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Do Teacher Effect Estimates Persist When Teachers Move to Schools with Different Socioeconomic Environments?

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Do Teacher Effect Estimates Persist When Teachers Move to Schools with Different Socioeconomic Environments?

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ABSTRACT

A considerable amount of this attention has been focused on schools with large concentrations of economically disadvantaged and minority students because student in these schools, on average, do not have equal likelihood of being in a sequence of classrooms with the same level of instructional quality as students in other schools. Select states and districts have proposed and implemented financial incentives to recruit and retain highly-effective teachers in these high need schools. A key challenge against programs offering financial incentives to highly effective teachers to either move to, or remain in, a high need school is a lack of quantitative research on whether teachers produce comparable results when they move to a school with a different socioeconomic environment from their previous school. In an effort to provide systematic information on this important question, this paper examines the relationship between measures of teaching effectiveness before and after teachers change schools which service student populations with demographics different from the previous school.

1. Introduction

Teachers are the single most important determinant of a student's schooling experience and academic outcomes. Social science studies have demonstrated not only that highly effective teachers are capable of producing nearly three times the student achievement gains of low-performing teachers, but also that a series of five above-average teachers can overcome the deficit typically reported between economically disadvantaged and higher income students.[2] By virtue of the role that a teacher plays in student learning, policymakers are increasingly searching for new policy mechanisms to enhance the overall quality of the teacher labor force.

A considerable amount of attention related to issues of teacher quality have been focused on schools with large concentrations of economically disadvantaged and minority students. Students in these schools, on average, do not have equal likelihood of being in a sequence of classrooms with the same level of instructional quality as students in other schools. If students are assigned to a sequence of classrooms with a disproportionate number of less effective teachers, then the cumulative effects of this reduction in student learning will likely result in meaningful differences in school attainment and an individual's future earnings.

A recent analysis released by the Tennessee Department of Education documents how the distribution of highly effective teachers in the Tennessee public school system is working to the detriment of students in schools with large concentrations of economically disadvantaged and

[2] Eric A. Hanushek, "The Trade-off between Child Quantity and Quality," *Journal of Political Economy*, vol. 100 (1992), p. 84-108; Steven G. Rivkin, Eric A. Hanushek, and John F. Kain, "Teachers, Schools, and Academic Achievement," *Econometrica*, vol. 73 (2005), pp. 417-458. Other important studies include William L. Sanders and June C. Rivers, "Cumulative and Residual Effects of Teachers on Future Student Academic Achievement: Tennessee Value-Added Assessment System (TVAAS)," University of Tennessee Value-Added Research and Assessment Center Research Paper, (1996), pp. 1-14; S. Paul Wright, Sandra P. Horn, and William L. Sanders, "Teacher and Classroom Context Effects on Student Achievement: Implications for Teacher Evaluation," *Journal of Personnel Evaluation in Education*, vol. 11 (1997), pp. 57-67.

minority students.[3] The report defines teacher effectiveness on the basis of a teacher's contribution to the academic growth of their students using Tennessee Value-Added Assessment System (TVAAS) methodology.[4] Highly-effective teachers are identified as those teachers who produce significant increases in student test scores. Least-effective teachers are identified as those teachers whose students do not progress as much as expected from one academic year to the next.

Figure 1 graphically displays the relationship between teacher effectiveness, years of teaching experience, and a school's socioeconomic environment that is presented in the Tennessee report. Schools with large concentrations of economically disadvantaged and minority students have a near equal share of highly-effective teachers with less than five year of teaching experience. The percentage of highly effective teachers decreases beyond five years of experience in schools with a significant percentage of economically disadvantaged and minority students. It is also apparent the converse is true for the relationship between teacher effectiveness and years of experience within more socioeconomically advantaged schools.

[Insert Figure 1 Here]

Similar inequities in the distribution of teacher quality are being reported with greater frequency both in academic journals and policy reports, and has increased interest among federal and state policymakers in developing practical strategies for incentivizing highly effective teachers to either move to, or remain in, high-needs schools.[5] Financial incentives have been the

[3] Tennessee Department of Education, *Tennessee's Most Effective Teachers: Are They Assigned to the Schools that Need Them the Most?*, Research Brief, March 2007.

[4] For more information on TVAAS, see William Sanders, Arnold M. Saxton, and Sandra P. Horn, "The Tennessee Value-Added Assessment System: A Quantitative Outcomes-Based Approach to Educational Assessment," in *Grading Teachers, Grading Schools: Is Student Achievement a Valid Evaluation Measure?*, edited by Jason Millman (Thousand Oaks, CA: Corwin Press, 1997), pp. 137-162.

