals the number of years teaching outside the district.

The piecewise linear model in Equation (1) is flexible in that the slopes of the individual line segments corresponding to 0–5, 5–10, 10–15, 15–20 and above 20 yrs of experience can vary in slope to any degree. The only restriction is that the function is continuous at the potential kink points (i.e., 5, 10, 15 and 20 yrs). This allows the salary increment for an additional year of experience to vary greatly across different levels of experience. The model in Equation (1) was estimated separately for each district and year in order to approximate each district’s salary structure for each of the years analyzed.

Figure 5 illustrates how the estimated 1970 salary structure for experience compares with the actual 1970 salary structure for teachers with MA degrees in the district considered in Table 1. The 1994 actual and estimated schedules are also shown. (For comparison purposes, the 1970 schedules are shown both in nominal and real (1993–94) dollars.) Note that the estimated structures closely track the actual schedules. Although the two differ at points, we believe that the regression model captures how individual districts reward experience and education.\(^{12}\)

In examining the structure of teacher salaries we ideally would like to separate the salary effects of a teacher’s increased education from their increased experience. Because average teacher salaries have risen partly as a result of increased educational attainment, we would like to understand the separate salary–experience and salary–education links. There are at least two factors, however, that complicate the separate analysis of the salary–experience and salary–education relationships. First, negotiated rewards for additional education and experience implicit in labor contracts may not be separately determined. For example, since New York requires that teachers earn master’s degrees within the first five years of teaching, only novice teachers can have MA degrees. Therefore, if districts wanted to target salary increases to starting teachers, either the relative reward for a MA or rewards for teachers with relatively little experience could be increased, or both. It becomes difficult to disentangle the separate effects. Second, to the extent that the typical educational credentials of starting teachers have changed over time, the change in the average salary of starting teachers will not be the same as the change in the salary of a teacher with no experience and a given level of education.

As a result of these considerations, two alternative methods are used to compare the salaries of novice teachers with those of veteran teachers in each district.\(^{13}\) The first method simply averages the salaries of all teachers in each experience cohort and does not separate out the reward for educational attainment. In this salary-average method, "novices" are defined to be teachers with less than five years teaching experience in the school district and "veterans" are teachers with at least 20 yrs of in-district experience. The second method employs the estimated regression models to identify salary structures. The regression equation for each district is used to predict the salaries of teachers with three and 23 yrs of in-district experience where the teachers are assumed to have a mas-

![Figure 5. Actual and estimated salary schedules, 1970 and 1994, MA degree.](image-url)
As expected, both groups fared much better in the 1980–94 period with the statewide average real percentage increase being roughly the same for both novices and veterans, although 58% of the districts continued to backload. Over the entire period, the statewide district average real salary increase paid to veterans was over 10 percentage points higher than that paid to novices. For the 86% of districts that backloaded over the 1970–94 period, veteran teachers were given real salary increases averaging 15% while these districts gave novice teachers an average 1% increase.

Again using the salary-average method, the real salaries of novice teachers actually declined during the 1970–1994 period in 47% of the districts that backloaded. The real salaries paid by these districts to novice teachers declined by an average of 7.6%. Over the same period, the real salaries that same districts paid to veteran teachers increased by an average of 10.9%.

The degree of backloading is even more pronounced when the regression method is used to net out the rewards for greater educational attainment. With 95% of districts backloading during the 1970–80 period and 68% backloading during the 1980–94 period, the net effect was that the vast majority of districts backloaded over the entire period. Even though the salaries of novice teachers increased in real terms after 1980, the increases were too small to offset the reductions in real salaries that occurred prior to 1980. Over the entire period, the real salary paid by districts to novice teachers decreased statewide by an average of over 8% at the same time that the real salaries paid to veteran teachers increased by an average of over 11%.

Based upon both methods, the differences in the degree of backloading prior to and after 1980 would suggest that backloading is more common in tight fiscal environments, but continues to occur even when the total salary increase is large.

