RECRUITING HIGHLY QUALIFIED TEACHERS:
DO DISTRICT RECRUITMENT PRACTICES MATTER?

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Abstract

This paper presents results from a survey on teacher recruitment practices used in New York State school districts and analyzes whether the level of use of recruitment practices is related to teacher qualifications. We find that most districts employ a wide variety of practices and that the number of recruitment practices used by districts goes up with district size. To examine the effectiveness of recruitment practices, we estimate a model relating a composite measure of teacher qualifications to the level of use of recruitment practices and labor supply and demand factors. The recruitment regressor is treated as an endogenous variable with factors related to district use of these practices as instruments. While we cannot identify which individual practices are important, we find consistent evidence that districts using only a limited set of recruitment practices have hired less qualified teachers in New York.

JEL Classification: H833, I22, J45

Recruiting Highly Qualified Teachers:
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1. Introduction

Decades of research on the determinants of student achievement make it clear that high quality teachers matter to student success (Ferguson 1998; Goldhaber 2002; Hanushek, Kain, and Rivkin 2002). With states under pressure to raise teacher quality to comply with the No Child Left Behind Act (NCLB) and with a significant increase in demand for teachers projected for the next decade (Hussar 1999), many school districts face teacher recruitment challenges. The growing literature examining the determinants of teacher mobility and retention has focused on a limited set of factors within district control (e.g., wages, class sizes), and outside district control (e.g., demographics of student body, district location) that could affect mobility.

Very little research exists, however, on what types of practices districts use to increase the number of applications for open teaching positions and on whether these recruitment practices are effective. Can school districts, through the strategic use of advertising, partnerships with colleges, and recruitment incentives, increase teacher quality? Using the results of a 2004 survey of school district superintendents in New York State on teacher hiring practices, the objectives of this paper are to: 1) describe the actual recruitment practices of New York school districts, and 2) examine the effect of teacher recruitment practices on the qualifications of teachers hired by New York school districts. We find that districts in New York use a range of recruitment practices, the number and types of practices vary with the enrollment size of the district, and districts employing only a limited set of recruitment practices have hired less qualified teachers, on average. While our results on effectiveness should be viewed as exploratory, they provide some of the first evidence that widespread use of teacher recruitment practices can improve teacher quality.

2. Teacher Recruitment Practices

Research examining the determinants of teacher mobility decisions has focused primarily on two set of factors affecting teacher labor supply: relative salaries and working conditions. A large body of empirical research confirms that compensation can significantly affect teacher decisions about leaving and moving (Baugh and Stone 1982; Murnane and Olsen 1990; Stinebrickner 1998; Imazeki 2005; Dolton and van der Klaauw 1999). However, several recent studies suggest that teacher mobility decisions may be more strongly influenced by working conditions than by salaries, particularly the characteristics of the students (Hanushek et al. 2001; Scafidi, Sjoquist, and Stinebrickner forthcoming; Falch and Strom 2005). Furthermore, the recent finding by Boyd et al. (2004) that "most public school teachers take their first public school teaching job very close to their hometowns or where they attended college" (p. 117) suggests that teachers may have strong preferences for a familiar teaching environment.

2.1. Research on Teacher Recruitment Practices

In contrast to the research on salaries and working conditions, very little attention has been paid to the practices districts actually use to recruit job applicants for teaching positions and whether these practices are effective in improving teacher quality. Teacher recruitment practices could increase the quality of teachers hired by the district for several reasons. First, if teacher job search, particularly beyond the local area, is limited by imperfect information about the school district, then districts may be able to increase applications through advertising in newspapers, journals, and other types of media (e.g., internet). Second, if applications are limited by the high entry costs into teaching created by state certification requirements and district policies, districts can reduce those barriers by encouraging applications from alternatively certified teachers and by

providing assistance for paraprofessionals to become teachers (Glazerman, Mayer, and Decker 2006; Boyd et al. 2006). Third, if uniform salary schedules reduce a district'd flexibility in attracting teacher applications, particularly in hard-to-staff fields and schools, then incentives in the form of additional compensation or benefits might expand the applicant pool.

The little evidence that does exist on actual recruitment practices in public education suggests that many districts engage in a fairly limited search for candidates. Based on a detailed survey in 1997 of superintendents, school board presidents, and teacher union presidents in Pennsylvania, Strauss et al. (1998; 2000) find that 75% of districts only advertise in Pennsylvania and 17% only advertise locally. The internet was used at least sometimes by 29% of respondents, and 30% of districts had partnerships with colleges for teacher training and placement. Strauss and colleagues (2000) conclude that districts in Pennsylvania focus their hiring process on substitute or part-time teachers and graduates of local colleges, instead of "actively seek[ing] new teacher applications through vigorous advertising and recruiting" (p. 405). Concerns over the quality of the public teacher hiring process have also been raised in several comparisons of teacher recruitment policies in public and private schools (Ballou 1996; Ballou and Podgursky 1998).

2.2. Teacher Hiring Survey

To shed some light on actual district hiring practices, we surveyed New York school superintendents in the spring of 2004. The survey covered three broad topics: 1) teacher recruitment, 2) teacher screening and selection, and 3) interest in training and support. For this paper we will concentrate on the results from the first section of the survey. In implementing the survey, we followed closely the recommendations of Dillman (2000) to maximize the response

rate.[1] The resulting response rate was over 71%. The survey sample did not include the New York City School District or districts primarily serving special populations.

To examine how representative the sample is of all school districts in New York, we compared characteristics of responding districts to non-respondents on a range of demographic, fiscal, teacher, and region variables. Districts completing the survey have similar enrollment size and student socio-economic composition as non-respondents. The one exception is the share of limited English proficient (LEP) students, which was higher in districts not in the survey. Regarding district finances, districts in the survey have 6% lower spending overall and 3% lower operating spending. None of the other differences in fiscal variables are statistically significant from zero. The teacher work force in responding districts is very similar to non-respondents, except that non-respondents have slightly less experienced teachers and a slightly lower share of tenured and permanently certified teachers. Respondents and non-respondents tend to be distributed evenly between urban, suburban, and rural districts; however, respondents are less likely to be located in the New York City metropolitan area (so called downstate New York).

3. Use of Teacher Recruitment Practices in New York

The high response rate and representative nature of the sample provides us the opportunity to examine in depth the teacher hiring practices of New York school districts. In this section we present simple bivariate relationships between use of specific recruitment practices and district characteristics including enrollment size and the fiscal health of a district.[2] The number of potential applicants aware of teacher openings in the district can be increased by using mass media, the internet, job fairs, and contact with colleges. Beyond broadening the pool of potential applicants, recruitment practices can help increase the number of applicants by providing financial

incentives and reducing barriers to entry into teaching for non-certified teachers and paraprofessionals. The survey results are summarized by the major categories of recruitment practices.