[5] Cynthia D. Prince, *Higher Pay in Hard-to-Staff Schools: The Case for Financial Incentives* (Lanham, MD: The Scarecrow Press, 2003); Heather G. Peske and Kati Haycock, *Teaching Inequality: How Poor and Minority Students Are Shortchanged on Teacher Quality* (Washington, DC: Education Trust, 2006); Brian A. Jacob, "The Challenges

most frequently discussed mechanism to enhance the quality of the teacher labor force.[6] Recruitment and retention incentives have come in various forms, including signing bonuses, certification stipends, tuition reimbursement, loan forgiveness, tax credits, and housing subsidies to name a few. The theory driving these programs assumes offering a financial incentive will help to recruit and/or retain more teachers in the upper tail of the ability distribution in high-need subjects or schools while also encouraging less-effective teachers to either improve or exit the system for a non-teaching position.

A key challenge against programs offering financial incentives to highly effective teachers to either move to, or remain in, a high need school is a lack of quantitative research on whether teachers produce comparable results when they move to a school with a different socioeconomic environment from their previous school. If an incentive program is implemented and highly effective teachers are successfully recruited to move to high needs schools, for example, can their previous measured effectiveness be sustained when teaching in a different school environment? Simply put, it has not been previously ascertained whether estimates of teacher effectiveness obtained in one set of schooling environments yield a different set of

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of Staffing Urban Schools with Effective Teachers," *Future of Children*, vol. 17 (Spring 2007), pp. 129-153. Jennifer Imazeki, "Attracting and Retaining Teachers in High-Need Schools: Do Financial Incentives Make Financial Sense?," San Diego State University, November 2007; Anthony T. Milanowski and others, *Recruiting New Teachers to Urban School Districts: What Incentives Will Work* (Seattle, WA: Center on Reinventing Public Education, 2007).

[6] Historical trends in district implementation reflect a willingness among local policymakers to experiment with financial incentives to recruit and retain teachers. Using data from multiple waves of the National Center for Education Statistics' Schools and Staffing Survey (SASS), a large nationally representative sample of teachers, schools and districts, Podgursky and colleagues examined the diffusion of incentive programs over time. One set of analyses found that fewer than 8 percent of United States public school districts (employing 11.3 percent of teachers) provided recruitment incentives in the 1987-88 school year. The prevalence of these incentive programs climbed to 12 percent of districts (employing 25 percent of teachers) in the 2003-04 school year. For more information on longitudinal trends in the size and incidence of incentive programs, see Michael J. Podgursky, Matthew G. Springer, Bonnie Ghosh-Dastidar, and Martin R. West, "The Diffusion of Teacher Performance Pay: Evidence from Multiple Waves of SASS," National Center on Performance Incentives Working Paper, November 2007.

estimates when they move to a different school serving a different set of students from other communities.

In an effort to provide systematic information on this point, this paper examines the relationship between measures of teaching effectiveness before and after teachers change schools which service student populations with demographics different from the previous school. The data used in this study includes teacher effectiveness estimates for more than 5,300 mathematics teachers in fourth through eighth grades from the 2002-03 and 2006-07 school years. Teacher effectiveness is measured using the TVAAS methodology, a statistical approach for estimating the impact an individual teacher has on the academic progress of their students.

A positive, statistically significant estimate on teacher effectiveness was found when teachers moved from high poverty to lower poverty schools. The magnitude of this effectiveness estimate was not sufficiently large, however, to overcome the relationship between a teacher's effectiveness measure before they moved to a lower poverty school and a teacher's effectiveness measure after the move. Another important observation is that the relationship between a teacher's effectiveness measure prior to changing schools was higher in the second year after the move than in the first year of the move. This is likely the result of teachers adjusting to their new surroundings and also adjusting to achievement levels of their students.

These findings should not dissuade policymakers as they consider strategies for incentivizing highly-effective teachers to either move to, or remain in, high need schools. Even though the number of teacher movements observed is much smaller than expected, it is interesting to note that very few teachers identified in the "least effective" category had an estimate of effectiveness greater than the sample average following their move. This suggests if policies are enacted to incentivize teachers, with previously measured high value-added scores,

to move to schools, which are underrepresented with highly effective teachers, the likelihood of selecting a relatively ineffective teacher is very small. This study used only individual teacher's one-year estimates. If a policy is implemented to identify candidates to be recruited and offered incentives to move to schools with greater needs, then two or three-year estimates for each teacher will add even more reliability to the estimates and will further minimize the risk of a faulty decision.