Table 3. The structure of teacher salaries allocations, by period and method

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<td>Salary-average</td>
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<td>Salary-average</td>
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Given that the number of veteran teachers exceeded the number of novice teachers in most districts, real salary increases for novice teachers usually could have been funded through smaller real increases for veterans. In most districts, both veteran and novice teachers could have had real increases without requiring an overall increase in total salary expense. Instead, the substantial increases in real salaries of more experienced teachers were accompanied in many districts by meaningful reductions in the real salaries of novice teachers. This is similar to the "backloading II" case shown in Table 2.

As a check of the validity of our basic findings, the salary schedules were obtained for a sample of 20 school districts. In addition to 5 frontloading districts, 15 backloading districts were selected. All the backloading districts were ordered in terms of the degree of backloading, as measured by the difference in the percentage real salary increases for veteran and novice teachers. The 5 districts closest to the 10th percentile were selected as were the 5 districts closest to the 50th and 90th percentiles. Table 4 shows the differences in the percentage increases calculated using the salary-average and regression methods as well as the differences calculated using the actual salary schedules. Even though the differences vary across the three methods, the three sets of differences are qualitatively similar and lead to the same conclusion: backloading has been very common over the past quarter century.

In many districts, backloading has resulted from the addition of steps for veteran teachers and the increase in longevity pay. Consider the example of a salary schedule in Table 1 where teachers with a given education received salary increases in each of the first 15 yrs of in-district experience as well as an additional increment in year 20. The schedule can be described as having 15 steps with an additional "longevity" salary increment for teachers with 20 yrs of experience. The addition of steps and increases in longevity increments were central to the changes in salary structures shown in Figure 3 and Figure 4. This case is typical, based on an analysis of the actual salary schedules for the sample of 20 districts over the 24 yr period. In the 15 districts that backloaded, the average number of steps increased from 12.8 to 15.9 between 1970 and 1994. In contrast, the average for the frontloading districts only increased from 12.8 to 13.2 steps. Even though there was little change in the average number of longevity increments, backloading districts had relatively large increases in the size of the longevity increments.

It would be obvious to those involved in collective bargaining that adding steps or increasing longevity payments would, to some extent, target salary increases to more experienced teachers. However, these officials may not be fully aware of how the cumulative effects of incremental increases in the structure of nominal salaries over many years, together with the historical pattern of inflation, have resulted in such marked changes in the relative rewards to veteran and novice teachers.

Our findings for the 1970's are consistent with those reported by Monk and Jacobson (1985) for New York and Murnane et al. (1987) for Michigan. The backloading that they found for the 1970's continued during the 1980's and early 1990's under very different circumstances. Backloading has occurred during periods of declining and rising enrollments as well as tight and more generous fiscal environments.

Is backloading a phenomenon found only in New York and Michigan? We address this question using salary schedule information collected by the American Federation of Teachers (AFT) in surveys of the 100 largest AFT local unions serving elementary and secondary teachers. The information collected includes starting and maximum salaries for teachers with given education levels, as well as information regarding the number of steps in the salary schedule and whether longevity payments are part of the salary schedules. Salary data for the 100 largest AFT local unions in 1993 were merged with comparable data for 1972 AFT (1972, 1993a, 1993b). In total, data for both years were available for 66 districts. Table 5 provides separate summary information for districts in and outside New York. Even though there are differences between the two geographical groupings, it is clear that backloading is a national phenomena. Almost two-thirds of the large AFT districts outside New York had relatively larger percentage increases in maximum salaries than in beginning salaries. This was also true in 13 of the 14 large AFT districts in New York. In those districts that backloaded, the average percentage increase in maximum salaries was approximately 12% higher than that for starting salaries, both in and outside New York. Again, the

<table>
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<th>Table 4. Average differences in percentage real salary increases between veteran and novice teachers</th>
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addition of steps in the salary schedules was a major factor. In the backloading districts outside New York, the average number of steps increased from 11.9 to 15.6. In contrast, frontloading districts outside New York had a reduction in the average number of steps from 12.6 to 12.1. (The average number of steps for large backloading AFT districts in New York increased from 13.5 to 22.4.) Even though the relatively small size of the sample of large AFT school districts prevents us from making generalizations about the exact extent of backloading nationwide, it is clear that backloading is not a phenomenon limited to New York.