3.1. Advertising

A simple and relatively inexpensive recruitment strategy, at least in terms of staff time, is to put advertisements in newspapers, trade publications, or on radio or television. The least expensive option would probably be advertising in local newspapers and possibly local access cable or radio stations. We asked districts to identify the media outlets they use and, in the case of newspapers, whether they are local (within 50 miles), in other areas of the state, or based out of state.[3] The typical district begins advertising in March or April for the following school year and makes an offer in June (Table 1); an early advertising date is associated with making earlier offers to prospective teachers.[4] High need urban districts begin advertising around the same time as average need and low need districts but make their offers one-half to one month later on average.[5]

The principal media outlet for teacher job advertisements is local newspapers, with 80% of districts placing most or all of their advertisements for open teaching positions in local newspapers (Table 2). A much smaller share of districts (25%) place the majority of their advertisements in non-local newspapers within New York State. Less than 5% of districts make education trade publications, out-of-state newspapers, or radio and television their principal advertising media for teaching positions. Small districts are more likely to use local newspapers and less likely to use other New York newspapers than districts with high enrollment. A lower share of high need urban districts use newspaper advertising compared to other districts, but they are only slightly more likely to use advertisements in education trade publications. Unexpectedly,

high need rural districts are heavier users of radio and TV advertising than other districts, but even among rural districts use of radio and TV advertising is very limited.

<Table 1 about here>

3.2. Recruiting from Colleges

A potentially effective approach to recruiting new teachers is to work with the colleges producing them. The contact can be fairly passive, as in asking colleges to post job notices on bulletin boards or in placement newsletters, or it can involve more direct contact by visiting the campus or talking to faculty about job candidates. School districts and colleges can establish even stronger partnerships through student teaching arrangements and the interaction of college faculty and district personnel on curricular and pedagogical issues. We asked superintendents to categorize their district's relationships with local colleges (colleges within 50 miles), other New York State colleges, and colleges in other states. Districts work primarily with local colleges; the most common college recruitment strategies include posting job notices at the colleges, and more active strategies, such as supervising student teachers and contacting college faculty (Table 2).[6] A majority of districts also place job notices in placement newsletters and visit local campuses to actively recruit candidates.

<Table 2 about here>

With regard to non-local colleges (farther than 50 miles from the district), the only strategy used by a majority of districts is to post job notices at the college. Less than 40% of districts use active recruitment strategies with non-local colleges. Larger districts are more likely to recruit in both local and non-local colleges than smaller districts, particularly visiting campuses and supervising student teachers. High need urban districts are more likely to visit local colleges and

supervise student teachers from non-local colleges but otherwise are not any more active in working with colleges than other types of districts.

As part of the survey, we asked superintendents to identify the "five colleges with which you conduct the greatest number of these activities." Over 40% of recently hired teachers (hired in the last three years) in responding districts earned their bachelor degree at these colleges, and 55% earned their masters degrees. If "local" college is defined as a college in the same county or neighboring counties, close to 50% of recently hired teachers in New York received their bachelors in local colleges, and over 70% received their masters.[7]

3.3. Use of the Internet

The emergence of the internet provides new opportunities to expand teacher recruitment outside the local area at relatively low cost compared to traditional advertising. For the cost of posting job notices on teacher recruitment websites, assuming such sites are available, a district can potentially have access to a national market of teachers. Districts can post job notices on their own websites and can provide recruiting brochures online for candidates to download. Prospective teachers can communicate with the districts by email and submit their applications online.

Over 70% of districts use the internet, most commonly to post job notices on school district websites (Table 3).[8] Approximately 40% of districts also post openings on other teacher recruitment websites or allow teachers to submit their applications online. A much smaller share of districts actively use the internet to search for job candidates. High need urban districts are somewhat more likely than average need districts to use the internet, particularly to post job openings on district and teacher recruitment websites and to search for candidates on the web. While small districts are less likely to use the internet for recruiting, one exception is small districts that contract with a regional education organization in New York (Board of Cooperative

Educational Services, or BOCES) for access to online application systems or online placement of vacancy notices.[9] Small districts using BOCES online recruitment services are much more likely to use the internet for recruitment than other small districts, and their usage rates are similar to those of larger districts.

<Table 3 about here>

3.4. Teacher Recruitment Incentives

A range of teacher recruitment incentives has been discussed in the recruitment literature including signing bonuses, subsidized tuition, and assistance purchasing a home.[10] Districts can also offer extra compensation for teaching in hard-to-staff fields and schools, National Board Certification (NBC), or performing extra curricular activities and administrative duties as an inducement. Superintendents may also be able to increase base salaries by crediting teachers for experience in other districts or in non-teaching occupations.

Almost three-quarters of superintendents responding to the survey said they used some type of recruitment incentive (Table 4), with the average district using between 1 and 2 incentives.[11] Only two incentives are used by over half the school districts—extra compensation for supervising extracurricular activities and crediting teachers for experience outside the district. Two-thirds of districts use at least one of these "traditional" incentives. Approximately 16% of districts offer subsidized tuition at local colleges, additional compensation for NBC, or credit teachers for work experience in non-teaching occupations. The only other incentive used by at least 25 school districts is additional compensation in hard-to-staff fields. Slightly over 40% of districts use at least one of these "non-traditional" incentives.

<Table 4 about here>

The use of incentives tends to go up with district size, particularly additional compensation for National Board Certification, and flexibility in crediting teaching experience in other districts. High need urban districts are more likely than other types of districts to use incentives, particularly signing bonuses, additional compensation for NBC, subsidized college tuition, and additional compensation for hard-to-staff fields or for extracurricular or administrative functions. It is interesting to note that these types of incentives have been recommended by several scholars as tools to attract high-quality teachers to high need schools, particularly in urban areas (e.g. Loeb 2000; Odden and Kelley 2000; Kearney 2000).

3.5. Strategies to Increase Supply

The findings of Boyd et al. (2004) that new teachers tend to teach close to their hometown, or where they went to college suggests that expanding the pool of teachers within the local area might be a more effective strategy to increase job applicants than broadening the job search beyond the local area. Strategies to increase the local supply of teachers might include recruiting substitute teachers, retired teachers, former teachers, and alternatively certified teachers or providing assistance for paraprofessionals to become certified teachers. Districts use two supply strategies on average, with recruitment of substitute teachers the most common strategy (Table 5).[12] Over 40%t of districts recruit teachers certified through alternative routes and 28% recruit retired teachers or provide assistance to paraprofessionals to become teachers. Only 7% of districts recruit former teachers. Use of supply strategies is not strongly related to district size, but larger districts are more likely to recruit substitutes and to assist paraprofessionals. High need urban districts are no more likely to use supply strategies than average need districts, except to recruit paraprofessionals.