The subsequent paper is broken into four sections. In Section 2, relevant literature on teacher recruitment and retention is reviewed, paying particular attention to labor market dynamics, human resource practices, and preferences of job candidates. In Section 3, the analytic strategy is described thus, setting the stage, for a presentation of results in Section 4. In Section 5, findings are discussed in the context of past research as well as broader implications for policy.

2. Review of Relevant Research on Teacher Recruitment and Retention

Federal policymakers have placed increased emphasis on teacher quality with the passage of the No Child Left Behind Act (NCLB). NCLB requires state departments of education to regularly report the number of teachers not meeting a state's highly qualified teacher definition and to then devise and implement a remedy if highly qualified teachers are disproportionately allocated to certain types of schools. Coupled with the growing body of social science evidence on the important role teachers' play in a student's education, many state and local education agencies face increased pressure to address inequities in the distribution of teacher quality. Although many of these locations are beginning to experiment with practical strategies for incentivizing highly-effective teachers to either move to, or stay in, high needs schools, the

process remains a complicated task due to labor market dynamics, human resource practices, preferences of job candidates, and a lack of scientific evidence to inform best-practices.

The teacher labor market presents a number of challenges for education stakeholders seeking to increase the supply of highly effective teachers and to weaken the association between teacher quality and a school's socioeconomic environment. Recent social science evidence indicates prospective employees who are best suited to raise student achievement are likely to be highly diverse on easily observable characteristics, including years of teaching experience, type of teaching certificate held, highest degree earned, or licensing exam performance.[7] Even though many states and districts currently support the development of alternative routes to enter the teaching work force, the prevalence of legal requirements for state certification restricts the pool of applicants for classroom assignments.[8] Furthermore, the effectiveness of these programs to increase the supply of effective teachers is unknown.

A second challenge is the relatively low concentration of highly effective teachers in certain subject areas. A large percentage of public school districts indicate it is difficult to fill teaching positions in mathematics, science, and special education. These difficulties are exacerbated when taking into consideration the socioeconomic demographics of a school and/or

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[7] Dale Ballou and Michael Podgursky, *Teacher Pay and Teacher Quality* (Kalamazoo, MI: W.E. Upjohn Institute, 1997); Dan Goldhaber, "Why Do We License Teachers?," in *A Qualified Teacher in Every Classroom? Appraising Old Answers and New Ideas*, edited by Frederick M. Hess, Andrew J. Rotherham, and Kate Walsh (Cambridge, MA: Harvard Education Press, 2004), pp. 81-100; Thomas J. Kane, Jonah Rockoff, and Douglas O. Staiger, "Photo Finish: Certification Does Not Guarantee a Winner," *Education Next*, vol. 7 (2007), pp. 60-67; Rivkin, Hanushek, and Kain 2005; Daniel Aaronson, Lisa Barrow, and William Sanders, "Teachers and Student Achievement in the Chicago Public High Schools," Federal Reserve Bank of Chicago Working Paper, 2003; Dan Goldhaber and Dominic J. Brewer, "Why Don't Schools and Teachers Seem to Matter? Assessing the Impact of Unobservables on Educational Productivity," *Journal of Human Resources*, vol. 32 (1997), pp. 505-523.

[8] See Ballou and Podgursky; Michael Podgursky, "Improving Academic Performance In U.S. Public Schools: Why Teacher Licensing is (Almost) Irrelevant," in *A Qualified Teacher in Every Classroom? Appraising Old Answers and New Ideas*, edited by Frederick M. Hess, Andrew J. Rotherham, and Kate Walsh (Cambridge, MA: Harvard Education Press, 2004), pp. 255-278.

school district.[9] Irrespective of recent growth in demand for highly qualified college graduates with degrees in mathematics, science, or special education, the wide variation in human capital investment by field, in concert with the wage compression endemic to rigidities arising from the single salary schedule, appear to attract college graduates who were most likely to occupy those types of teaching positions in the last century.[10]

Some districts ability to hire the best possible job candidate is hampered due to ineffective human resource practices. A recent qualitative study examined recruitment and hiring practices in four large districts, focusing on the capacity of urban systems to attract highly effective teachers.[11] The study found the urban districts received a rather large number of strong applicants in contradiction to conventional wisdom. These districts struggled to hire many of the best applicants, however, due to bureaucratic obstacles that created a large enough time lag so neighboring suburban areas depleted the applicant pool. These findings align with earlier work in which it was concluded that public schools do not necessarily hire the best applicants for the job, thus policies intended to improve teacher quality need to consider incentives on both the demand and supply sides of the market.[12]

A final challenge for maintaining a highly talented supply of teachers in high needs schools is the compensation structure for professional educators around the country.[13] The conventional practice of paying all classroom teachers on the basis of educational background

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[9] Michael J. Podgursky, Matthew G. Springer, Bonnie Ghosh-Dastidar, and Martin R. West, "The Diffusion of Teacher Performance Pay: Evidence from Multiple Waves of SASS," National Center on Performance Incentives Working Paper, November 2007.

