

**UNDERSTANDING TEACHER LABOR MARKETS:
IMPLICATIONS FOR EQUITY**

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Executive Summary

Education policymakers at both the state and federal level are struggling to identify ways to improve the academic achievement of public school students. Faced with the sub-standard academic performance of some student groups and the persistence of achievement discrepancies between certain racial, ethnic and socio-economic groups of students, policymakers' need for information to bridge the gap is at an all-time high. Concern over low student performance has a long history but has taken on new urgency in a time of dramatic increases in the availability of achievement data, frequent court cases on adequacy and equity and widespread calls for accountability. Recent research on student achievement suggests a strong link between teachers and student outcomes, though efforts to eliminate funding disparities within states still leave many schools comparatively short-changed in the qualifications of their teachers.

Public policy already recognizes the connection between the distribution of teacher qualifications and educational equity. Education systems in some states currently face legal challenges because of charges they are not meeting adequacy standards for student outcomes. Plaintiff's evidence increasingly includes examples of how teacher qualifications differ across schools and districts and how teachers with low qualifications are unevenly distributed to students from nonwhite and low socio-economic households. Federal, state and district policies have begun to focus on strategies designed to attract better qualified teachers to traditionally low-performing schools where an overwhelming majority of students are poor, nonwhite and from urban areas. Moreover, as states and districts work to implement the standards and accountability systems required by the No Child Left Behind Act, issues relating to the equitable distribution of teacher qualifications will continue to grow in importance.

Though ample literature exists on the mobility decisions of teachers and teaching equity, little is known about the specific distribution of teacher qualifications and their contribution to and effect on educational equity. This report bridges the gap by examining 1) the distribution of teacher qualifications, 2) their relationship to educational equity and 3) the attributes of teacher labor markets that contribute to the poorest-qualified teachers being unevenly distributed to nonwhite students.

The results of our study show striking differences in the qualifications of teachers across schools. Teachers are sorted across New York State public schools such that the least qualified teachers are much more likely to teach in schools with higher concentrations of nonwhite, poor, and low-achieving students than their more qualified peers. Too often these teachers do not meet the minimum guidelines for certification, nor do they possess the skills required to educate students to high standards. We believe that this type of teacher sorting is attributable to student factors (e.g., achievement, race, socioeconomic status) and teacher factors (e.g., preference to teach high-achieving students, district-wide single salary schedules, relatively heavy reliance on local property wealth for teacher salaries, post-and-fill seniority hiring, and geographically limited labor markets). Though support for our position may be viewed as circumstantial, it comports with theory, common sense and anecdotal evidence.

Given that inequities in the qualifications of teachers exist and that the neediest students suffer most, how can the disparity be remedied? The research on this crucial point is particularly thin; analysis of system design and the comparative effectiveness of differing policies and systems is sketchy at best. For example, research suggests that teachers respond to working conditions, including compensation, school culture and physical safety. However, it is not known how much value is added (as measured by increases in student achievement) by increasing dollars in these areas. The research needed to understand and improve ways to attract and retain highly qualified teachers to hard-to-staff schools must be more sophisticated. Two aspects are particularly important. First, better measures of the qualifications of teachers, the environments in which they work, their classroom behaviors and the outcomes they produce are needed to better understand the policies that would be most effective. Researchers need to go well beyond data typically available in national survey or state administrative databases, even those in data rich states like Florida, New York, North Carolina or Texas. Second, researchers likely will need to develop conceptual models and empirical methods to account for the institutional structure of teacher labor markets. For example, most existing models continually adjust wages to equilibrate markets, though this is clearly not the case in public school teacher labor markets.

I. Introduction

Federal and state policy makers are struggling to improve the low student achievement of many students and reduce the large differences in achievement that exist among racial, ethnic and socio-economic groups. Concern over low student performance has a long history, but has taken on urgency in an era marked by court cases that focus on adequacy, by dramatic increases in achievement information, and by widespread calls for accountability. Recent research on student achievement identifies the important link between teachers and student outcomes.¹ Yet, even with increases in spending equity within states (Evans, Murray and Schwab, 2001), substantial differences remain across schools in the qualifications of teachers (Lankford, Loeb and Wyckoff, 2002; Betts, Rueben and Danenberg, 2000). Despite a rather large literature examining mobility decisions by teachers and the equity of education, we know relatively little about the distribution of teacher qualifications and how this relates to educational equity. This report examines the distribution of teacher qualifications, their relationship to educational equity, and the attributes of teacher labor markets that lead to the poor, nonwhite students being most likely to have teachers with the worst qualifications.

The connection between the distribution of teacher qualifications and educational equity already plays an important role in several aspects of public policy. First, the educational systems of some states are being challenged in court because they do not meet adequacy standards for student outcomes. Plaintiff's evidence in such cases is increasingly dominated by documenting the disparities in teacher qualifications across schools and districts and specifically the very low level of teacher qualifications for the teachers of children from nonwhite and low socio-economic households (see, for example, Lankford 1999 and the text of Judge Leland DeGrasse decision in *Campaign for Fiscal Equity v. New York State*, 2000). Second, federal, state and district policies are focusing on attracting better qualified teachers to schools that traditionally have been low-performing (see Education Week, 2003). These low-performing schools are overwhelmingly dominated by urban schools with high concentrations of poor, nonwhite students. Thus, identifying policies to address educational equity by improving the qualifications of teachers and

¹ Rivkin, Hanushek, and Kain (2000) attributes at least seven percent of the total variance in test-score gains to differences in teachers; and they argue that this is a lower bound. Sanders and Rivers (1996) find that the difference between attending classes taught by high-quality teachers (highest quartile grouping) and attending classes taught low-quality teachers (lowest quartile grouping) for three years in a row is huge, approximately 50 percentile points in the distribution of student achievement. They also find residual effects of teachers in latter years. That is, having a high quality teacher in grade three increases learning not only in grade three but also in grades four and five.

reduce inter-school disparities in teacher qualifications is and will continue to play an important role in judicial, executive and legislative policy development. As states focus on standards and accountability systems required by the No Child Left Behind Act, issues related to the equity of the distribution of teacher qualifications likely will grow. However, these efforts to improve educational equity are handicapped by an incomplete understanding of teacher labor markets.

Our results show striking differences in the qualifications of teachers across schools. Low-income, low-achieving and non-white students, particularly those in urban areas, find themselves in classes with many of the least skilled teachers. Too often these teachers do not meet minimal thresholds for certification, not to mention the skills required to educate students to high standards. We believe that the lower qualifications often found in classrooms with poor, nonwhite, low-performing students results from a combination of factors that include district wealth, policies and practices of public schools and the preferences of teachers for job attributes.

II. Background

Distribution of teacher qualifications

A number of studies have examined the distribution of teacher qualifications. Until very recently, measures of these qualifications were typically limited to educational attainment and experience. More recently, researchers have employed state administrative data which often have more detailed information describing the qualifications of teachers, e.g., teacher performance on certification exams, identification of the undergraduate and graduate colleges from which degrees were obtained, and comparison of certification areas with current teaching assignments. These measures provide a much richer description of the qualifications of teachers, but there has been little work that connects these attributes with measures of student outcomes. In general, recent work finds that the qualifications of teachers are sorted such that poor and nonwhite students frequently have less qualified teachers. However, we know little about the factors that lead to this sorting.