<Table 5 about here>

3.6. Use of Multiple Practices

Most districts use a variety of practices, but only a small set of practices are used by the vast majority of districts. What is less clear is the portfolio of recruitment practices that districts employ, and whether practices of different types are treated as substitutes or complements. If a district posts job notices on the internet, for example, is it more or less likely than the average district to use advertising in newspapers or other media outlets as well? Table 6 reports for a district using a particular practice how likely they are to also use other practices compared to the average district. For example, if a district uses incentives in recruiting, they are 7.7% more likely than the average district to use the internet for recruiting as well. The predominance of positive percentages suggests that districts view most practices as complements when developing their recruiting plan. This is particularly true for less traditional practices, such as non-traditional recruiting incentives, other uses of the internet besides posting job notices on school websites, recruitment of alternatively certified teachers, and working with non-local colleges. Using one of these non-traditional practices is associated with 15% higher use of all other practices on average, and 22% higher use of other non-traditional practices.

<Table 6 about here>

4. Relationship between Use of Recruitment Practices and Teacher Qualifications

In this section, we propose an empirical model of teacher qualifications and present estimates from the model for New York school districts. As far as we are aware, this is one of the first attempts to examine the relationship between recruitment practices and the qualifications of recently hired teachers. Given that this analysis is based on cross-sectional data, and that proxy measures are used for teacher quality, the results should be viewed as exploratory. Despite these

limitations, the results provide evidence on the role that recruitment practices may play in improving teacher qualifications.

4.1 Measuring Teacher Qualifications

The importance of teacher "quality" is frequently acknowledged in the education policy literature; however, measures of quality are often poorly defined and inconsistent (Goldhaber and Anthony forthcoming). Teacher quality would preferably be measured by student performance gains (Stone 1999; Sanders, Saxton, and Horn 1997), but the lack of micro-student data for New York requires that we take a more indirect approach by measuring teacher qualifications that may be related to teacher quality. While the extensive education production function literature has found inconsistent evidence about the relationship between teacher education, and experience and student performance (Hanushek 1986; Greenwald, Laine, and Hedges 1994), there is stronger evidence that certification in the subject taught is related to student performance gains that subject (Goldhaber and Brewer, 2000). There is also fairly consistent evidence that measures of teacher academic proficiency, such as performance on college entrance exams or teacher certification exams, are related to student performance gains (Ehrenberg and Brewer 1994; Ferguson and Ladd 1996). However, recent research by Goldhaber (2005) suggests that teacher certification exams may only explain a small percentage of student performance gains.

To estimate teacher qualifications we use factor analysis with measures of teacher certification test score performance, certification status in teaching assignments, and college ranking to construct a composite measure of teacher qualifications (Loeb 2000). The data used in the factor analysis comes from the teacher certification database and the basic education data system maintained by the New York State Education Department (SED).[13] To match the timeframe in the survey we used information on recently hired teachers, which are defined as

teachers who began working in the district in the 2002-03 through 2004-05 school years.[14] Table 7 presents the factor analysis results, with the scoring coefficients (reported in the second column) used to construct the composite measure of teacher qualifications.[15] We estimated a Cronbach alpha to examine the reliability of the teacher qualification measure, and found that the reliability of this measure (Cronbach alpha=0.56) is below the standard (0.7) often used to identify reliable measures.

<Table 7 about here>

4.2. Teacher Quality Model

Observed teacher qualifications in a district reflect both district demand and teacher supply decisions. The cross-sectional nature of our data makes it difficult to estimate structural models of supply and demand for the teacher labor market. The approach we take instead is to estimate a reduced-form model of teacher qualifications, which includes both supply and demand factors. Teacher labor supply can be modeled as a function of four factors: teacher salaries (W) relative to comparable private sector salaries (P_L), working conditions (C), amenities (A), and personnel policies, such as recruitment practices (R) that may affect teacher supply (Hanushek, Kain, and Rivkin 2001). Most studies of teacher retention have focused on the first two categories–salaries and working conditions–and some hedonic models of teacher salaries have also considered amenities, such as urban location (Chambers 1995).

District demand for teacher quality is a function of factors in an education cost model, including the level of student outcomes (S), factor price for teachers and capital (P_K), physical characteristics of the district (N) that could affect costs of production (enrollment and pupil density), and student characteristics (Z) affecting the translation of resources into student outcomes (e.g., poverty, limited English proficiency). As a derived demand, district demand for

teachers also reflects citizen demand for education. An exogenous set of demand variables (D), such as income, state aid, voter tax share, and variables related to voter preference for education, can be substituted for S in the labor demand equation. Solving the demand equation for W and substituting it into the supply equation results in a reduced form model of teacher qualifications (Q):

$$Q = f(P_L, P_K, C, A, R, N, Z, D). \quad (1)$$

We assume for simplicity that equation (1) has a constant elasticity functional form, which implies Cobb-Douglas technology, and constant elasticity functions for labor supply and education demand. The reduced form approach limits our ability to identify the structural parameters, such as the effect of recruitment practices on labor supply. The coefficient on R (c_R) in equation (1) is equal to:

$$c_R = \text{to } (\beta_K/(\alpha_L + \beta_K))\alpha_R, \quad (2)$$

where β_K is the output elasticity for capital as a percentage of returns to scale, α_L is the supply elasticity for teacher qualifications with respect to relative wages, and α_R is the effect of recruitment practices on supply of teacher qualifications. While we cannot identify α_R, it is likely to be larger than c_R; as long as β_K and α_L are positive as expected, then $(\beta_K/(\alpha_L + \beta_K))$ will be less than one.