[10] Caroline M. Hoxby and Andrew Leigh, "Pulled Away or Pushed Out? Explaining the Decline of Teacher Aptitude in the United States," *American Economic Review*, 92(2), 236-240.

[11] Jessica Levin and Meredith Quinn, *Missed Opportunities: How We Keep High-Quality Teachers Out of Urban Classrooms* (New York, NY: The New Teacher Project, 2003).

[12] Dale Ballou, "Do Public Schools Hire the Best Applicants?" *Quarterly Journal of Economics*, vol. 111 (February 1996), pp. 97-133.

[13] Donald Boyd and others, "The Preparation and Recruitment of Teachers: A Labor-Market Framework," in *A Qualified Teacher in Every Classroom? Appraising Old Answers and New Ideas*, edited by Frederick M. Hess, Andrew J. Rotherham, and Kate Walsh (Cambridge, MA: Harvard Education Press, 2004), pp. 149-171.

and years of experience has serious consequences for the labor market. A set of policy evaluations of a monetary bonus program for math, science, and special education teachers in North Carolina found high levels of support for financial incentives to stay in high poverty and low-performing schools, but skepticism about the optimal size of the bonus amount.[14] The second study, using a more refined estimation strategy, deduced that a one percent increase in salary at a traditionally low-performing school led to a three to four percent reduction in teacher turnover.[15] The authors note, however, poor program design and implementation inhibited the effect of the monetary bonus.

There is a general lack of consensus on the relative merits of different approaches for motivating teachers to accept job assignments in schools with economically disadvantaged students or poor standardized test results.[16] It is clear that teachers appear to be highly sensitive to the demographic composition of the student population as well as the academic achievement level of the school.[17] Additionally, a large proportion of newly hired teachers with strong academic records are drawn from outside urban areas and teachers who live farther from home are more likely to quit or transfer to a different job.[18]

What is a sound policy option for raising teacher quality in schools with high poverty and high minority populations? The policy implications of the social science literature on teacher

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[14] The state of North Carolina provided a salary bonus of $1,800 to math, science, and special education teachers for each year those personnel remained in a group of low-performing and/or high poverty schools. See Charles T. Clotfelter and others, "Teacher Bonuses and Teacher Retention in Low-Performing Schools: Evidence from the North Carolina $1,800 Teacher Bonus Program," *Public Finance Review*, vol. 36 (January 2008), pp. 63-87.

[15] Charles Clotfelter and others, "Would Higher Salaries Keep Teachers in High-Poverty Schools? Evidence from a Policy Intervention in North Carolina," *Journal of Public Economics*, forthcoming.

[16] Edward Liu, Susan Moore Johnson, and Heather G. Peske, "New Teachers and the Massachusetts Signing Bonus: The Limits of Inducements," *Educational Evaluation and Policy Analysis*, vol. 26 (Fall 2004), pp. 217-236; Imazeki 2007.

[17] Eric A. Hanushek, John F. Kain, and Steven G. Rivkin, "Why Public Schools Lose Teachers," *Journal of Human Resources*, vol. 39 (Spring 2004), pp. 326-354.

[18] Donald Boyd and others, "Explaining the Short Careers of High-Achieving Teachers in Schools with Low-Performing Students," *Proceedings of the American Economic Association*, vol. 95 (May 2005), pp. 166-171; Donald Boyd and others, "The Draw of Home: How Teachers' Preferences for Proximity Disadvantage Urban Schools," *Journal of Policy Analysis and Management*, vol. 24 (2005), pp. 1134-1132.

recruitment and retention are not sufficiently precise to guide practitioners in local school districts around the country. While there is some evidence suggesting financial incentives may help to recruit or retain teachers in high needs school much remains to be known. To further inform policy discussion, this study evaluates whether estimates of teacher effectiveness persist when a teacher moves to school with a different socioeconomic environment.