Teachers differ fundamentally from other school resources. They have preferences about whether to teach, what to teach, and where to teach. Potential teachers prefer one type of district to another; and within districts, they prefer one school to another. There has been much discussion about the role that compensation plays in the ability of schools to attract and retain high-quality teachers. A large literature suggests that teachers respond to wages. As a group, these studies show that individuals are more likely to choose to teach when starting teacher wages are high relative to wages in other occupations (Baugh and Stone, 1982; Brewer, 1996; Dolton

1990, 1993; Dolton and van der Klaaw, 1999; Dolton and Makepeace, 1993; Hanushek and Pace, 1995; Manski, 1987; Mont and Reece, 1996; Murnane, Singer & Willett, 1989; Rickman and Parker, 1990; Stinebrickner, 1998, 1999, 2000; Theobald, 1990; Theobald and Gritz, 1996). Baugh and Stone (1982), for example, find that teachers are at least as responsive to wages in their decision to quit teaching, as are workers in other occupations.²

Salary is one element of employment that is likely to impact sorting, but non-pecuniary job characteristics appear important as well. These characteristics may include class size, preparation time, facilities, or characteristics of the student body, among other things. As an example, class size reduction in California resulted in an increase in demand for teachers across the state. Teachers in schools with low-achieving students chose to move to higher-achieving schools, leaving many high-poverty districts with vacancies and unqualified instructors (Betts, Rueben & Danenberg, 2000; Bohrnstedt and Stecher, 1999). Similarly, in Texas, Hanushek, Kain and Rivkin (1999) found teachers moving to schools with high-achieving students and, in New York City, Lankford (1999) found experienced teachers moving to high-socioeconomic status schools when positions became available.

Educational equity

Research on the distributional equity of educational resources has a long and rich history. Numerous studies provide strong evidence of disparate student access to resources and the role that courts have played in addressing these issues. More recently, as policy has become more concerned with student achievement, issues of resource disparity have been linked to student outcomes. In particular, high-stakes exit requirements for students have fueled the development of the ‘adequacy’ of resources to reasonably attain these outcomes.³ This discussion has generally occurred outside the black box; that is, expenditures have been tied to outcomes without an understanding of the mediating process. Research is focusing on how to translate definitions of adequate outcomes back to expenditure levels that would produce these outcomes. This research has made good progress on addressing a number of conceptual and empirical issues, but still has some distance to go before results will withstand substantial scrutiny. For example, there

² These findings may appear to be contradictory to qualitative studies (such as Berliner, 1987; Feistritzer, 1992; Murphy, 1987; and Wise, Darling-Hammond and Praskac, 1987) which tend to find that ideology and the value individuals place on education for society are important in decisions about whether and where to teach. However, because individuals' answers to questions may not reflect their actions, factors less emphasized by respondents, such as wages and job stability, may still be relatively important to teachers.

³ The chapters in Ladd, Chalk, and Hansen (1999) provide a very good summary of the current state of research on educational equity.

is little agreement on the definition of adequacy, let alone how to determine expenditures necessary to produce the outcome.

Teacher labor markets

Teacher labor markets are characterized by several institutions that enhance the likelihood of an inequitable distribution of qualified teachers. In theory, employers in deciding to make job offers consider an array of employee attributes and make offers to individuals who rank highest on the employers' weighted average of these attributes. Likewise, in evaluating which jobs to pursue and which offers to accept prospective employees consider a bundle of attributes tied to specific jobs, preferring jobs which rank highest according to the individual's weighting of attributes. Typically, economists believe that wages adjust to equilibrate labor markets, allocating the most productive employees to their highest valued place of employment, *ceteris paribus*. Teacher labor markets are characterized by a number of institutions, which likely inhibit market wages from functioning smoothly in the allocation of teachers.

Important among these institutions is the single salary schedule, which operates in most school districts.⁴ A common example of the single salary schedule is one where all teachers in a district are paid according to threshold levels of educational attainment and years of district experience. Thus, to the extent that the steps of the salary matrix do not highly correlate with teacher productivity, which is likely, wages will not allocate teachers to their most valued use. Moreover, use of the single salary schedule makes it very difficult to raise salaries to attract more qualified teachers to hard-to-staff schools without also raising salaries in other schools in the district.

Another institution that inhibits teacher labor markets from freely allocating teachers is the post-and-fill, seniority-based, recruiting method employed in many districts. This institution requires districts to post vacancies within the district and give preference to within-district candidates based on their seniority. Thus employers may be constrained from hiring the most productive applicant. One implication of this policy is that teachers working in hard-to-staff schools can easily transfer to other schools within the district after gaining some experience, taking their on-the-job training with them and leaving the hard-to-staff school to recruit again, most likely from the ranks of inexperienced teachers. This has the effect of encouraging higher turnover and systematically reducing the qualifications of teachers in the hard-to-staff school relative to other schools within the district.

⁴ Increasingly, school districts are altering teacher compensation away from the single salary schedule. However, examples of such behavior remain rare. For examples, see Odden (2003).

As is well known from the rich literature examining the equity of educational resources, reliance on local funding combined with geographically small school districts is likely to encourage substantial differences in ability to pay for education across school districts. These differences are typically reflected in level of teacher salaries and other working conditions. This, when combined with the notion that working conditions are an important element in how teachers choose among jobs, increases the likelihood of differences in the qualifications of teachers across districts within a job market.

III. Data

Our database links seven administrative datasets and various other information characterizing districts, communities, and local labor markets in New York State. It includes information for every teacher and administrator employed in a New York public school at any time from 1969-70 through 1999-2000. (See Table A) The core data comes from the Personnel Master File (PMF), part of the Basic Education Data System of the New York State Education Department. In a typical year there are at least 180,000 teachers identified in the PMF. We have linked these annual records through time, yielding detailed data which characterizes the career history of each individual.

Several other databases that contain a range of information about the qualifications of prospective and actual teachers, as well as the environments in which these individuals make career decisions, substantially enrich this core data. For teachers this information includes age, gender, race/ethnicity, salary, course subject and grade taught, experience (in the district, in NYS public schools, and total), years of education and degree attainment, and teacher certification exam scores of individual teachers and whether they passed on their first attempts. In addition, we identify the institutions from which individual teachers earned their undergraduate degrees and combine it with the Barron's ranking of college selectivity to construct variables measuring the selectivity of the college from which each teacher graduated and the location of the institution. Measures of schools and districts include enrollment, student poverty, racial composition, limited English proficiency composition, student test results for recent years, dropout rates, district wealth, district salary schedules, crime, spending in numerous categories, number of employees in numerous categories, as well as many other measures. We are able to examine the geographic

nature of labor markets by knowing an individual's zip code at various times as they moved from high school to their first and subsequent teaching jobs.⁵

In order to assess the distribution of teachers across the schools, we create multiple measures of average teacher characteristics at the school level. These measures include:

- the percent of teachers with no prior teaching experience,
- the percent with no more than a Bachelors degree,
- the percent not certified in any current assignment,
- the percent certified in all current assignments,
- the percent of exam takers who failed the NTE General Knowledge Exam or the NYSTCE Liberal Arts and Science Exam on their first attempt,
- the percent who attended Barron's College Guide most competitive and highly competitive schools,
- and the percent who attended competitive, less competitive, or least-competitive schools.

These are a subset of the measures we have available but are illustrative of the trends we observed in all our teacher attribute measures. To simplify the discussion we also create a composite measure using principal components analysis that combines a number of these characteristics. Table B describes the components of this measure. It has a reliability of 0.86 and explains 52 percent of the variation in its component measures. The measure has a mean of zero and a standard deviation of one, indicating that a one-unit change in the composite corresponds to a one standard deviation change.⁶

IV. Analysis of Teacher Labor Markets

⁵ This information is not uniformly available for all individuals, but is available for a sub sample and is known for all individuals when they applied for certification and subsequently.