4. AN ASSESSMENT OF BACKLOADING

How should the compensation of teachers be structured? There continues to be much discussion regarding the relative merits of the predominant single salary schedule compared to a variety of other compensation schemes, including merit pay, group incentive pay, career ladders and differential pay by subject. Given that teacher compensation is such a large portion of total educational expenditures, it is most important that policy makers, analysts, teachers and the public all have a clear understanding of how alternative compensation schemes would affect our system of education and educational outcomes. In spite of its central importance, such an analysis is beyond the scope of this paper; however, we will address the more narrowly defined question of how the single salary schedule, if used, should be structured so as to best achieve the often stated goal of recruiting and retaining teachers of outstanding quality. The importance of high quality teachers is clear from the research finding that the quality of teachers is one of the few classroom characteristics that is consistently associated with increased learning by students. High quality, effective teachers do matter in the determination of educational outcomes.

How should districts structure salary schedules so as to maximize the quality of the teaching force for a given total salary expenditure? The optimal steepness of the salary schedule will depend upon a number of factors including the extent to which teacher effectiveness increases with experience, how the level and structure of salaries affect teacher recruitment and retention as well as other factors such as external labor market conditions. Education production function studies provide some evidence that teacher effectiveness increases with experience, with much of the increase occurring in the early years of teaching. For example, Hanushek (1972) has estimated the elasticity of the gain in student achievement with respect to teacher experience to be 0.049 for reading and 0.070 for vocabulary. Using an elasticity of 0.06 to illustrate, consider how the gain in a student’s achievement varies with the experience of their teacher. Compared with the case of the teacher having no past experience, the achievement gain would be larger by 11.3%, 15.5% and 20.0%, respectively, if the teacher had 5, 10 and 20 yrs of experience. In this case, over half of the improvement in effectiveness occurs in the first 5 yrs, with over three-quarters occurring within the first 10 yrs. Such estimates of the link between student performance and teacher experience do not provide support for the very large and increasing differential between the salaries of veteran and less experienced teachers where the latter group actually includes teachers with 10–15 yrs of experience.

Regarding the relationship between salaries and teacher supply, individuals making career choices will consider the pecuniary and nonpecuniary rewards of teaching relative to the rewards in alternative occupations. With increases in teacher salaries resulting in teacher salaries being higher relative to other salaries, other things constant, it is not surprising that numerous empirical studies have found that salaries do significantly affect the attractiveness of a career in teaching as well as the attractiveness of teaching jobs in particular districts.

Figure 6 shows the salaries of beginning teachers as a ratio to the salaries of recent college graduates in a number of other fields. It is clear that increases in teacher salaries since the early 1980’s have increased starting teacher salaries relative to starting salaries in the other occupations shown. The monet-
ary rewards for teaching, however, are little or no higher relative to the alternatives than 20 yrs ago and remain low relative to the alternatives. This does not imply that teaching is as relatively attractive today as it was in the early 1970's. Women, who have traditionally made up a disproportionate share of the teaching force, have a greatly expanded set of career options today as compared to the alternatives available two decades ago. Because the salaries of teachers have not risen relative to the salaries in alternative occupations, teaching is now a less competitive career option. Further increases in starting salaries were needed to make teaching more attractive to those choosing careers.

In addition to considering starting salaries, individuals choosing between alternative careers will also consider expected future rewards. The number of individuals seeking careers in education, however, appears more strongly affected by increases in starting salaries than by increases in future earnings. This empirical finding is consistent with several insights from economic theory. A change in a district's salary schedule which increased the salaries of experienced teachers, other things equal, would increase the present value of life-time earnings from teaching in that district. However, these higher future earnings will be achieved only if one continues to teach in that same district. Thus, backloaded salary increases will do little to attract high quality candidates who are not certain they will both teach long term and remain in that same district. There is also uncertainty regarding whether a salary schedule with higher salaries for experienced teachers will be maintained 20 or more years into the future. These considerations imply that perspective teachers would prefer tangible short- and intermediate-term rewards as compared to uncertain long-term rewards having the same present value. Thus, it is not surprising that the decision to teach is most sensitive to the salary paid in the early years on the job.