3. Methodology

To test various hypotheses about teacher effectiveness and mobility a two-way repeated measures analysis of variance with one between-subjects factor and one within-subjects factor was deployed. The response variable in the analysis was a TVAAS teacher effect t-value in mathematics, grades four through eight, from the 2002-03 through 2006-07 school years.[19] The teacher effect t-values were obtained from TVAAS teacher analyses. This statistical process uses multivariate, longitudinal models to assess the contributions of individual teachers to the academic growth of students. This approach uses all available student data, over multiple grades and years in multiple subjects, while allowing the use of students with incomplete data. In this model, the random teacher "effect" estimates the contribution of the teacher to the student's academic growth in a given subject-grade-year expressed as a deviation from the average growth for the school district as a whole.[20]

The between-subjects factor is teacher mobility groups. Teacher mobility is delineated into four groups: teachers who do not change schools (stayers); teachers who change schools and

[19] We converted teacher effect estimates to t-values (i.e., estimated teacher effect divided by its standard error) since the scale for measuring teacher effectiveness changed during this time period from using scale score units to using Normal Curve Equivalent units. We do not include observations prior to 2002-03 school year because school level demographic data on percentage of free and reduced-price lunch status students is unavailable.

[20] William Sanders, Arnold M. Saxton, and Sandra P. Horn, "The Tennessee Value-Added Assessment System: A Quantitative Outcomes-Based Approach to Educational Assessment," in *Grading Teachers, Grading Schools: Is Student Achievement a Valid Evaluation Measure?*, edited by Jason Millman (Thousand Oaks, CA: Corwin Press, 1997), pp. 137-162.

the new school has similar percentage of free and reduced price lunch students (move to same); teachers who change schools and the new school has a greater percentage of free and reduced price lunch students (move to poorer); and teachers who change schools and the new school has a smaller percentage of free and reduced price lunch students (move to richer). A move to a "richer" or "poorer" school is said to take place if the difference in the percentage of free and reduced price lunch students between the two schools is greater than 15 percentage points. A move to a "same" school took place if the difference in the percentage of free and reduced price lunch students between the two schools was no greater or less than 15 percentage points.

The within subject factor in the analysis of variance was "relative year". In all cases, a move to a new school took place between the first and second years of a 3-year time span. The first year of the 3-year span is referred to as the pre-move year (identified as RelYear = -1 in the analyses). The second year was the year of the move and represent a teacher's first year in the new school (identified as RelYear = 0 in the analyses). The third year is referred to as the post-move year and represent the second year in the new school (identified as RelYear = +1 in the analyses). A cell-means model parameterization was used to facilitate construction of various contrasts of interest.

To eliminate the potentially confounding influence of district effects on estimates of teacher effective, all comparisons are made on a within-district basis and all teacher moves were restricted to within-district movements. The analyses were restricted to those teachers who had single year estimates for three consecutive years, and who had an estimate in the same grade after moving to a new school.

4. Results

Table 1 displays the number of teacher-grade units in this study. Only those teachers who had three consecutive teacher estimates in the same grade were included. Clearly, the percentage of teachers, who had three consecutive teacher estimates within the same grade and subject, and who changed schools over these time spans was very small. A mere 4.04 percent over the whole state and 6.48 percent for the four largest urban districts met these criteria.

[Table 1]

It is also interesting to note the percentage of teachers within each moving class by the four largest districts in Tennessee: Hamilton County Schools (Chattanooga), Knox County Schools (Knoxville), Memphis City Schools, and Metropolitan Nashville School System. These four urban districts account for the majority of moves in our entire sample classified as moving to poorer (11 of 19, 57.9%) and moving to richer (38 of 62, 61.3%). Teacher mobility in these urban districts accounted for a disproportionately smaller share of teachers who moved to a school with similar percentage of free and reduced price lunch students (40 of 135, 29.6%) and stayers (1,285 of 5,131, 25.0%).

Table 2 reports simple descriptive statistics of the years of experience and percentage of free and reduced price lunch (FRPL) students of the moving teachers. Note that the median years of experience of the moving teachers ranged from 12 to 13.5 years and were not dramatically different across the three types of moves. Table 3 further indicates that teachers who moved schools were not clustered at any one part of the teacher years of experience distribution but rather represented the entire range of the distribution.

[Insert Tables 2-3 Here]

[Tables 4-5]

Of all categories of moving teachers only those teachers who moved from a Poorer school to a Richer school had a significantly higher mean change in their estimates. However, the question remains as to what percentage of teachers who changed buildings actually had a major shift in their respective teacher effects distributions. Consider the following tables.

[Table 6]

As can be seen, only a very small percentage of teachers who had estimates less than -1 had an estimate greater than +1 after the move. The converse was also true. This suggests that if policies are enacted to incentivize teachers to move to schools, which are under represented with highly effective teachers, that by using one year teacher estimates with t-estimates of +1 or greater the likelihood of selecting a relative ineffective teacher is very small. When two or more years of teacher effect estimates are available, then the likelihood of selecting an ineffective teacher is even less due to the fact that the repeatability of the two year estimate goes from approximately 0.5 for a one year estimate to approximately 0.6 for a two year estimate and to about 0.7 for a three year estimate.