⁶ Our measures of teacher qualifications reflect the performance of individual teachers and the attributes of the colleges and universities they attended. In addition to the measures presented, we also know: individual teacher certification exam scores and whether the individual passed each of three component tests in the general battery as well as scores on the content specialty tests; whether the individual is certified to teach each of the courses they teach; their tenure status; their education level; and their experience teaching. For each of the higher educational institutions they attended we know: the identity of the college, the distribution of its math and verbal SAT scores, its ranking in the Barron's College Guide, and its admissions and attendance rate. There is remarkable consistency among most of the measures. The factor that we use is just one of many possible composite measures. We created numerous other factors in order to test the robustness of our results and found that the choice of factor made little difference.

We employ the New York State education workforce database described above to examine the distribution of teacher qualifications and to better understand the processes that resulted in the sorting we observe.

Distribution of teacher qualifications among schools.⁷

We find substantial variation across schools in the qualifications of teachers. As shown in Table 1, across a number of separate measures of teacher qualifications and a composite measure, there are schools with teachers whose qualifications are very strong and schools whose teachers have much weaker qualifications. For example, consider whether a teacher is uncertified to teach anything she currently teaches. The school at the 10th percentile of this distribution has no teachers uncertified to teach anything they currently teach (that is, they are all certified to teach at least some of their current teaching assignments). However, the school at the 90th percentile of this distribution has nearly a quarter of its teachers uncertified to teach anything they currently teach. Similar differences exist across the other teacher qualification measures. When these measures are combined into a composite measure, the overall teacher qualification factor, substantial differences exist.⁸

<Table 1 about here>

These differences primarily represent differences within labor markets rather than differences across labor markets. We define labor markets as Metropolitan Statistical Areas (MSA), which in urban areas includes a city school district and the districts in the surrounding suburban counties.⁹ Figure 1 shows the distribution of the composite teacher qualification factor

⁷ Much of this analysis is drawn from Lankford, Loeb and Wyckoff (2002).

⁸ The school-level teacher qualification attributes are highly correlated. Schools that have lesser-qualified teachers as measured by one attribute are more likely to have lesser-qualified teachers based on all other measures. For example, schools with high proportions of teachers who failed exams are more likely to have teachers from less competitive colleges (correlations of approximately 0.45); schools with a high proportion of teachers who are not certified to teach any of the courses that they currently teach are much more likely to have graduated from the less competitive colleges (correlation of .40). Thus, New York's schools are subject to substantial systematic sorting of teachers based on their qualifications.

⁹ The MSAs are defined by the Office of Budget and Management and used by the US Census Bureau. The urban regions are Albany-Schenectady-Troy (including Albany, Montgomery, Rensselaer, Saratoga, Schenectady, Schoharie), Buffalo-Niagara Falls (including Erie and Niagara counties), New York City (including Putnam, Rockland, Westchester, Nassau, and Suffolk counties), Rochester (including Genesee, Livingston, Monroe, Ontario, Orleans, Wayne counties), Syracuse (including Cayuga, Madison, Onondaga, Oswego), and Utica-Rome (including Herkimer and Oneida counties). The rural regions are Mid-Hudson (including Columbia, Delaware, Dutchess, Greene, Orange, Otsego, Sullivan, and Ulster counties), North Country (including Clinton, Essex, Franklin, Fulton, Hamilton, Jefferson, Lewis, St. Lawrence, Warren, Washington counties) and the Southern Tier (including Allegany, Broome, Cattaraugus, Chautauqua, Chemung, Chenango, Schuyler, Seneca, Tioga, Tompkins, Steuben, Wyoming, Yates counties).

for each major metropolitan area of New York State (Albany-Schenectady-Troy, Buffalo, New York City, Rochester, Syracuse, and Utica-Rome) and for three rural regions (Mid-Hudson, Southern Tier, and North Country). As shown, there is substantial variation within each region and with the exception of New York City this variation is very similar across regions. Table 2 shows a similar picture when individual measures of teacher qualifications are examined. For example, in the best 10 percent of schools in New York City, none of the teachers failed the general knowledge portion of the certification exam, while over half the teachers failed the exam in the 10 percent of schools faring worst on this measure. Other measures show large, but somewhat less striking differences across schools within the New York City. These results reflect substantial heterogeneity of teacher qualifications within the New York City. The results from the other large cities show large differences in the qualifications across schools within districts. Table 2 also highlights that although there is heterogeneity within the suburban schools, these schools typically have teachers who are much more qualified than their urban counterparts within the same labor market. Seventy-five percent of the variation in the composite measure of teacher qualifications is roughly equally divided between differences between districts within a region and between schools within a district.¹⁰ Thus, one lesson regarding educational equity of teacher qualifications is that important differences exist primarily within labor markets rather than across labor markets. This suggests policy makers should focus on remedies that address within district and urban/suburban differences.

<Figure 1 about here>

<Table 2 about here>

How is the variation in teacher qualifications distributed across schools and districts? In particular are the qualifications of teachers sorted in ways that provide particular disadvantage to certain groups of students? We find that fewer well-qualified teachers are much more likely to teach in schools with higher proportions of poor, non-white or low-performing students.

Table 3 shows that the average non-white student in New York State has a teacher who is more than two standard deviations worse on the composite teacher qualification measure than her white counterpart (-1.48 compared to 0.85). Non-white students are four times more likely to be taught by a teacher who is not certified to teach any of her current assignments, three times more

¹⁰ The remaining 25 percent of the variation reflects differences across regions. This figure drops to 2 percent when New York City is omitted. Similar results hold when any of the individual measures of teacher qualification are examined.

likely to be taught by a teacher who failed the general knowledge portion of the certification exam the first time, and twice as likely to be taught by a teacher whose B.A. degree is from the least competitive category of Barron's rankings of colleges than her white counterpart. Poor students are taught by less qualified teachers than non-poor students, but the differences are less dramatic. These differences reflect both the within and across district differences in teacher qualifications. When we consider only the differences within urban school districts, non-white and poor students are taught by less qualified teachers than their white and non-poor district colleagues, as shown in the bottom panels of Table 3. In New York City, the average white or non-poor student has a teacher with a composite teacher qualification factor that is more than one standard deviation better than their non-white or poor peer. Somewhat smaller differences exist in other urban areas and for other teacher qualification measures. Thus, even within an urban school system, non-white and poor students are systematically exposed to teachers with worse qualifications than white or non-poor students.

<Table 3 about here>

Table 4 shows that the lowest performing students are taught by the least qualified teachers.¹¹ Thirty-five percent of the teachers in schools where more than 20 percent of the students performed at the lowest level on the 4th grade ELA exam failed the general knowledge portion of the certification exam at least once. The comparable figure for teachers in schools in which none of the students scored at the lowest level is 9 percent. Similar relationships exist across all the teacher qualification measures. Correlations between school achievement and teacher characteristics tell the same story; the proportion of a school's students who achieved at Level 1 has a 0.63 correlation with the proportion of that school's teachers who are not certified to teach any of their current courses. The correlations for the proportion failing either the NTE General Knowledge or the NYSTCE Liberal Arts and Science exam are both 0.50, and the correlation of student achievement with teacher graduation from a less competitive college is 0.41. The results of these analyses are clear. Students in low-performing urban schools are taught by dramatically less qualified teachers than their higher performing, typically suburban

¹¹ New York's student achievement data for 4th and 8th grade English Language Arts and Math place each student's test results in one of four performance levels. The school data indicate the number of students in each level. To examine low-performing students we employed the portion of the students tested whose results place them in the lowest performance group, Level 1. Level 1 for 4th grade ELA is described by the New York State Education Department as, "These students have serious academic deficiencies. They show no evidence of any proficiency in one or more of the elementary standards and incomplete proficiency in all three standards."

counterparts. The results are similar if we use the 4th grade mathematics exam or the 8th grade ELA and math exams. In sum, there is strong evidence that many of the least qualified teachers are in schools with the lowest performing students. Although these results provide powerful evidence of the sorting of teacher qualifications, they do not help us understand why this sorting has occurred. Some insights to this process result from a better understanding of the career paths of teachers, the geography of teacher labor markets and the nature of teacher compensation.