In evaluating alternative salary policies, it is also important to understand how salaries can be structured to help retain highly qualified teachers. Here, two empirical findings are relevant. First, teachers receiving higher salaries stay longer. "Teachers working in school districts offering comparatively high salaries stayed longer than teachers working in districts offering low salaries" (Murnane et al., 1991, p. 71). Second, attrition from teaching is highest in the first year and declines steadily over time with the relationship between the probability of leaving a teaching job and salary diminishing over time so that, after only six to eight years of teaching, salary has little effect on the probability that one would leave teaching.

Insights from economic theory also provide an explanation why the decisions of teachers to leave teaching, or particular teaching jobs, are most sensitive to salary in the early years of their careers. In considering whether to leave teaching or a particular school district, an individual will consider the net expected return of each of the available alternatives, just as when they initially chose to teach in that district. The relative returns, however, will now differ from those faced at the time of their initial decision. First, the individual has developed occupation-specific human capital while teaching which would increase the individual's productivity in teaching relative to that in other occupations where different human capital skills are relatively more important. The implication will be that wages and salaries in alternative occupations will be relatively lower after having taught than they had been when the decision to teach was initially made. Second, with teacher salaries crucially depending on experience within the district employed, a teacher with experience in the district considering a move to another district will most often face a substantially lower salary. For these reasons, alternative jobs—whether in other occupations or teaching positions in other school districts—will be relatively less attractive for experienced teachers than for novices.

Because the decision to enter teaching appears to be most sensitive to starting salaries and the decision to leave a teaching job is likely to be most sensitive to salary in the early years on the job, the goal of attracting and retaining teachers of exceptional quality can best be achieved by having a salary structure...
with high starting salaries and meaningful increases over the first 5–10 yrs of experience. Increases in starting salaries can increase the pool of individuals interested in teaching careers. In turn, this would make it possible for teacher training programs to be more selective in their admissions and school districts to be more selective in their hiring. With a limited number of teaching jobs, the number of individuals being certified and going into teaching may not be higher than it would have been had salaries not increased. However, higher salaries—especially higher starting salaries—together with effective screening of candidates can result in those entering teaching being more highly qualified than otherwise would have been the case.

The pattern of teacher salary increases that has occurred over the last 25 yrs has likely had profound effects on the teaching workforce in New York and the nation. Since the majority of districts chose to backload their salary increases over the 1970–94 period, salary increases have gone disproportionately to those who had already settled into education careers rather than to those who are more likely to be actively choosing between education and alternative careers. If the increases in teacher salaries had been across the board or more targeted toward starting teachers, teaching would have likely been made substantially more attractive to those making career choices.

It is important to note that salary increases to veteran teachers based upon individual merit, skill or team performance, or based on teachers taking on additional responsibilities, might be viable alternatives to increasing starting salaries if such policies increased the productivity of those already settled into teaching careers. However, almost all of the salary increases for veteran teachers were based only upon the number of years taught in the districts and educational attainment, not performance. There is little reason, therefore, to believe that the salary increases contributed meaningfully to increased productivity. It is also relevant to note that backloading districts continue to recruit a large number of novice teachers. Novice teachers typically account for over 20% of all teachers in backloading districts, which differs little from the proportion of novice teachers in frontloading districts.

To better understand how starting positions could have been filled with teachers who were more able on average, consider the following example based upon the regression results summarized above. For each backloading district in the sample, we calculated the across-the-board percentage real increase in the 1970 salary structure that would have been possible with the actual expenditure level in 1994 and given the composition of teachers as existed in 1994. As compared to the actual salaries paid in 1994, the salaries of novice teachers would have been higher by an average of $3750 while the salaries of veteran teachers would have been lower by an average of $4434. Novice teachers would not have been the only winners. The salaries of teachers with 10 yrs of experience would have increased by an average of $4500. Compared to what actually occurred, teachers with 10 or fewer years of experience would have had real salary increases in excess of 10% on average. The salaries paid by districts to veterans would have been smaller by an average of almost 9%.

How would a 10% increase in the salaries of new recruits have affected the supply of those desiring careers in teaching? Manski (1987) has estimated that the elasticity of the supply of teachers with respect to salary is between 2.4 for small salary changes and 3.2 for large changes. For example, an elasticity of 2.8 would imply that the calculated 10% increase in the salaries of new hires would result in a 28% increase in those interested in the available positions. As Manski points out, such an increase in earnings would likely attract both high- and low-ability students into teaching in proportions comparable to the initial composition of the teaching force. Therefore, the increase in the salaries that entrants could expect over their first decade of teaching and the substantial rise in the number of those preferring teaching careers would not assure that the most effective teachers were employed and retained. The recruitment and screening of teachers by districts would also need to be improved so as to only select and retain those who were most able.