4.3. Factors Affecting District Use of Recruitment Practices

Teacher recruitment regressors have to be treated as endogenous variables, because recruitment practices are likely to be chosen when districts make decisions about staffing and budgets. To identify possible instruments, we evaluated superintendents' responses to an open-ended question asking them to "list the major constraints faced by your district in recruiting new teachers." Among exogenous factors mentioned by superintendents, rural or remote location was

the most frequently cited reason. Other limitations mentioned include a small pool of candidates in certain specialties, and resource limitations both in terms of staff time, and budget constraints. Based on these responses and our evaluation of the descriptive results, we hypothesize that district adoption of a recruitment practice is affected by three exogenous factors: enrollment size, county population, and district wealth. First, the most consistent finding in the descriptive tables is that use of practices is strongly related to district enrollment, with adoption of most practices going up with enrollment size.[16] Second, districts with low fiscal capacity (property wealth) may be less willing to invest scarce resources in a broad range of recruitment practices with uncertain benefits; thus, use of most practices is hypothesized to go up with property wealth. Third, districts may have less need to use a broad array of recruitment practices if they are located in a large local labor market with a significant number of potential teachers. We might expect then that use of recruitment practices would decline with the population of the county in which the district is located.[17]

4.3 Measuring Level of Use of Recruitment Practices

Since most districts use a bundle of recruitment practices, it is difficult to isolate the impact of any one practice. However, the results in Table 6 suggest that districts can be roughly categorized as heavy, moderate or light users of recruitment practices. For our empirical analysis we develop several classifications for level of use of recruitment practices by districts. First, we categorize districts as "broad users" of recruitment practices if they use at least one practice from each of the following categories: internet, supply, incentives, and active college strategies. Approximately 52% of districts fall into this category (Table 10). A smaller share of districts (9%) are classified as "innovators" because they use several non-traditional strategies including at least one strategy from each the following categories: non-traditional recruiting incentives, active

strategies with non-local colleges, recruitment of alternatively certified teachers, and other internet strategies besides posting job notices on the school website. We label districts as "traditional users" (19% of districts) if they do not use any non-traditional strategies. The terms "non-traditional" or "innovator" are used purely for descriptive purposes to describe practices not used by most school districts, not to signify effectiveness.

Another way to classify users is by the number of strategies that they employ. We label districts as "heavy users" (21% of districts) if they use at least two recruitment strategies from each of the following categories: internet, incentives, and local supply, as well as at least three college strategies. By contrast, districts are classified as "light users" if they use two college strategies or less, and one strategy or less from each of the other recruitment categories (8% of districts).

4.3. Data and Measures

The independent variables used in the empirical model are generally based on information published by the New York State Education Department (SED). To match the time period used in constructing the teacher qualification factor score, most variables are expressed as a three-year average from 2002 to 2004 (unless noted otherwise). Data from SED includes enrollment counts, the share of elementary school students receiving free lunch, the share of students who are non-white, pupil density (pupils per square mile), data on teacher qualifications, adjusted gross income, and regional classifications (downstate, rural, and upstate suburbs).[18] Information on county-level unemployment rates and private salaries (average payroll for professional and technical services) are from the New York State Department of Labor. Market values for property are estimated by the New York Office of Real Property Services. Crime rates are supplied by the New York State Division of Criminal Justice Services. County population is estimated by the U.S.

Bureau of the Census, and the percentages of the population age 65 years or older, and 5 to 17 years of age are from the *2000 Census of Population*. Several variables in the teacher quality model have been dropped because of high collinearity.[19] Table 8 reports descriptive statistics for model variables.[20]

<Table 8 about here>

4.4 Empirical Results

Models are estimated with linear 2SLS with instruments based on the three factors associated with district adoption of recruitment practices discussed in section 4.2 (enrollment, county population, and per pupil property values). Overidentification tests and weak instrument tests have been run to assess the appropriateness of the instruments.[21] Hypothesis tests are based on robust standard errors. While these estimates should be viewed as exploratory, they may be suggestive of the effect of recruitment practices on teacher qualifications.

The full regression results are reported in Table 9, when the measure for broad users of recruitment practices is included in the model. The coefficient on this variable is statistically significant from zero at the 10% level. Because the teacher qualification measure has a standard deviation of 1, the coefficient on the broad users indicates that use of a broad range of recruitment practices is associated with a 0.67 standard deviation increase in teacher qualifications. Coefficients for other variables in the model generally have the expected sign, and several are statistically significant from zero. For example, teacher qualifications are estimated to be positively related to private sector salaries and the county unemployment rate, and negatively related with the share of free lunch students.

<Table 9 about here>

Coefficients on the other recruitment measures are reported in Table 10. The coefficient on the indicator variable for innovative districts (model 2) is 0.90, although it is not statistically significant from zero at conventional levels. Traditional users (districts not using non-traditional practices) are estimated to have teacher qualifications 0.64 standard deviations below districts using at least some of these practices (model 3). A similar story emerges when we look at measures of the number of strategies used. Heavy users of recruitment strategies (model 4) are associated with teacher qualifications that are 0.74 standard deviations above non-heavy users, while lights users (Model 5) have qualifications 1.06 standard deviations below non-light users.

5. Conclusions

The survey results have provided a rich picture of the teacher recruiting process in New York State. Most New York school districts advertise in local newspapers, work with local colleges to recruit, post job notices on their school website, recruit substitute teachers, and use extra compensation for extra-curricular or administrative functions as a recruiting incentive. Relatively few districts, on the other hand, advertise outside their local area, work with non-local colleges, search for job candidates on the internet, or offer signing bonuses, assistance with home purchase, or compensation for hard-to-staff fields and schools as recruiting incentives.

The most consistent finding from our descriptive analysis is that the use of recruiting incentives goes up with the enrollment size of the school district (except for local newspaper advertising). With regard to fiscal health, high need urban districts are more likely to use some active and innovative strategies than other districts, such as the internet for recruiting, supervisng of student teachers from non-local colleges, and non-traditional recruiting incentives.

While all districts employ a portfolio of recruitment practices, some districts appear to have a much more diversified portfolio than others. The use of recruitment practices in one category (e.g., college strategies) is positively related to recruitment strategies in other categories (e.g., incentives), particularly for non-traditional recruiting strategies. In other words, some districts are heavy users and some are light users of recruitment practices. The overlap in use of practices makes evaluating the effects of individual practices difficult, but we can categorize districts by the level of use of recruitment practices to determine if there are benefits to utilizing a broad array of recruiting strategies.

In the second part of the paper we carry out an analysis of the relationship between level of use of recruitment practices and teacher qualifications. To measure teacher qualifications we develop a composite measure, which includes certification test score performance, selectivity of the college(s) the teacher attended, and certification status in their assignments. The cross-sectional nature of the survey does not permit the use of time series data to identify effects of recruitment practices. Instead, we estimate a reduced-form model of teacher qualifications with the recruitment measures treated as endogenous variables. Instruments are selected among exogenous variables associated with the adoption of these practices. While the regression results should be viewed as an exploratory, they provide some of the first evidence available that district recruitment practices affect district teacher qualifications.

One consistent finding from the regression analysis is that using a limited set of recruitment practices is negatively related to teacher qualifications. This finding holds for both light users of recruitment practices and for districts not using any non-traditional recruitment practices. The size of the effects appears to be quite large, at least one standard deviation. We also found that broad use of recruitment practices was associated with higher teacher

qualifications. Focusing on heavy users of practices, particularly non-traditional practices, the results are less definitive. While the coefficients on the measures of innovative users or heavy users are positive, they are not statistically significant at conventional levels.