<Table 4 about here>

Factors related to the sorting of teacher qualifications

Career paths of teachers.¹² Does the substantial sorting of teacher qualifications described above occur at the initial hiring decision—that is are better qualified teachers initially hired in predominately white, non-poor, higher achieving schools? Or does this result from the transfer and quit decisions of teachers, so that a relatively equal distribution of teacher qualifications becomes skewed as better-qualified teachers systematically and disproportionately leave schools with higher proportions of non-white, poor and low-achieving students? Our analysis suggests that the answer to this question depends upon the nature of the school. For schools with relatively low percentages of poor, non-white and low-achieving students the qualifications of the teachers are predominately determined by the initial match, and subsequent transfer and quit decisions leave these qualifications unchanged. However, for schools with relatively high concentrations of poor, non-white and low-achieving students, the qualifications of teachers deteriorate substantially as a result of transfer and quit decisions.

Figure 2 shows for the 1995 cohort of entering teachers the proportion of teachers who failed the general knowledge portion of the certification exam at least once separately for schools grouped by quartile of non-white student enrollment. So, in 1995, for schools in the lowest quartile of minority enrollment, 18 percent of newly employed teachers failed the exam. The comparable figure for schools in the highest quartile of minority enrollment is 30 percent. Thus, through their initial hiring decisions these schools employed teachers who differed dramatically in this teacher qualification measure. Over time the 12 percentage point difference grew to 19 percentage points, as the schools with high non-white enrollment increased the proportion of teachers in that 1995 cohort who failed the exam, without a similar trend in the low non-white enrollment schools. This results from relatively higher attrition in the high non-white schools from that cohort of teachers who had not failed the exam. A similar pattern emerges when we

¹² Much of this analysis is drawn from Boyd, Lankford, Loeb and Wyckoff (2002a).

perform the same analysis based on student performance quartiles rather than race, as shown in Figure 3. The 1995 cohort of teachers in schools where fewer of the students failed the 4th grade ELA exam had roughly the same failure rate in 2000 as in 1995 (about 24 percent). However, the schools with the highest quartile of student failures on the 4th grade ELA exam, experienced an increase in the proportion of teachers who failed the certification exam from 28 percent to 40 percent.

<Figure 2 about here>

<Figure 3 about here>

This suggests that both the initial match of teachers to schools and the subsequent career decisions of teachers contribute meaningfully to the sorting of teacher qualifications observed above. Thus both recruitment and retention policies are important for improving the educational equity with respect to teachers. Can we further isolate the factors that influence these inequities in the qualifications of teachers?

Geography of teacher labor markets.¹³ What sustains the substantial differences in the qualifications of teachers at the time of initial match? These differences could result from a variety of job attributes, including compensation and working conditions. It is also possible that teachers have preferences over the location of their employment. Our analysis indicates that new teachers have strong preferences over the locations in which they work, even after controlling for a variety of other attributes. In particular, new teachers much prefer to work close to their ‘hometown’ and in a district with similar urbanicity to the one where they attended high school.

Most teachers enter public school teaching very close to their hometowns or where they attended college. Eighty-three percent of teachers entering the New York State public school workforce took jobs within 40 miles of their home (Table 5).¹⁴ The relationship between

¹³ Much of this analysis is drawn from Boyd, Lankford, Loeb and Wyckoff (2001).

¹⁴ Distance from hometown is missing for many observations in our database, especially in New York City. However, distance from college of most recent degree to first job is available for 85 percent of the observations with missing hometown-first job distance data. Moreover, observations with missing hometown-first job distance data for which college-first job distance is available are more likely to take a job within 15 miles of the college where they received their most recent degree (47 percent) than observations for which hometown-first job distance is available (33 percent). Most New York City teachers come from one of the CUNY colleges or universities. CUNY students are overwhelmingly residents of New York City. As a result, the vast majority of the 78 percent of New York City teachers for whom we have no hometown-first job distance information likely have a New York City hometown. Thus, there is good reason to believe that our results would suggest even more individuals would take a first job very close to home if we knew the hometown-first job distance for all new teachers.

hometown and first job varies across Metropolitan Statistical Areas (MSAs). In some regions, 90 percent of all teachers located within 40 miles of their hometowns (New York City, New York City suburbs, and the suburbs of Buffalo), while in others job search appears to be broader, e.g., in the city of Rochester fewer than 60 percent of the teachers took a first job within 40 miles of home.

<Table 5 about here>

These relationships may involve more than just distance. For example, over 90 percent of the individuals whose hometown is New York City and who entered public school teaching from 1997 to 2000 first taught in a New York City school (Table 5, row percentage). About 60 percent of those with hometowns in the New York City suburbs first taught those suburbs. Other major urban areas follow a similar pattern. Teachers with hometowns in urban locations are more likely to take a first job in that urban district relative to its suburbs, and those whose hometown is in the suburbs are much more likely to initially locate in those suburbs rather than the urban district. These patterns are summarized in Table 6. Eighty-five percent of teachers whose hometown is an urban district first teach in an urban district, although only 48 percent of urban teachers come from urban hometowns. Fully 47 percent of urban teachers originate in the suburbs, while only 5 percent of suburban teachers have hometowns in urban regions.¹⁵ Although distance may clearly play a role in these results, it is also the case that apart from distance, the culture of schools or communities may play some role in the segmentation of teacher labor markets.

<Table 6 about here>

Although these descriptive statistics are powerful, we are cautious about implying preferences of teachers merely based on these data. Accordingly, we estimate a multivariate model of the factors relevant to teachers' decisions about what regions in which to locate for their first job. These multivariate analyses confirmed the information in the descriptive statistics. Distance from hometown is very important in determining where a teacher would choose to

¹⁵ Again, these patterns are supported when location of most recent college is substituted for hometown location. Eighty-four percent of individuals who obtained their most recent degree in New York City first taught there.

initially look for employment, other things equal.¹⁶ After controlling for distance, teachers prefer regions similar to those of their hometown. For example, teachers whose hometown is in the suburbs are more likely to teach in the suburbs, while those whose hometown is in an urban area prefer to teach in urban areas. Taken together, this suggests that it is much easier to attract a teacher to an urban school when the candidate attended high school in that city. This is true primarily because of the importance of distance to hometown but also because teachers have preferences for schools similar to those they attended. As a result, teacher labor markets are quite local and distance and preference for similar schools create a friction that make differential teacher qualifications more likely, other things equal. For example, if urban areas produced proportionately fewer teachers with high qualifications, due, perhaps, to well known correlations between many measures of teacher qualifications and socio-economic status of individuals, which on average are higher in the suburbs, then the friction described above makes it less likely for teacher qualifications to be evenly distributed, even if other variables were equal. In many cases, other factors likely to influence teacher employment, e.g., the quality of the students themselves, safety and building quality, work to the disadvantage of non-white, poor and low-achieving students.

Teacher salaries and other working conditions.¹⁷ Most models of labor markets posit that employees are responsive to real differences in compensation. To what extent might the differences in teacher qualifications be attributable to differences in teacher compensation? We now look at salary differences across schools to determine whether these differences are likely to be adding to the disparities that we see or reducing additional inequities that would exist if salaries were the same across schools. Salary schedules generally do not vary within districts. That is, most teachers who remain within the same district would receive similar salaries regardless of which school they taught in. Thus, salary differentials are unlikely to be driving the substantial within-district disparities in teacher characteristics across schools.