5. POSSIBLE ORIGINS OF BACKLOADING

Monk and Jacobson (1985) suggest that backloading during the 1970's may have been due to an excess supply of teachers resulting from declining enrollments, or that teachers' unions may have effectively bargained for the interests of the more experienced teachers who increasingly controlled the unions. Even though the first hypothesis is consistent with the changing salary pattern during the 1970's, it has little explanatory power for the period after 1980. In contrast, the explanation that backloading is at least in part due to the shifting experience distribution of teachers is consistent with the changes in the structure of salaries that has occurred during the last 25 yrs (see Figure 2).

The salary structure of each district is an outcome of contract bargaining between the local teachers' union and school district officials. In order to understand the factors contributing to the significant backloading, one should look to the different incentives and constraints faced by union and school officials. From this perspective, the changing composition of the teacher population and the nature of governance in the public education system likely contributed to the backloading.

The substantial shift in the in-district experience distribution of teachers may have resulted in changes in the objectives of union officials in the bargaining process. Labor economists frequently discuss the need to understand the objectives of unions or, more
particularly, their leadership.\textsuperscript{34} Even though much of
the discussion has focused on the goals of union
officials regarding lay-off policies and the tradeoff
between higher wages and lower employment, there
has been some discussion of why union officials often
prefer salary schedules that link wages to seniority.

A standard median voter analysis of salary structure
implies that the degree to which union officials
would desire that salaries increase with seniority (e.g.,
in-district experience) will depend upon the experi-
ence distribution of teachers in the local union. To
the extent that the majority of teachers have little
experience, one would expect a relatively flat salary
schedule since such a schedule would target relatively
more of the salary dollars to the less experienced
teachers. If a majority of teachers have substantive
experience, union officials seeking to remain in power
would prefer a salary schedule that targets relatively
more of the dollars to these more senior teachers.\textsuperscript{35}

Given such a possible link between the structure of
salaries and the in-district experience distribution, it
is not surprising that substantial backloading of salary
increases has occurred over a period in which there
has been a striking shift from teachers having rela-
tively little experience to a situation in which a
majority of teachers have substantially more expe-
rience.

Even though the increasing experience of the
teacher population is important in understanding why
union officials would attempt to backload salary
increases, questions remain regarding why school
officials would agree to such a policy. Several alterna-
tive views of government behavior are relevant in
considering the backloading of salaries: local school
officials could work to serve the interests of students,
parents or taxpayers or, instead, could pursue objec-
tives reflecting their own self interests.\textsuperscript{36} There
are several reasons why the objectives of school officials
in labor negotiations might differ from the interests
of students, parents or taxpayers. First, officials might
like to avoid conflict. To the extent that voters and
parents do no have the information or knowledge
needed to assess the merits of alternative salary struc-
tures, the officials would have latitude in how a given
average salary increase is allocated. The fact that
most discussions regarding teacher compensation
focus on average salaries provides evidence that this
is the case. If the union leadership prefers backload-
ing, school officials might go along in order to avoid
conflict. Similarly, in a system where voters are not
well informed, school board members might agree to
backloading in order to gain the support of teacher
unions in elections. In addition, school administrators
would benefit from high veteran teacher salaries if
their own salaries were indirectly tied to the salaries
of these teachers. The perspectives of many school
administrators might also be affected by many of
them having been teachers. Some combination of
these factors could explain why school officials might
pursue their own objectives in labor negotiations,
rather than the objectives of their constituents. Alter-
atively, local school officials working to serve the
interests of their constituents could have had insuf-
sicient bargaining power to withstand union demands
for backloading. They might also have had different
views, or a lack of understanding, regarding how sal-
ary increases could best be structured to improve edu-
cational quality. We are not able to say the extent to
which the various factors contributed to the observed
pattern of backloading.\textsuperscript{37} It is clear, however, that
local school officials in labor negotiations with
teacher unions over many years have not prevented a
substantial shift in the structure of teacher salaries.