Another question which is often debated is: "how much are differences in measures of student progress among classrooms a function of the unique environments among schools, and how much is attributable to the individual teacher?" In an attempt to provide an insight to this question, the effectiveness estimates for teachers who changed buildings were used in another set of analyses.

Analyses of covariance were completed, with 't-estimate before the Move' as the predictor variable and 'FRPL-class' as the classification variable. Two different response variables were used: 't-estimate 1st year after Move' and 't-estimate 2nd year after Move'. Additionally, the set of analyses were completed using all of the teachers for the state, and then

separate analyses using only the data from the four largest urban districts. These results are presented in Table 7.

[Table 7]

Notice that the relationship between the t-estimate is higher with the second year after the move than with the estimate for the first year after the move. There are significant effects of 'FRPL-class' not accounted for by adjustment for estimates prior to the move. However, the relative magnitude of the relationship indicates that most of the variation explained was attributed to a teacher's effectiveness scores prior to the move. This suggests that the differences among classrooms are primarily attributable to the individual teacher.

5. Discussion

The estimates of teaching effectiveness were deliberately restricted to only those teachers who had estimates for three consecutive years and who taught Math in the same grade after moving between schools. Thus, the estimates of the percentage of teachers who actually moved are considerably lower than if the teachers who moved, but who changed grades had been included. However, even allowing for this, the percentage of teachers who moved within districts was lower than was expected. Similarly, when considering only the percentage of teachers who moved within the four largest urban districts, the percentage of observations movers meeting our restrictions was smaller than expected.

A significant positive effect in teacher effectiveness estimates were found when teachers moved from high poverty to lower poverty schools. However, the magnitude of this effect was not sufficient to overpower the relationship between the measure of teaching effectiveness before the move to a lower poverty school and the subsequent effect after the move. Another important

observation is that the relationship between the teacher effectiveness measures prior to the move was higher with the second year after the move than with the first year of the move. Perhaps this is the result of teachers adjusting to their new surroundings and also adjusting to the achievement levels of their students.

These are positive findings which should not dissuade policy makers as they attempt to develop strategies for incentivizing highly effective teachers to either move to, or remain in, schools with the greatest student academic needs. It is also important to note this study used only individual teacher's one-year estimates. If a policy is implemented to identify candidates to be recruited and offered incentives to move to schools with greater needs, then two or three-year estimates for each teacher will add even more reliability to the estimates and will further minimize the risk of a faulty hiring or retention decisions.

Where available, appropriately determined value-added teacher effectiveness measures should be included as a major component in determining which teachers are to be offered incentives to move to high needs schools. Teachers selected from a policy, which heavily weights prior value-added estimates, will more likely to be effective in facilitating academic growth for students, after moving to a new school, than teachers who are selected based upon traditional credentials.