Although salary schedules are generally constant within districts, they do vary across regions and districts. Among districts in New York State, 72 percent of the variation in starting salaries for teachers with master's degrees is between regions (not between districts within regions). For teachers with 20 years of experience, 79 percent of the variation is between regions (again, not between districts within regions). This suggests that the bulk of the variation in salaries is not contributing to the sorting of teachers across districts or schools within labor

¹⁶ The results of the conditional logit estimation can be found in Boyd, Lankford, Loeb and Wyckoff (2001).

¹⁷ This section is drawn from, Lankford, Loeb and Wyckoff (2002).

markets. It may contribute to differences across regions or simply reflect differences in the opportunity cost of teaching across labor markets.

While less variation in salary exists within regions, this variation nonetheless appears to be large enough to impact teacher sorting.¹⁸ To help assess whether these differences are likely to contribute to teacher sorting, Figure 4 plots the 10th, 50th, and 90th percentile starting salary for each region of the state. It shows that approximately ten percent of districts have starting wages lower than \$28,000, while another ten percent have starting wages higher than \$42,000.¹⁹ The New York City metropolitan area has the highest overall starting salaries, with Buffalo a close second. Within regions, the difference in starting salaries between districts at the 90th percentile and those at the 10th percentile ranges from \$4,477 in the Utica and Rome region to \$9,962 in the Mid-Hudson region. These differences are economically substantial and may be contributing to sorting between districts within a region.²⁰

<Figure 4 about here>

In 1970 in every major metropolitan region, salaries paid to urban teachers either matched or exceeded those paid to suburban teachers. In most of these regions, this pattern continued through 2000. In Buffalo and Syracuse, for example, there has been little difference over time between suburban and urban salaries either for starting teachers or more experienced teachers. They remain almost identical today. In Rochester urban salaries have been higher on average than suburban salaries though this difference has diminished in recent years, especially for new teachers. The pattern in the New York City region is quite different. Over the 1970-2000 period, New York City urban salaries at both the entry level and the veteran level fell

¹⁸ This is true nationally as well. Using the Schools and Staffing Surveys (1993-94) we found that although most of the variation was not between districts within the same region, the variation that did exist within regions was economically important. For example, in Pittsburgh, PA, the metro area in our sample with the largest variation across districts (only MSAs for which at least 20 districts were represented in SASS), the lowest starting salary was \$18,500 while the highest was \$34,554. Chicago also showed substantial differences across districts ranging from \$19,891 to \$31,621. The salaries for more experienced showed even greater variation within regions. In Chicago there was a \$36,978 difference in wages for teachers with 20 years of experience and a Masters degree between the lowest and highest paying district. Only Dallas, Huston and Tulsa showed ranges of less than \$10,000 and even there the differences across districts were large enough to be economically important.

¹⁹ These data are from the 1998-1999 academic year.

²⁰ As a check on the magnitude of salary differences across districts we looked at the distribution of salaries for teachers with 20 years of experience. The variation across districts is even larger for experienced teachers. Approximately ten percent of districts have salaries lower than \$43,500 for these teachers, while another ten percent have starting wages higher than \$74,900.

substantially behind their suburban counterparts (see Figures 5 and 6).²¹ In 2000, starting salaries for novice New York City school district teachers with a master's degree were about 15 percent lower than those for comparable suburban teachers; those for veteran teachers were more than 25 percent less than their suburban counterparts.

<Figure 5 about here>

<Figure 6 about here>

It is also the case that many other aspects of working conditions enhance inequities in the allocation of teacher qualifications. There is increasing evidence that student attributes affect the attractiveness of a school. For example, Boyd, Lankford, Loeb and Wyckoff (2002b) find that white and non-white teachers prefer to teach white, non-poor, and higher achieving students. These results may arise from the correlation of these student groups with unmeasured school attributes that prospective teachers care about. Whether a direct or indirect effect, teachers tend to prefer jobs in schools with fewer non-white, poor and low-achieving students. As long as employers use teacher qualifications as attributes on which to select teachers, then schools with more non-white, poor, and low-achieving students will have teachers with weaker qualifications.

V. Summary

Teachers are sorted across New York State public schools such that the least qualified teachers are much more likely to teach in schools with higher concentrations of non-white, poor, and low-achieving students than their more qualified peers. We believe that the preferences of teachers for better students and other student attributes that are correlated with higher student achievement, e.g., race and socioeconomic status, as well as attributes of the teacher labor market, such as district-wide single salary schedules, post-and-fill seniority hiring, relatively heavy reliance on local property wealth for teacher salaries and the geographically limited nature of the labor market all contribute to this sorting. Our evidence on these points is circumstantial but it accords with theory, common sense and anecdotal reports.

Can the educational inequities that match the least well-qualified teachers to the neediest students be altered? Here the research evidence is particularly thin. There are a number of

²¹ We normalized all salaries over time using the Consumer Price Index for July of the relevant year. No adjustments have been made to account for differences in costs across places at a point in time.

general policies that conceptually could make a difference; however, little is known about how to specifically design these policies or their relative effectiveness. Moreover, frequently these policies pit the interests of key stakeholders against each other and make implementation difficult. For example, there is evidence that teachers respond to working conditions, including compensation, school culture, physical environment and safety, but there is little information as to the return from a particular investment or the relative return in teacher qualifications across investments in these working conditions. What increase in teacher qualifications results from a \$1000 increase to 100 teachers teaching in hard-to-staff schools? How does that increase compare to spending the same \$100,000 on improving supplies and the physical plant? We simply don't know. Additionally, attracting higher quality teachers to hard-to-staff schools requires greater investment in these schools than other schools in the district. Making such investments in teacher compensation violates the single salary schedule compensation policies of most districts. Teachers' unions are likely to resist changing the single salary schedule as that would create inequalities among their members.²²

The research required to make important progress on the issue of attracting and retaining highly qualified teachers to hard-to-staff schools needs to be much more sophisticated than that currently available. Two aspects are particularly important. First, much better measures of the qualifications of teachers, the environments in which they work, their classroom behaviors and outcomes they produce are needed to better understand the policies that would be most effective. Researchers will be required to go well beyond data typically available in national survey or state administrative databases, even those in data rich states like Florida, New York, North Carolina or Texas. Second, researchers will likely need to develop conceptual models and empirical methods that account for the institutional structure of teacher labor markets. For example, most models currently employed situations where wages continually adjust to equilibrate markets. That is clearly not the case for public school teacher labor markets.

²² However, Odden and Kelly (2001) argue that teachers are willing to differentiate solely based on differential skills and knowledge.