What are the potential implications of these findings for state education policymakers? First, if our findings are correct then state governments may want to target assistance to light (or traditional) users of recruitment practices, primarily small rural districts. If states want to encourage the use of a broader set of recruitment practices by rural districts, they need to help lower the costs of recruitment practices for these districts by providing technical assistance, access to teacher recruitment websites, and financial assistance with recruiting incentives. Regional education organizations, such as New York's BOCES, could assist rural districts to design, manage, and implement recruitment programs. Second, state governments can help to reduce the uncertainty surrounding the benefits of adopting particular recruitment practices by improving the quality of and access to information, including funding program evaluation research to help identify which methods are successful and which are not for particular types of districts; and supporting regional organizations to provide training and assistance in adopting successful strategies.

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Table 1
Advertising for Teachers in Media Outlets by District Characteristics

District Enrollment	Low	Medium	High	All Districts	N
Date of first advertisements (months)	***4.0***	***3.6***	***3.2***	3.6	454
Date of typical offer (months)	***6.1***	***5.8***	***5.7***	5.8	472
Percent of responses indicating "most" or "all" advertising placed in these media outlets:					
Local newspapers/periodicals (within 50 miles)	***87.7***	***79.9***	***70.7***	79.6	489
Other advertising:	23.6	24.4	29.3	25.5	447
Other newspapers/periodicals in New York	23.3	23.5	28.3	24.7	474
Newspapers/periodicals in other states	1.8	1.3	0.9	1.3	459
Education trade publications/periodicals	1.7	3.9	4.3	3.4	464
Radio/television	2.7	4.3	0.9	1.1	459

SED Need/Resource Capacity Categories	High Need Urban	High Need Rural	Average Need	Low Need
Date of first advertisements (months)	***3.5***	***4.1***	***3.6***	***3.1***
Date of typical offer (months)	***6.4***	***6.1***	***5.9***	***5.4***
Percent of responses indicating "most" or "all" advertising placed in these media outlets:				
Local newspapers/periodicals (within 50 miles)	***70.4***	***86.8***	***81.7***	***66.3***
Other advertising:	***24.0***	***28.7***	***21.0***	***37.3***
Other newspapers/periodicals in New York	***19.2***	***26.7***	***19.2***	***42.0***
Newspapers/periodicals in other states	0.0	3.2	1.1	0.0
Education trade publications/periodicals	***7.7***	***6.1***	***1.5***	***5.0***
Radio/television	0.0	3.1	0.8	0.0

Note: "Low" is below 25th percentile (approximately 1,000 students), "medium" is 25th to 75th percentile, and "high" is above the 75th percentile (approximately 3,500 students). Months are defined as 1=January, 2=February, etc. Bold and italics indicate a statistically significant difference among district enrollment size categories or among need/resource capacity categories (10% level) using a chi-square test.

Table 2
Location of Colleges Where Districts Using Recruitment Strategies by District Characteristics

	Local Colleges				Non-Local Colleges			
District Enrollment	Low	Medium	High	All Districts	Low	Medium	High	All Districts
All strategies	***88.9***	***81.8***	***97.8***	88.9	***56.1***	***52.4***	***64.2***	56.3
List job openings:	***84.8***	***75.5***	***89.5***	81.5	43.9	41.9	43.1	42.7
Post job notices at the college	80.9	80.4	88.8	82.7	41.5	40.7	40.7	40.9
Advertise in placement newsletter distributed by college	***59.6***	***57.9***	***70.0***	***61.7***	15.4	16.1	24.4	18.0
Active strategies:	***82.8***	***85.1***	***97.3***	89.4	***29.3***	***33.5***	***56.9***	38.3
Visit campus to actively recruit job candidates	***51.4***	***61.1***	***82.8***	67.8	***6.5***	***9.3***	***30.9***	14.0
Contact specific college faculty to identify potential job candidates	81.7	77.6	84.9	80.5	***19.5***	***16.9***	***30.1***	20.9
Supervise student teachers from the college	89.0	84.9	88.6	86.8	***13.0***	***21.0***	***35.0***	22.5
SED Need/Resource Capacity Categories	High Need Urban	High Need Rural	Average Need	Low Need	High Need Urban	High Need Rural	Average Need	Low Need
All strategies	85.7	84.6	88.3	96.0	***60.7***	***60.7***	***59.3***	***39.3***
List job openings:	83.3	74.5	85.6	75.0	***28.6***	***50.5***	***45.8***	***27.4***
Post job notices at the college	73.9	76.7	86.6	79.2	***28.6***	***47.7***	***44.0***	***26.2***
Advertise in placement newsletter distributed by college	58.3	57.1	66.9	48.3	14.3	21.5	19.6	9.5
Active strategies:	90.9	82.4	89.8	94.4	53.6	35.5	40.0	31.0
Visit campus to actively recruit job candidates	***92.3***	***46.7***	***71.9***	***70.5***	14.3	11.2	15.3	13.1
Contact specific college faculty to identify potential job candidates	78.9	81.7	79.9	82.0	21.4	20.6	22.2	16.7
Supervise student teachers from the college	80.0	86.2	86.5	91.2	39.3	18.7	23.3	19.0

Note: Sample size is 494. Percent of responses using a particular recruitment strategy with a college. Local colleges are defined as colleges within 50 miles. "Low" is below 25th percentile (approximately 1,000 students), "medium" is 25th to 75th percentile, and "high" is above the 75th percentile (approximately 3,500 students). Bold and italics indicate a statistically significant difference among district enrollment size categories or among need/resource capacity categories (10% level) using a chi-square test.

Table 3
Use of the Internet for Recruitment by District Characteristics

District Enrollment	Low (Using BOCES)	Low	Medium	High	All Districts
Total number of internet strategies used	1.9	***1.2***	***1.7***	***2.1***	1.7
Percent of responses:					
Uses internet to recruit teachers	77.1	***54.5***	***75.8***	***82.1***	72.1
Posts job openings on the internet:	74.3	***52.8***	***72.6***	***81.3***	69.8
School district website	42.9	***35.8***	***59.7***	***76.4***	57.9
Online recruitment websites targeted to teachers	65.7	37.4	46.0	44.7	43.5
General online recruitment websites	14.2	***8.9***	***7.3***	***16.3***	9.9
Other uses of the internet for recruitment:	45.7	***30.9***	***44.8***	***52.8***	43.3
Searches for candidates on a recruitment website	31.4	***15.4***	***15.7***	***25.2***	18.0
Allows candidates to submit applications online	37.1	***24.4***	***40.3***	***43.1***	37.0