Figure 1: Distribution of the "Most Effective" Teachers by Experience

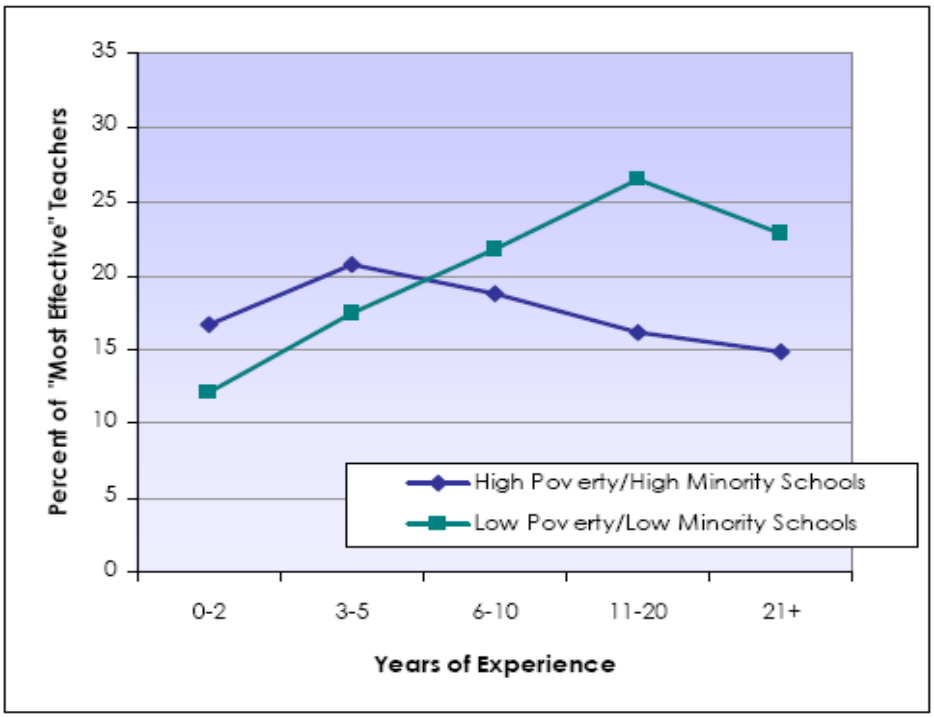

Table 1. Distribution of Moving Teachers by Moving Class

	Whole State		Four Largest Districts	
Moving Class	**N**	**%**	**N**	**%**
Move to Poorer	19	0.36	11	0.80
Move to Same	135	2.52	40	2.91
Move to Richer	62	1.16	38	2.77
Stay	5,131	95.96	1,285	93.52

Table 2. Descriptive statistics for Years of Experience of moving teachers and Percent Free Reduced Price Lunch (FRPL) for schools in which the teachers taught.

Moving Class	Relative Year	Variable	N	Mean	Std Dev	min	Lower Quartile	Median	Upper Quartile	max
Move to Poorer		YrExp	19	13.0	7.9	4.0	5.0	12.0	22.0	28.0
Move to Same		YrExp	135	14.2	9.0	2.0	7.0	12.0	21.0	38.0
Move to Richer		YrExp	62	15.1	8.2	2.0	8.0	13.5	22.0	34.0
Stay		YrExp	5131	16.3	10.2	1.0	7.0	14.0	25.0	53.0
Move to Poorer	-1	% FRPL	19	36.3	21.8	0.0	25.0	32.7	59.8	73.1
	0	% FRPL		67.1	21.7	27.5	48.9	70.9	92.0	96.7
	1	% FRPL		61.8	24.2	7.8	43.4	64.2	78.7	97.2
Move to Same	-1	% FRPL	135	55.1	24.8	2.0	36.5	52.7	74.4	97.9
	0	% FRPL		53.6	24.8	0.1	38.1	51.8	70.9	99.8
	1	% FRPL		54.7	25.2	2.3	38.0	52.2	72.7	99.6
Move to Richer	-1	% FRPL	62	61.8	23.2	30.4	35.6	64.7	83.8	96.4
	0	% FRPL		29.6	21.0	4.7	9.0	27.9	46.5	79.9
	1	% FRPL		35.4	17.5	7.1	24.9	31.2	43.7	82.2
Stay	-1	% FRPL	5131	48.9	22.3	0.0	34.5	48.8	62.0	100.0
	0	% FRPL		49.0	23.1	0.0	33.7	48.7	62.5	100.0
	1	% FRPL		50.2	23.1	0.0	35.1	50.3	64.2	100.0

Table 3. Simple statistics for Teacher t-effect before and after the Move.

Moving Class	Relative Year	Variable	N	Mean	Std Dev	min	Lower Quartile	Median	Upper Quartile	max
Move to Poorer	-1	t-effect	19	-0.28	1.51	-3.57	-1.47	-0.13	0.82	2.49
	0	t-effect		-0.29	1.37	-3.58	-1.25	-0.22	0.81	1.93
	1	t-effect		-0.47	1.58	-2.49	-1.83	-0.53	0.22	2.97
Move to Same	-1	t-effect	135	0.17	1.46	-5.19	-0.64	0.03	1.08	5.26
	0	t-effect		0.06	1.58	-5.39	-0.73	0.08	0.89	6.08
	1	t-effect		0.23	1.53	-3.22	-0.79	0.14	1.18	6.15
Move to Richer	-1	t-effect	62	0.05	1.58	-3.05	-0.81	0.03	0.58	6.75
	0	t-effect		0.84	1.84	-4.57	-0.38	0.67	1.80	6.19
	1	t-effect		0.8	2.25	-3.63	-0.45	0.53	1.61	7.21
Stay	-1	t-effect	5131	0.2	1.54	-10.57	-0.74	0.08	1.05	19.81
	0	t-effect		0.2	1.59	-5.67	-0.75	0.07	1.07	14.29
	1	t-effect		0.15	1.61	-7.21	-0.82	0.04	1.00	18.25

Table 4. Fixed effects estimates from analysis.