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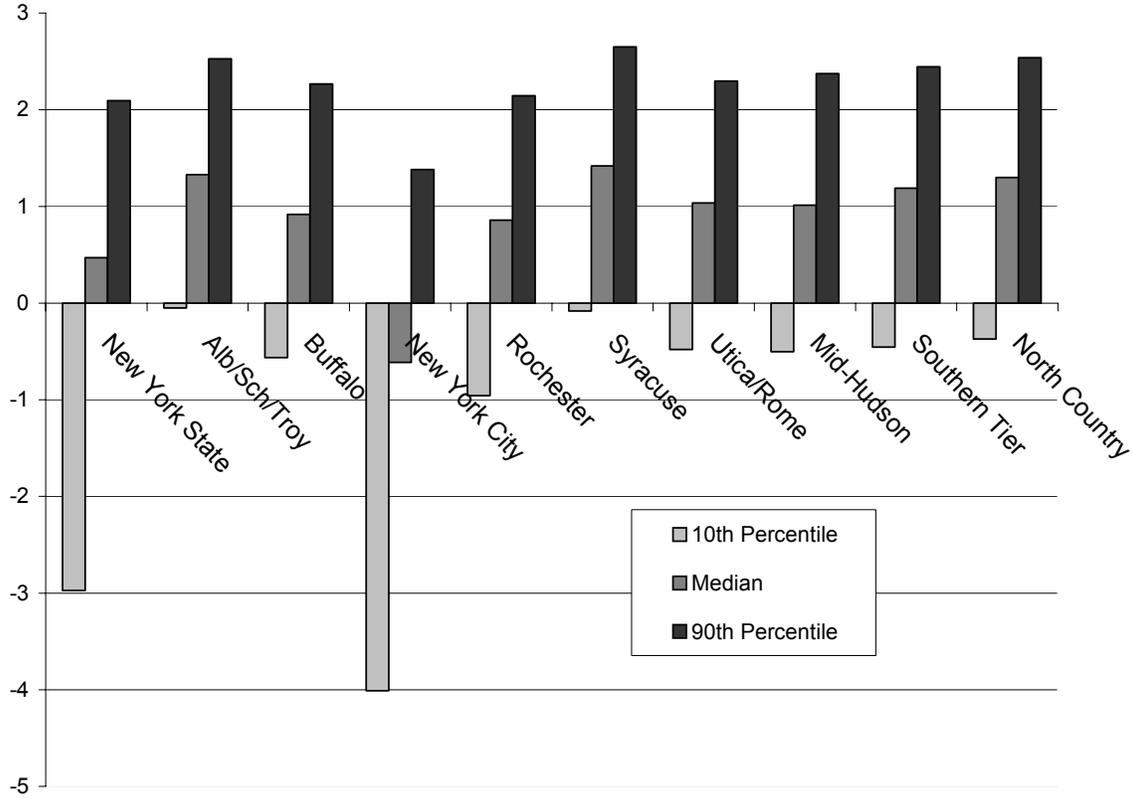
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Figures & Tables

Figure 1: The Distribution of Composite Teacher Qualifications By Region



* Buffalo reflects the schools in the Buffalo MSA outside of the Buffalo City School District. The Buffalo City School District has a certification program that differs from that in the remainder of the State and therefore certification data is not comparable and the composite measure could not be computed.

Figure 2: Percent of New York City Teachers from the 1995 Cohort Who Failed a Teacher Certification Exam by Percent Minority Students in the Schools, 1995-2000

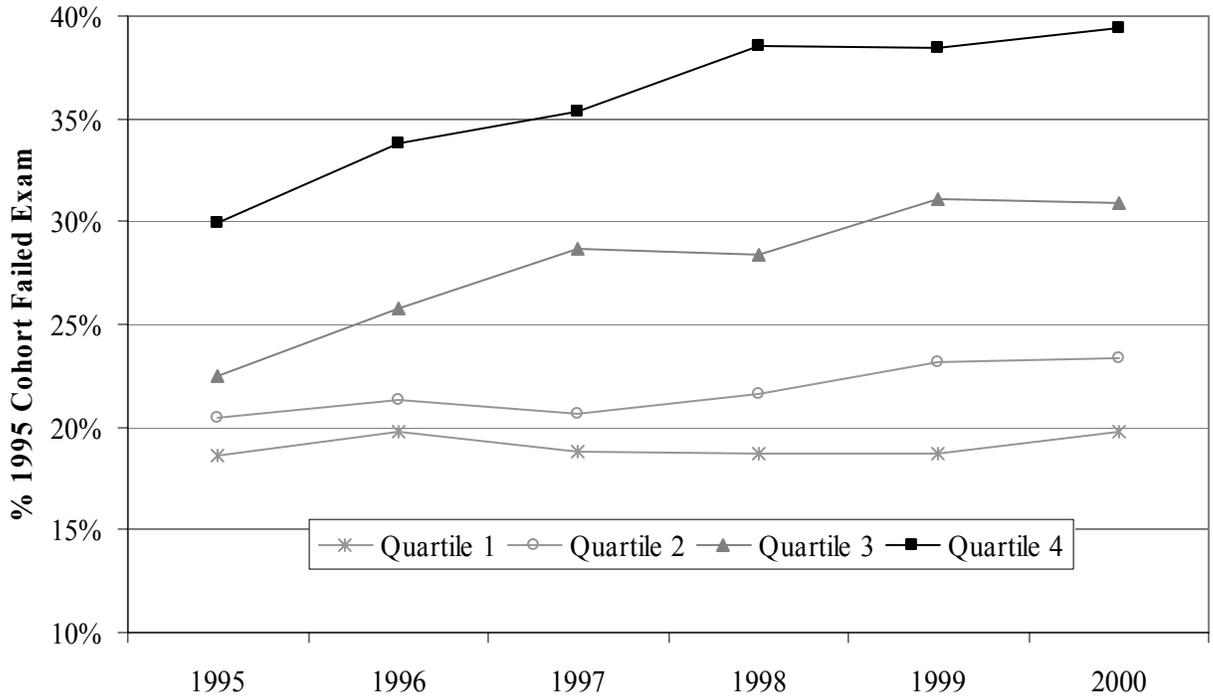


Figure 3: Percent of New York City Teachers from the 1995 Cohorts Who Failed a Teacher Certification Exam by Percent Students in the School with Lowest Level Test Score.