6. CONCLUSION

Backloading of salaries in New York, and we
believe in many other places, is a sustained school
district policy that occurs in a majority of districts.
Much of the discussion leading to the substantial
increases in average salaries focused on the need to
attract new teachers having stronger academic creden-
tials. However, novice teachers have received far less
than a proportionate share of the large salary
increases. Bargaining between local teachers’ unions
and school district officials does not appear to have
provided the largest possible benefit to students or
taxpayers.

In recent years those interested in educational pol-
icy have increasingly discussed alternative systems of
teacher compensation such as knowledge and skill-
based pay and collective incentives. These dis-
cussions often focus on the merits and shortcomings
of alternative proposals (e.g. the implied incentives
for teachers). The findings reported above make clear
that discussions of compensation schemes, whether
for teachers or other public employees, also need to
consider the bargaining context in which such salary
systems would be implemented. Even though the
teacher salary increases over the last decade were the
result of a political consensus regarding the need to
attract and retain better teachers, we believe the salary
increases implemented did not best achieve the stated
goal. In a similar way, the implementation of alterna-
tive systems of teacher compensation by local school
officials and unions could yield salary systems that
differed greatly from those envisioned by policy ana-
lysts or state-level policy makers. Such possibilities
need to be taken into account in policy discussions.

The significant declines during the 1970’s in both
teacher salaries and the academic quality of those
entering teaching, together with the expanding set of
career options for women, make clear that substantial
increases in teacher salaries were needed. Our find-
ings, however, suggest that an alternative allocation
of the salary increases may have done more to
improve the quality of teachers and, in turn, the qual-
ity of the educational outcomes. Returning to the
question of whether additional educational expendi-
tures affect educational attainment, our analysis indi-
icates that the substantial increase in the money spent on teacher salaries likely has not had as large an impact on educational attainment as would have occurred had the money been targeted to the recruitment and retention of a more highly qualified teaching force. Money could have mattered more if those in policy-making positions had chosen to allocate the salary dollars differently.

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NOTES

1. For examples, see Hanushek (1986, 1989) as well as Hedges et al. (1994a, b).
2. Bok (1993) presents a variety of evidence that students attracted to teaching are not among the better college students. Murmane et al. (1991) find that the percentage of the academically most talented students entering teaching declined considerably during the 1970’s. In addition, see the Carnegie Forum on Education and the Economy (1986) and U.S. National Commission on Excellence in Education (1983).
4. Papers by Monk and Jacobson (1985) as well as Murmane et al. (1987) discussed below are exceptions.
5. Between 1971 and 1991, median years of teaching experience increased from 8 to 15 years in the United States.
6. This case does not require that the nominal salaries of novice teachers decline, only that the nominal increase falls short of the rate of inflation with the reverse being true for experienced teachers.
7. Throughout the paper nominal dollars are converted to real dollars using the school year CPI reported in the Digest of Education Statistics (National Center for Education Statistics, 1993).
8. Even though there are substantial differences between individual districts, it is shown below that the pattern of salary structure change indicated in Figures 3 and 4 has been quite common. This pattern corresponds to the backloading case II in Table 2.
9. The data are obtained from a self-reported form that every teacher is asked to fill out, and are remarkably consistent for all characteristics except salary. While the salary data are very good, some teachers fail to respond to this question. The salary data are usually unavailable for individuals in districts not currently under contract. If salary information was not available for at least two-thirds of the teachers in a district, salary data for the following year were employed.
10. The PMF actually includes information for all professional employees. The analysis reported here includes only those employees teaching full-time.
12. For 1970, β4 corresponding to EXP4 was restricted to equal zero, as relatively few teachers had more than 20 yrs experience and most salary schedules were horizontal with respect to experience after 15 yrs.
13. For example, for the 1990 regression estimates of Equation (1), fewer than 8% of the districts had an adjusted R-squared statistic of less than 0.80. It is not possible to present the summary statistics and parameter estimates for each of the 539 districts in each of four years.
14. The terms novice, veteran, frontloading, and backloading were first used by Monk and Jacobson (1985).
15. Three and 23 yrs were chosen so that the categories and definitions for the regression method would roughly correspond to those for the salary-average method. Because of the nature of the functional form used in the regressions, defining backloading using somewhat different years of experience would make little difference.
16. Virtually all of the districts having reductions in the real salaries of novice teachers were identified to be backloaders.
17. Those backloading districts which increased the real salaries of novice teachers increased the real salaries of novice and veteran teachers by 8.7 and 19.3%, respectively.
18. In the case at hand, the regression method indicates more backloading than does the salary-average method. This results from the fact that the education for entry level teachers increased over both periods studied. Since there is a positive return to education built into the compensation of teachers, the salary-average method shows relatively higher salaries for novice teachers in the latter periods than does the regression method, which holds education fixed over time.
19. In competitive markets, supply and demand determine salaries in a rather straightforward manner. The supply and demand, however, is less obvious in the less competitive, unionized market for public school teachers. For example, with the increasing variety of job opportunities available to women during the 1980’s and 1990’s, one might expect that salaries for novice teachers would increase relative to the salaries of veteran teachers. However, the opposite occurred.
20. Front and backloading were here defined using the regression method.
Structure of Teacher Compensation