FRPL Class	Relative Year	Estimate	Standard Error	DF	t Value	Pr > |t|
Move Poorer	-1	-0.2754	0.3534	5347	-0.78	0.4358
Move Poorer	0	-0.2865	0.3659	5347	-0.78	0.4337
Move Poorer	1	-0.4707	0.3712	5347	-1.27	0.2048
Move Same	-1	0.1733	0.1326	5347	1.31	0.1913
Move Same	0	0.05801	0.1373	5347	0.42	0.6726
Move Same	1	0.2255	0.1392	5347	1.62	0.1055
Move Richer	-1	0.04863	0.1956	5347	0.25	0.8037
Move Richer	0	0.8407	0.2026	5347	4.15	<.0001
Move Richer	1	0.8006	0.2055	5347	3.9	<.0001
Stay	-1	0.2003	0.0215	5347	9.31	<.0001
Stay	0	0.197	0.02227	5347	8.85	<.0001
Stay	1	0.1453	0.02259	5347	6.43	<.0001

Table 5. Specific Comparisons Among Moving Categories

Specific Comparisons				
Contrast	**Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Poorer: Post-Pre	-0.1953	0.3948	-0.49	0.6209
Poorer: Mid-Pre	-0.01105	0.3649	-0.03	0.9758
Poorer: Post-Mid	-0.1842	0.3588	-0.51	0.6077
Same: Post-Pre	0.0522	0.1481	0.35	0.7245
Same: Mid-Pre	-0.1152	0.1369	-0.84	0.3999
Same: Post-Mid	0.1674	0.1346	1.24	0.2136
Richer: Post-Pre	0.7519	0.2185	3.44	0.0006
Richer: Mid-Pre	0.7921	0.202	3.92	<.0001
Richer: Post-Mid	-0.04017	0.1986	-0.2	0.8398
Stay: Post-Pre	-0.05499	0.02402	-2.29	0.0221
Stay: Mid-Pre	-0.00323	0.0222	-0.15	0.8844
Stay: Post-Mid	-0.05177	0.02184	-2.37	0.0178

Table 6. Percentage of teachers by 'Year before Move' and 'Year after Move' t-statistic categories.

Move to a Poorer School	**Teacher t-estimate category in Year before Move**			
Teacher t-estimate category in Year after Move	**< -1**	**-1 to +1**	**> +1**	**Total**
< -1	4 57.14	3 42.86	0 0	7
-1 to +1	2 20	6 60	2 20	10
> +1	0 0	1 50	1 50	2
Total	6	10	3	19

Moved to a Same FRPL School	**Teacher t-estimate category in Year before Move**			
Teacher t-estimate category in Year after Move	**< -1**	**-1 to +1**	**> +1**	**Total**
< -1	10 33.33	13 43.33	7 23.33	30
-1 to +1	9 13.64	44 66.67	13 19.7	66
> +1	4 10.26	19 48.72	16 41.03	39
Total	23	76	36	135

Table 6 (continued).

Moved to a Richer School	**Teacher t-estimate category in Year before Move**			
Teacher t-estimate category in Year after Move	**< -1**	**-1 to +1**	**> +1**	**Total**
< -1	7 50	7 50	0 0	14
-1 to +1	4 16	18 72	3 12	25
> +1	3 13.04	13 56.52	7 30.43	23
Total	14	38	10	62

Stayed in the Same School	**Teacher t-estimate category in Year before Move**			
Teacher t-estimate category in Year after Move	**< -1**	**-1 to +1**	**> +1**	**Total**
< -1	395 36.64	553 51.3	130 12.06	1078
-1 to +1	463 16.65	1727 62.12	590 21.22	2780
> +1	119 9.35	557 43.75	597 46.9	1273
Total	977	2837	1317	5131

Table 7. This is a set of analyses using only teacher estimates of teachers who moved.

Model	Response Variable	Predictor Variables	DF	SS	MS	F Value	Pr > F	R-Square
Whole State	***t-estimate 1st year after Move***	't-estimate before the Move'	1	44.45	44.45	17.74	<.0001	12.6
		FRPL-class	2	32.38	16.19	6.46	0.0019	
		Residual	212	607.89	2.87			
	t-estimate 2nd year after Move	't-estimate before the Move'	1	86.11	86.11	31.25	<.0001	16.0
		FRPL-class	2	25.34	12.67	4.60	0.01	
		Residual	212	584.17	2.76			
4 Urban Districts	***t-estimate 1st year after Move***	't-estimate before the Move'	1	18.52	18.52	6.25	0.01	11.9
		FRPL-class	2	15.47	7.73	2.61	0.08	
		Residual	85	252.03	2.97			
	t-estimate 2nd year after Move	't-estimate before the Move'	1	62.88	62.88	17.17	<.0001	20.5
		FRPL-class	2	17.61	8.81	2.40	0.0964	
		Residual	85	311.29	3.66			

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