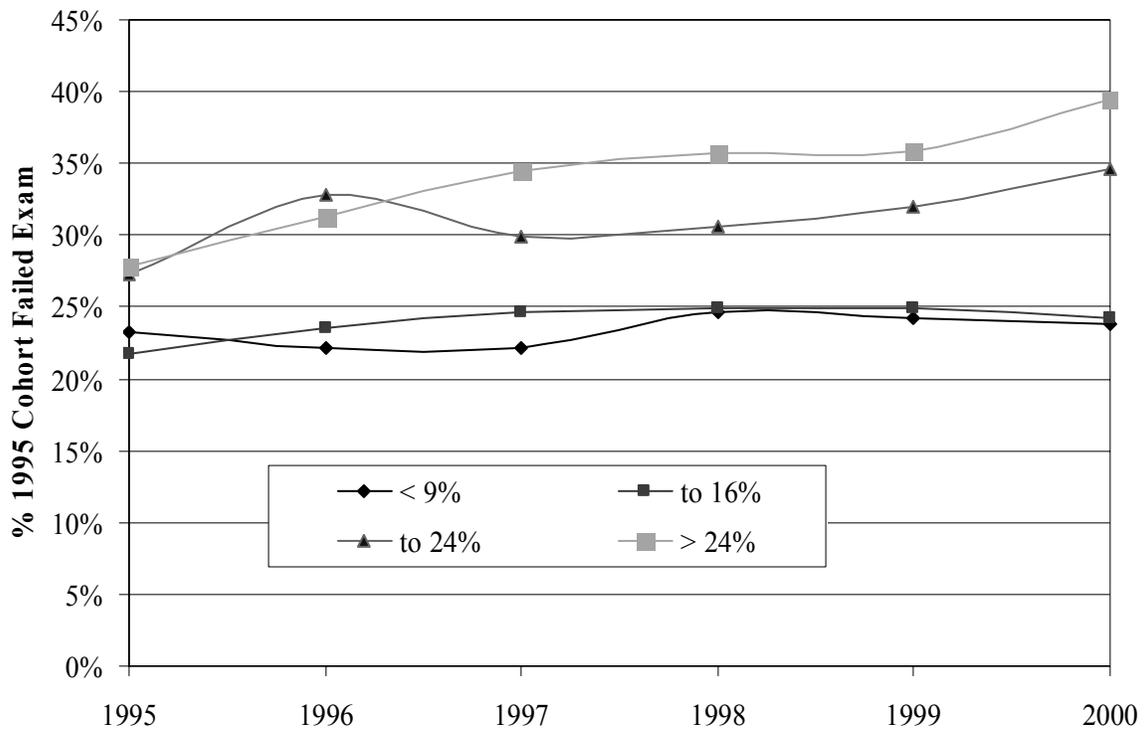
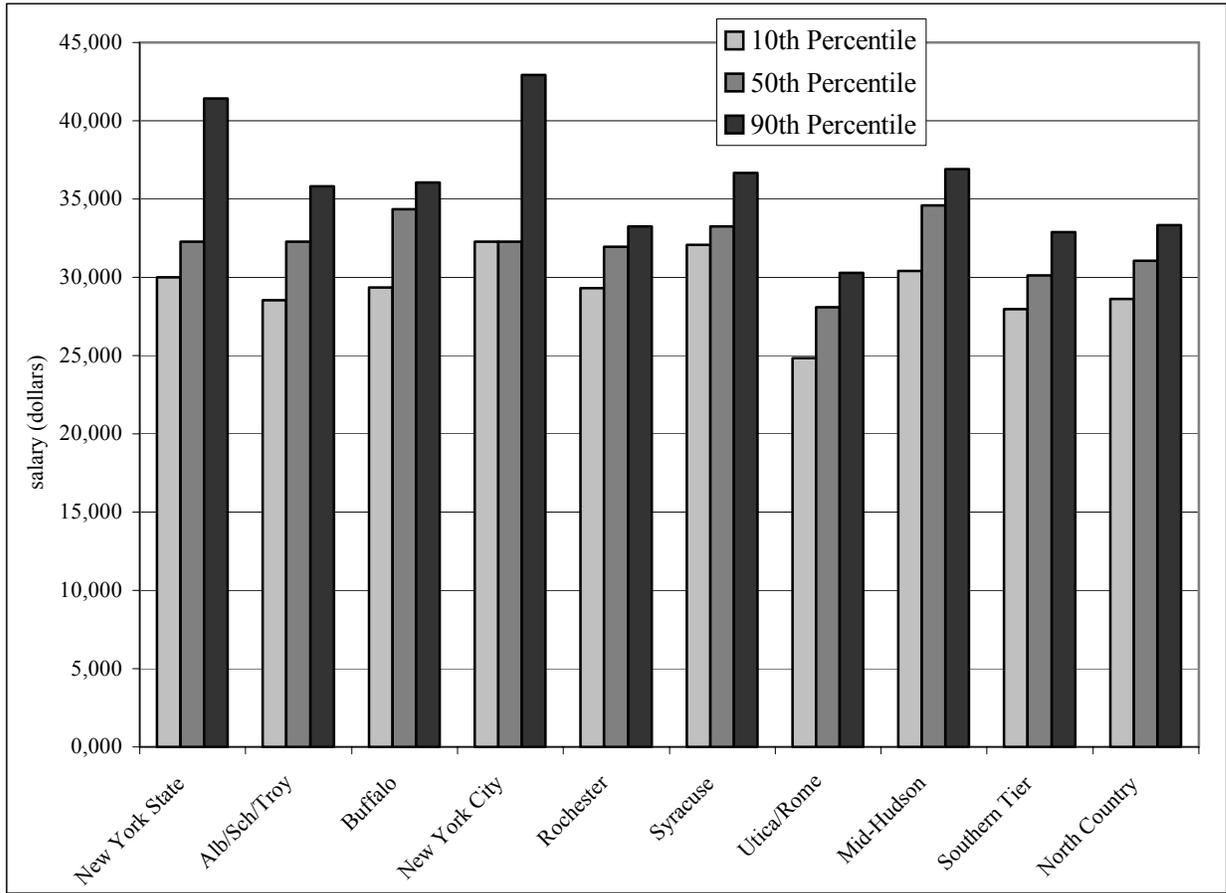


Figure 4: The Distribution of Starting Salary New York State, by MSA, 2000



Note. The standard error of the mean is 73 for the state and 181, 160, 107, 112, 155, 215, 197, 119, 136 for the regions respectively

Figure 5: Estimated Real Salaries for Teachers with MA and No Experience, New York City Metropolitan Area, 1970-2000

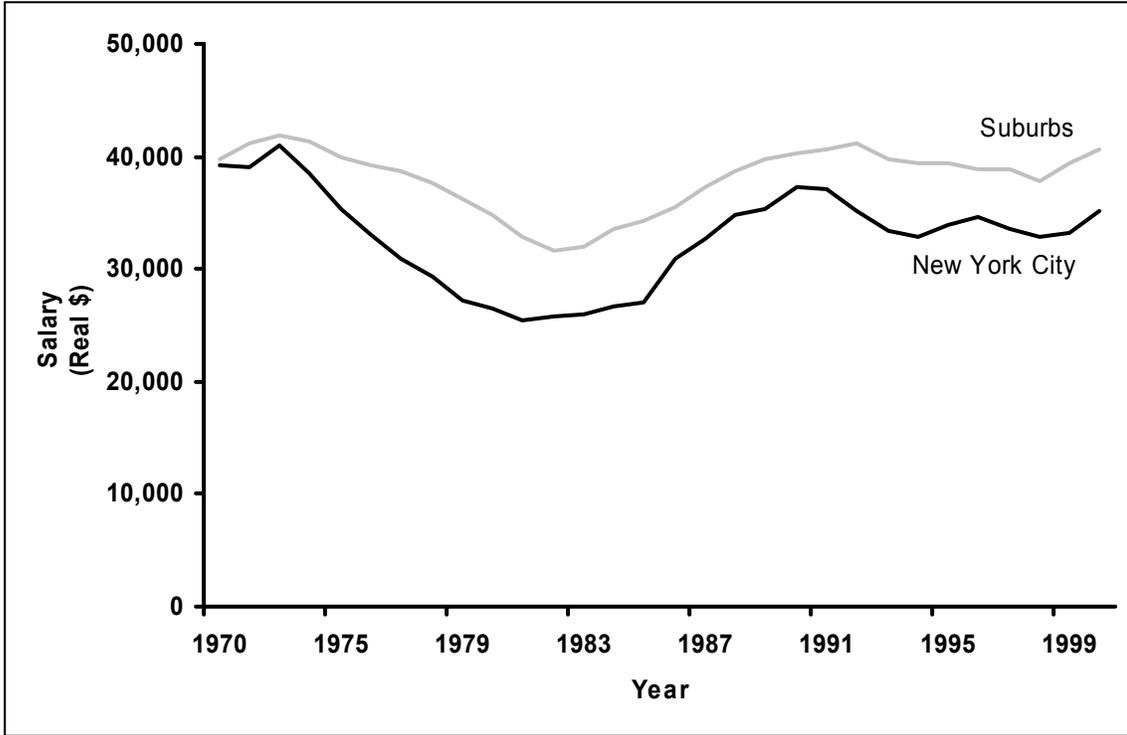


Figure 6: Estimated Real Salaries for Teachers with MA and 20 Years Experience, New York City Metropolitan Area, 1970-2000



Table 1: School Quartiles for New York State Teacher Qualification Attributes, 2000

	Percentiles		
	10th	Median	90th
Overall Teacher Qualification Factor	-2.974	0.469	2.093
% with no Teaching Experience	0.000	0.067	0.176
% BA Degree or Less	0.029	0.125	0.262
% Not Certified in any Assignment	0.000	0.038	0.243
% Permanent Certification in All Assignments	0.449	0.731	0.889
% Fail General Knowledge or Liberal Arts	0.000	0.077	0.308
% BA from Most Competitive College	0.000	0.088	0.234
% BA from Least Competitive College	0.000	0.097	0.300

Table 2: School Quartiles for New York State Teacher Attributes by MSA and Urbanicity, All Teachers 2000 (All teachers FTE > .5)