SED Need/Resource Capacity Categories	High Need Urban	High Need Rural	Average Need	Low Need
Total number of internet strategies used	***2.0***	***1.4***	***1.7***	***1.7***
Percent of responses:				
Uses internet to recruit teachers	82.1	65.4	74.5	69.0
Posts job openings on the internet:	78.6	61.7	72.7	67.9
School district website	64.3	47.7	60.7	59.5
Online recruitment websites targeted to teachers	57.1	39.3	44.7	40.5
General online recruitment websites	10.7	8.4	11.3	7.1
Other uses of the internet for recruitment:	46.4	33.6	45.1	48.8
Searches for candidates on a recruitment website	28.6	13.1	18.9	17.9
Allows candidates to submit applications online	***35.7***	***28.0***	***37.8***	***46.4***

Note: Sample size is 494. Percent of responses indicating use of internet to recruit teachers. "Low" is below 25th percentile (approximately 1,000 students), "medium" is 25th to 75th percentile, and "high" is above the 75th percentile (approximately 3,500 students). Sum of internet strategies is a simple count of the number of strategies (0 to 5). Bold and italics indicate a statistically significant difference among district enrollment size categories or among need/resource capacity categories (10% level) using a chi-square test.

Table 4
Use of Teacher Recruitment Incentives by District Characteristics

District Enrollment	Low	Medium	High	All Districts
Total number of incentives offered	1.4	1.5	1.8	1.6
Percent of responses:				
District offers recruiting incentives	***64.2***	***70.6***	***77.2***	70.6
Traditional recruiting incentives:	***57.2***	***66.9***	***74.8***	66.6
Additional compensation for extra-curricular or administrative functions	45.5	49.2	53.7	49.4
Flexibility in crediting teaching experience in other districts or states	***38.2***	***47.2***	***55.3***	47.0
Non-traditional recruiting incentives:	39.0	39.1	48.0	41.3
Flexibility in crediting job experience in non-teaching occupations	19.5	14.9	18.7	17.0
Subsidized tuition in local college	17.1	14.5	19.5	16.4
Additional compensation for National Board Certification	***8.1***	***13.3***	***27.6***	15.6
Additional compensation for teaching in hard-to-staff fields	8.9	7.3	5.7	7.3
Additional compensation for teaching in hard-to-staff schools	0.0	0.8	0.0	0.4
One-time compensation for new teachers (signing bonus)	0.8	2.8	3.3	2.4
Help with purchase of a home	0.8	0.8	0.8	0.8

SED Need/Resource Capacity Categories	High Need Urban	High Need Rural	Average Need	Low Need
Total number of incentives offered	***2.0***	***1.5***	***1.6***	***1.4***
Percent of responses:				
District offers recruiting incentives	85.7	72.0	68.7	70.2
Traditional recruiting incentives:	82.1	68.2	65.1	64.3
Additional compensation for extra-curricular or administrative functions	64.3	52.3	49.1	41.7
Flexibility in crediting teaching experience in other districts or states	39.3	45.8	48.0	47.6
Non-traditional recruiting incentives:	50.0	43.0	40.7	38.1
Flexibility in crediting job experience in non-teaching occupations	10.7	15.0	17.8	19.0
Subsidized tuition in local college	***21.4***	***14.0***	***19.3***	***8.3***
Additional compensation for National Board Certification	***28.6***	***9.3***	***16.4***	***16.7***
Additional compensation for teaching in hard-to-staff fields	***17.9***	***11.2***	***5.1***	***6.0***
Additional compensation for teaching in hard-to-staff schools	0.0	0.0	0.7	0.0
One-time compensation for new teachers (signing bonus)	***10.7***	***4.7***	***1.5***	***0.0***
Help with purchase of a home	3.6	1.9	0.4	0.0

Note: Sample size is 494. Percent of responses indicating use of incentives to recruit teachers. "Low" is below 25th percentile (approximately 1,000 students), "medium" is 25th to 75th percentile, and "high" is above the 75th percentile (approximately 3,500 students). Sum of recruiting incentives is a simple count of the number of incentives (0 to 9). Bold and italics indicate a statistically significant difference among district enrollment size categories or among need/resource capacity categories (10% level) using a chi-square test.

Table 5
Use of Strategies to Increase Supply of Teachers by District Characteristics

District Enrollment	Low	Medium	High	All Districts
Total number of supply strategies used	1.8	1.8	2.1	1.9
Percent of responses:				
District uses strategy to increase supply	84.6	86.7	89.4	86.8
Recruit teachers certified through alternative routes	40.7	40.7	52.8	43.7
Other supply strategies:	81.3	83.9	85.4	83.6
Recruit substitute teachers	***74.0***	***80.2***	***82.1***	79.1
Recruit retired teachers	30.1	25.0	31.7	27.9
Recruit former teachers who have left teaching	8.9	6.0	8.9	7.5
Provide assistance to paraprofessionals to become certified teachers	***24.4***	***24.2***	***35.8***	27.1

SED Need/Resource Capacity Categories	High Need Urban	High Need Rural	Average Need	Low Need
Total number of supply strategies used	2.0	1.7	1.9	1.7
Percent of responses:				
District uses strategy to increase supply	85.7	86.0	89.5	79.8
Recruit teachers certified through alternative routes	46.4	41.1	46.5	36.9
Other supply strategies:	85.7	79.4	86.9	77.4
Recruit substitute teachers	***82.1***	***71.0***	***83.6***	***73.8***
Recruit retired teachers	28.6	27.1	28.7	26.2
Recruit former teachers who have left teaching	7.1	8.4	7.6	6.0
Provide assistance to paraprofessionals to become certified teachers	39.3	26.2	25.8	28.6

Note: Sample size is 494. Percent of responses indicating use of ;strategy to increase supply. "Low" is below 25th percentile (approximately 1,000 students), "medium" is 25th to 75th percentile, and "high" is above the 75th percentile (approximately 3,500 students). Sum of supply strategies is a simple count of the number of strategies (0 to 5). Bold and italics indicate a statistically significant difference among district enrollment size categories or among need/resource capacity categories (10% level) using a chi-square test.