21. Consistent with the data reflected in Figure 1, the AFT districts in New York had stronger real salary growth than did the districts outside New York. The statewide 6.6% reduction in real average salaries of New York teachers during the 1970's is somewhat smaller than the 9.8% reduction for teachers nationwide. During the 1980-94 period, real average salaries increased by 25.7% in New York and 19.8% for the nation as a whole. Consistent with these numbers, the large AFT districts in New York substantially increased the real salaries of veteran teachers while maintaining the real salaries of starting teachers. In contrast, the large AFT districts outside New York maintained the real salaries of veteran teachers while allowing the real salaries of starting teachers to fall substantially. Even though these cases differ, backloading is common in both.


24. Also see Ehrenberg and Brewer (1994).

25. For example, see Dolton (1990), Hanushek and Pace (1995), Manski (1987), Murmane et al. (1991) and Zabula et al. (1979).

26. The data are drawn from an AFT publication (AFT, 1993b) which summarized data from Northwestern University's Endicott Reports since 1973.

27. For further discussion, see Flyer and Rosen (1996) who employ Current Population Survey data between 1967 and 1989. They find that the earnings of teachers have gone down relative to the earnings of other college graduates, once other socioeconomic determinants (e.g. experience) are taken into account.


29. Murmane et al. (1991) show that the probability of a teacher in North Carolina leaving teaching in a given year is approximately a third as large for someone who has taught for 10 yrs as it is for someone who has taught for only one year. Using Michigan data, the probability is only one-fifth as large.

30. See Dolton and van der Klaauw (1996) for a general discussion of factors relevant to teachers considering whether to leave teaching.

31. Raising salaries is certainly not the only policy change considered when discussing the need to attract more qualified teachers. Other proposals have included redesigning schools of education as well as certification and licensing rules and procedures. Improvement in working conditions and the professional status of teaching are also likely to affect teacher recruitment and retention. Such changes might also affect the way and extent to which salaries affect the decisions whether to enter and remain in teaching, thereby changing the salary schedule that would be most effective in attracting and retaining the most outstanding teachers.

32. Ballou (1996) finds that public schools tend not to hire the most qualified applicants. As discussed by Manski (1987) and Murmane et al. (1991), improved screening is needed.

33. See Murmane et al. (1991), chapter 4 for further discussion.

34. For example, see Pencavel (1991).

35. The analysis of collective choice in unions to determine desired wage structures is similar to the public choice analysis of voting on income tax schedules. As an example, see Roberts (1977).

36. Brueckner and O'Brien (1989) consider these alternative views of government behavior as well as the preferences of union officials in a theoretical model of collective bargaining. The model forms the basis for their empirical analysis of collective bargaining by police, fire and sanitation workers.

37. Even though it is beyond the scope of this paper, an empirical analysis of the extent to which various factors contributed to the backloading would be of general interest to those studying collective bargaining in the public sector as well as those interested in the political and economic context in which education policy is formulated. In future research we hope to quantify the extent to which the observed salary structure changes were the result of changes in the population of teachers and their unions, changes in factors affecting collective processes in school districts and possibly other changes which might affect collective bargaining directly.

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