		Buffalo		New York City		Rochester		Syracuse	
		urban	suburban	urban	suburban	urban	suburban	urban	suburban
Composite Qualification Factor	10th	na	-0.56	-4.99	-1.47	-2.00	-0.55	-0.39	0.03
	Median	na	0.92	-1.97	0.70	0.07	1.02	0.87	1.44
	90th	na	2.27	0.15	1.93	1.45	2.30	2.10	2.70
% with No Teaching Experience	10th	0.01	0.00	0.02	0.00	0.00	0.00	0.02	0.00
	Median	0.08	0.06	0.10	0.05	0.09	0.06	0.06	0.05
	90th	0.22	0.15	0.24	0.15	0.18	0.14	0.14	0.14
% Not Certified in any Assignment	10th	na	0.00	0.09	0.00	0.06	0.00	0.00	0.00
	Median	na	0.00	0.20	0.03	0.14	0.02	0.05	0.02
	90th	na	0.06	0.38	0.10	0.26	0.08	0.11	0.09
% Failed NTE Gen. Know. or NYS Lib. Arts Exam	10th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Median	0.10	0.04	0.27	0.09	0.13	0.00	0.10	0.00
	90th	0.33	0.20	0.53	0.32	0.25	0.17	0.24	0.19
% BA from Most Competitive College	10th	0.00	0.00	0.00	0.00	0.10	0.09	0.14	0.05
	Median	0.03	0.06	0.07	0.11	0.19	0.22	0.21	0.15
	90th	0.08	0.13	0.23	0.24	0.25	0.36	0.29	0.29
% BA from Least Competitive College	10th	0.00	0.00	0.11	0.06	0.00	0.00	0.00	0.00
	Median	0.06	0.03	0.24	0.15	0.10	0.03	0.05	0.03
	90th	0.14	0.09	0.42	0.28	0.16	0.09	0.09	0.07

Table 3: Teacher Attributes for the Average Student with Given Characteristics

	Composite qualification factor	No Teaching Experience	Not Cert in any subject taught	Failed Gen Know or Lib Arts Exam	B.A. from Least Competitive College
New York State					
Non-White	-1.484	0.099	0.166	0.212	0.214
White	0.847	0.067	0.040	0.071	0.102
Poor	-2.393	0.118	0.207	0.279	0.250
Non-Poor	-1.223	0.098	0.159	0.202	0.239
New York City SD					
Non-White	-2.183	0.109	0.212	0.256	0.247
White	-0.726	0.078	0.150	0.161	0.254
Poor	-2.562	0.120	0.215	0.296	0.268
Non-Poor	-1.341	0.100	0.167	0.212	0.258
Rochester City SD					
Non-White	-0.302	0.105	<i>0.148</i>	0.107	0.103
White	0.051	0.089	<i>0.147</i>	0.099	0.107
Poor	-0.418	0.108	<i>0.173</i>	0.120	0.097
Non-Poor	-0.221	0.111	<i>0.171</i>	0.111	0.096
Syracuse City SD					
Non-White	1.029	0.080	0.058	0.100	0.045
White	1.254	0.063	0.054	0.095	0.043
Poor	0.970	0.081	0.056	0.109	0.046
Non-Poor	1.194	0.069	0.046	0.103	0.040

* Differences between Non-Whites and Whites and between Poor and Non-Poor are significant at the $p < .01$ level except for those in italics.

Table 4: Average School Attributes of Teachers by Student Test Score—4th Grade ELA Level 1, 2000

Teacher Quality Attributes	Percent of Students in Level 1 4th Grade ELA			
	0	0% to <5%	5% to <20%	>20%
Overall Teacher Quality Factor	0.98**	0.86**	-0.30**	-2.82
% with No Teaching Experience	0.06**	0.07**	0.09**	0.14
% Not Certified in any Assignment	0.03**	0.04**	0.09**	0.22
% Fail NTE Gen. Know. or NYS Lib. Arts Exam	0.09**	0.10**	0.19**	0.35
% BA from Most Competitive College	0.11**	0.11**	0.09	0.08
% BA from Least Competitive College	0.10**	0.11**	0.16**	0.26

Statistical significance refers to differences between other student performance levels and the > 20% level for each of the mean teacher attributes: ~ p<.01; * p<.05; ** p<.01.

Table 5: Distance from High School to First Job, by MSA, 1997-2000

Region	0 to 15 miles	15 to 40 miles	40 to 100 miles	100 or more miles	All
Buffalo City	77.6	6.6	4.6	11.2	100.0
Buffalo suburbs	71.8	19.3	3.9	5.0	100.0
New York City	62.4	27.3	6.5	3.8	100.0
New York City Suburbs	69.6	23.5	3.3	3.5	100.0
Rochester City	48.7	10.8	21.4	19.1	100.0
Rochester Suburbs	42.3	27.0	18.4	12.3	100.0
Syracuse City	76.4	6.0	6.0	11.5	100.0
Syracuse Suburbs	51.4	22.9	15.3	10.4	100.0
Other	48.2	23.0	14.6	14.2	100.0
All	59.0	23.7	9.3	8.0	100.0

Table 6: Urbanicity of Hometown by Urbanicity of First Job, 1997-2000

Region of High School		Region of Job			
		Urban	Suburban	Rural	All
Urban	% Row Total	84.6	12.8	2.6	100
	%Col Total	47.9	4.7	2.1	17.6
Suburban	% Row Total	23.6	67.4	9	100
	%Col Total	46.6	86.1	26.2	61.2
Rural	% Row Total	8	20.9	71.1	100
	%Col Total	5.5	9.3	71.7	21.3
All	% Row Total	31	47.9	21.1	100
	%Col Total	100	100	100	100

Table A: Workforce Database

	<i>Personnel data</i>	<i>Certification and exam data</i>	<i>SUNY student data</i>	<i>School and district data</i>
<i>UNIVERSE:</i>	All public school teachers, superintendents, principals, and other staff	All individuals taking certification exams	All SUNY applicants (including non-teachers)	All public schools and districts
<i>ELEMENTS:</i>	<ul style="list-style-type: none"> - salary - course subject and grade - class size - experience (district and other) - years of education and degree attainment - age - gender 	<ul style="list-style-type: none"> - scores on each taking of NTE and NYSTCE (general knowledge, pedagogy, and content specialty) exams - college of undergraduate and graduate degrees - degrees earned - zip code of residence when certified - race 	<ul style="list-style-type: none"> - high school attended - high school courses - high school GPA - SAT exam scores - college attended and dates - intended college major - actual college major - college GPA - degrees earned 	<ul style="list-style-type: none"> - enrollment - student poverty (free and reduced lunch counts) - enrollment by race - limited English proficiency - student test results - dropout rates - district wealth - district salary schedule - support staff and aides
<i>TIME PERIOD:</i>	1969-70 to 1999-00	1984-85 to 1999-00	1989-90 to 1999-00	1969-70 to 1999-00
<i>SOURCE:</i>	New York State Education Department	New York State Education Department	The State University of New York	New York State Education Department

Table B: The Composite Measure of Teacher Quality

Components:	Scoring Coefficients
1. percent of teachers with less than or equal to 3 years of experience	-0.36449
2. percent of teachers with tenure	0.36032
3. percent of teachers with more than a BA degree	0.31576
4. percent of teachers certified in all courses taught	0.39435
5. percent of teachers from less-competitive or non-competitive colleges	-0.27578
6. average teacher score on the NTE communication skills exam	0.37538
7. average teacher score on the NTE general knowledge exam	0.34601
8. average teacher score on the NTE professional knowledge exam	0.38134

Eigenvalue: 4.17 (52.14% of variation)

Cronbach's alpha (reliability): 0.8641