Table 6
Use of Multiple Recruitment Practices

For Districts Using This Recruiting Practice	Use of Other Practices -- Percent Above (+) or Below (-) Average District														
	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	Average
1) Incentives				7.7	7.1	13.9	4.3	12.7	3.9	10.0	8.7	16.1	0.3	3.3	8.0
2) Traditional				7.5	7.5	11.0	4.7	11.9	4.3	9.6	7.5	16.8	0.7	2.3	7.6
3) Non-traditional				19.0	19.3	23.9	6.1	32.3	6.1	22.8	20.5	25.6	0.2	-2.7	15.7
4) Internet	7.8	7.5	19.1				3.5	15.0	3.8	11.3	12.5	13.1	-0.7	1.9	8.6
5) Post job openings	7.2	7.5	19.4				3.5	16.0	3.7	13.3	14.0	14.4	-0.8	3.1	9.2
6)Other uses	14.5	11.6	24.5				4.4	24.0	2.8	13.8	21.4	14.8	-1.6	10.6	12.8
7) Supply	4.3	4.7	6.1	3.5	3.5	3.9				5.6	6.4	6.6	0.1	5.0	4.5
8) Use alternatively certified teachers	12.8	11.9	32.2	14.9	16.0	23.4				16.0	17.1	18.6	-3.4	19.7	16.3
9) Other supply strategies	3.9	4.4	6.1	3.8	3.7	2.4				5.8	7.1	8.2	0.6	4.0	4.5
10) Non-local Colleges	10.1	9.6	22.8	11.3	13.3	13.2	5.6	16.0	5.8			77.7	1.1	12.4	16.6
11) Advertising at college	8.7	7.5	20.6	12.4	14.0	20.9	6.4	17.1	7.1			51.1	1.6	22.1	15.8
12) Active strategies	16.2	16.8	25.7	13.0	14.4	14.3	6.6	18.6	8.2				1.0	11.9	13.3
13) Local newspapers	0.9	1.2	0.2	-0.9	-1.0	-2.0	0.6	-2.4	1.2	1.4	1.7	1.5		-0.7	0.1
14) Non-local media	3.7	2.6	-2.9	1.6	2.9	10.0	5.4	20.8	4.5	12.6	22.0	12.3	-0.9		7.3

Note: If this percent is greater then 0, then districts are more apt to use this practice than the average district. For example, districts using incentives are 7.7% more likely to use the internet than the average district.

Table 7
Factor Analysis of Average Teacher Qualifications at the District Level
(Teachers hired from 2003 to 2005)

Factors	Factor Loading	Scoring Coefficient
Percent very selective colleges	0.441	0.251
Certification exams: Score as percent of passing score (NYSTCE)	0.758	0.431
Teacher Certification (percent of assignments in):		
Permanent certification	0.604	0.342
Low-level certication	-0.791	-0.450
Cronbach alpha	0.557	

Note: Principal component factor analysis for one unrotated factor.

Table 8
Descriptive Statistics For Variables in Teacher Qualification Model

Variables	Mean	Standard Deviation	Minimum	Maximum	Sample Size
Teacher qualification factor score	0.231	0.767	-5.817	2.616	433
Variables used in teacher qualification model:					
Average payroll for professional and technical services[a]	10.588	0.320	9.918	11.235	481
K6 free lunch share	0.192	0.121	0.000	0.620	483
Minority student share	0.118	0.180	0.000	0.998	484
County crime rate (crimes per 1,000 people)	23.7	7.4	11.3	42.2	484
Unemployment rate	0.053	0.008	0.037	0.071	484
Pupil density (pupils/square mile)[a]	4.159	1.836	-0.916	8.205	484
Per pupil income (2003)[a]	11.652	0.549	10.407	14.712	483
Share of population 5 to 17 years old (2000)	0.190	0.025	0.102	0.265	482
Share of population 65 years or older (2000)	0.142	0.036	0.039	0.350	482
Downstate districts (1=yes)	0.238	0.426	0.000	1.000	484
Rural districts (1=yes)	0.308	0.462	0.000	1.000	484
Upstate suburbs (1=yes)	0.378	0.485	0.000	1.000	484
Variables related to use of recruiting practices (instruments)					
Enrollment[a]	8	1	4	11	484
County population[a]	12.2	1.3	8.6	14.2	484
Per pupil property values[a]	13	1	11	17	484
College degrees granted by colleges in county divided by K12 enrollment in county (2002)	0.082	0.094	0.000	0.661	484

Note: Independent variables are measured as an average from 2002 to 2004 unless noted otherwise.
a. Expressed as a natural logarithm.

Table 9
Relationship between Broad Use of Recruitment Practices and Teacher Qualifications

	Model 1	
Variables	Coefficient	t-statistic
Intercept	-7.989	-3.38
Broad use of recruitment practices[a]	0.670	1.75
Private salaries (Professional and technical services)[b]	0.394	2.14
Working conditions:		
K6 free lunch share	-1.426	-2.39
Minority student share	-0.141	-0.44
County crime rate (crimes per 1,000 people)	-0.003	-0.56
Amenities/Labor market variables:		
Pupil density (pupils/square mile)[b]	0.003	0.07
Unemployment rate	13.505	2.09
Demand variables:		
Per pupil income (2003)[b]	0.242	1.56
Share of population 5 to 17 years old (2000)	1.885	0.81
Share of population 65 years or older (2000)	1.135	0.68
Region:		
Downstate	-0.195	-0.89
Rural	0.007	0.04
Upstate suburbs	0.141	0.89

Note: Estimated with 2SLS with the teacher qualification factor score for teachers hired from 2003 to 2005 as the dependent variable, and recruitment regressors treated as endogenous variables. See text for discussion of instruments. Independent variables are measured as an average from 2002 to 2004 unless noted otherwise. Sample size is 428. Hypothesis tests are based on robust standard errors.

a. Variable set equal to one if the district uses at least one recruitment strategy from all of the following categories (internet, strategies to increase supply, active college strategies, and recruiting incentives).

b. Expressed as a natural logarithm.

Table 10
Relationship between Use of Recruitment Practices and Teacher Qualifications (Alternative Recruitment Measures)

	Percent of Districts	Coefficient	t-statistic
Model 1:			
Broad users of recruitment practices[a]	51.9	0.670	1.75
Model 2:			
Innovators (use non-traditional practices)[b]	8.7	0.909	1.11
Model 3:			
Traditional users (Do not use non-traditional practices)[c]	18.6	-0.643	-1.91
Model 4:			
Heavy users (Use multiple practices of each type)[d]	20.5	0.743	1.39
Model 5:			
Light users (Do not use multiple practices of each type)[e]	8.1	-1.057	-1.83

Note: Estimated with 2SLS with the teacher qualification factor score for teachers hired from 2003 to 2005 as the dependent variable, and recruitment regressors treated as endogenous variables. See text for discussion of instruments. Independent variables are measured as an average from 2002 to 2004 unless noted otherwise. Sample size is 428. Hypothesis tests are based on robust standard errors.

a. See Table 9 for variable definition.

b. Variable set equal to one if the district uses all of the following (internet for recruiting besides posting job notices on school website, recruits alternatively certified teachers, non-traditional recruiting incentives, and active strategies with non-local colleges).

c. Variable set equal to one if the district does not use any of the following (internet for recruiting besides posting job notices on school website, recruits alternatively certified teachers, non-traditional recruiting incentives, and active strategies with non-local colleges).

d. Variable set equal to one if the district uses more than one strategy from the following categories (internet, strategies to increase supply, recruiting incentives) and more than two recruiting strategies with colleges.

e. Variable set equal to one if the district uses no more than one strategy from the following recruiting categories (internet, strategies to increase supply, recruiting incentives) and no more than two recruiting strategies with colleges.

Notes

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[1] The New York State Council of School Superintendents (NYSCOSS) endorsed the survey, put a link to the online survey on their website, and sent a joint cover letter with the survey. We sent four waves of mailings to superintendents over a two-month period, and the survey was available in both hardcopy and online.

[2] Fiscal health is measured using a classification scheme developed by the New York State Education Department (SED) based on the ratio of a poverty measure (share of K6 free lunch students) and a measure of fiscal capacity, called the combined wealth ratio (CWR), which averages statewide indices of property values and income. The fiscal health ratio is used to place districts into categories for high need (high ratio), average need (average ratio), and low need (low ratio). In addition, high need districts are broken down into high need urban districts (large cities, small cities and suburbs), and high need rural districts.

[3] The survey asked, "What share of your advertisements for open teaching positions do you place in each of the following media outlets," with 4 categories of use ("None", "Some", "Most", and "All").

[4] Months are numbered based on a calendar year (1=January, 2=February, etc.) The correlation between the date of advertising (in months) and offering date is 0.44. For districts that gave us a range of months for advertising date and offer date, we used the middle date in the calculations (using fractions of months).

[5] See note 4 for a discussion of the fiscal health categories.

[6] The survey asked, "Where are the colleges at which the district uses each of the following recruitment strategies?" The locations included "Colleges within 50 miles", "Other colleges in New York", "Colleges in other states" and "Not Applicable."

[7] For school districts on the border with other states, we included any college in the other state that was within 50 miles of the district.

[8] The survey asked, "How does the district use the internet to recruit teachers?" One of the response categories was "The district does not use the internet to recruit teachers."

[9] There are 38 BOCES across the state that offer a range of services—from special education to teacher recruitment services—to encourage districts to share resources and realize economies of scale.

[10] Despite the increased attention given to the use of teaching incentives, the existing research on incentives tends to be anecdotal and prescriptive in nature (Hirsch, 2001; Clewell, et al., 2000).

[11] The survey asked, "Which of the following are offered to prospective teachers as recruiting incentives?" One of the response categories was "The districts does not offer recruiting incentives." Several of the response categories included the phrase "additional compensation." We did not clarify on the survey whether additional compensation involved a one-time payment or an increase in the teacher's base salary.

[12] The survey asks, "Which of the following does your district do to increase the supply of teachers?" One of the response categories is "None of the above".

[13] A college was rated as very selective if it was classified by Barrons as highly competitive or most competitive, or identified as more selective in the Carnegie classification for undergraduate programs. Certification categories are

based on the percentage of a teacher's assignments when they had either permanent certification or a low level of certification (temporary certification, no certification, or unknown certification). The measure for New York State Teacher Certification Exams (NYSTCE) is based on percentage of the passing score (300) for the Liberal Arts and Science Test, and either the Assessment of Teaching Skills Elementary (ATS-E) or Secondary (ATS-S).

[14] Specifically, we matched certification data for teachers in the fall of 2005 with information on salary and experience of teachers working in the 2004-05 school year. We kept teachers for the analysis with less than four years of experience in the district. The data set does not include teachers who left the district from 2002 to 2004. The survey first asked superintendents to indicate "how difficult has it been over the last 3 years to recruit certified teachers" for several categories. It then went on to ask about a range of recruitment practices.

[15] Given that the purpose of this factor analysis is to develop one composite measure of teacher qualifications, we decided that the most appropriate method to use was principal components analysis without rotation (Gorsuch 1983). The factor loadings indicate how the variables correlate with the latent factor. The measures of high qualifications (highly selective college, certification exam scores, and permanent certification) all load positively and low-level certification loads negatively. The factor scores are used to construct a linear combination of the variables, where the variables are normalized to have a mean of zero, and a standard deviation of 1.

[16] Enrollment is typically included in an education cost function, so it could be included in the teacher qualification model. Because of the importance that enrollment appears to play in the adoption of recruitment practices, we have included it instead in the cost model measures of urbanicity (pupil density and rural location). Once we control for these factors, enrollment does not appear to have an independent effect in the teacher qualification model.

[17] We also examined a measure of the availability of college graduates from local colleges (measured by the number of college degrees issued by colleges in the county relative to total K12 enrollment in the county) as an instrument. One concern about the college degree variable is that districts, through their recruitment practices, could influence the types of degrees issued in local colleges. We tested for this possibility using an overidentification test (Murray 2005), and found that for some recruitment measures we could reject the null hypothesis that the set of instruments with this variable was uncorrelated with the error term in the teacher qualification model. We dropped this variable as an instrument in all of the models.

[18] Large and small cities that are not in the New York City metropolitan area (upstate) is the omitted district type.

[19] The only measures we could find that are related to the price of capital are county-level average payroll in the construction industry or average salaries in construction occupations for labor market areas. Both measures were strongly related with average payroll in professional and technical services. The share of limited English proficiency students was also dropped because of a high correlation with the share of nonwhite students. Finally, state aid is correlated with both income and the share of free lunch students, so was dropped from the model.

[20] Over 50 observations had to be dropped from the regression analysis because of missing information on teacher qualifications or because there were no teachers with less than four years of experience in the district. The districts dropped from the analysis are similar to included districts in most respects, but they are more likely to be rural districts in upstate New York with lower pupil density and to have significantly higher property values per pupil.

[21] We tested for overidentifying restrictions using a version of the Sargan test (Murray 2005), and found that we could not reject the null hypothesis that the instruments are uncorrelated with the error term in the teacher quality model. Using the procedure outlined in Bound, Jaeger and Baker (1995), we tested for weak instruments and found that the bias of the IV estimate relative to an OLS estimate was well under 3% for the "traditional users" and "light users" measures (Table A.1 in Bound, Jaeger, and Baker 1995). For the other recruitment variables the bias of the IV estimate is between 3% and 9% of the OLS estimate. To check for the possible effects of weak instruments on the accuracy of 2SLS estimates, we reran the teacher quality models using a couple of Fuller's k-class estimators (a=1, a=4), which are considered to be better estimators when instruments are weak (Murray 2005). The results using the Fuller estimators are very similar to those with 2SLS; results are available from the authors upon request.