

**Performance Screens for School Improvement:
The Case of Teacher Tenure Reform in New York City**

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The effects of public school teacher tenure remain hotly debated, but little understood. Research provides little evidence on the effects of tenure policy choices on teaching quality and, thus, little guidance on how to structure tenure policies. In this paper we examine the effects of a substantial tenure reform in New York City initiated in 2009-10. Below we summarize the key findings from this research, followed by a more detailed discussion of the New York City tenure reforms, our approach to the research, and the findings.

Highlights

- Tenure reforms in NYC led to a substantial drop in the percent of eligible teachers approved for tenure – from 94 percent during academic years 2007-08 and 2008-09, the two years prior to the introduction of the policy, to 89 percent in the first year of the policy (2009-10) and to an average of 56 percent during the three subsequent years.
- The vast majority of eligible teachers who were not approved for tenure had their probationary period extended. The proportion of teachers denied tenure changed only slightly, from two to three percent, following reform.
- Being extended meaningfully increased the likelihood a teacher would transfer across schools or exit teaching in New York City. The probability of transferring was nine percentage points higher and the probability of exiting was four percentage points higher for teachers who were extended compared with teachers in the same school receiving the same principal ratings who were approved for tenure. These differences represent a 50 percent and a 66 percent increase in the probability of transferring and exiting, respectively.
- Extended teachers who transferred or exited were less effective, as measured by principal ratings and value-added, than those likely to replace them. There were 45 percentage points fewer teachers rated as highly effective or effective among all extended leavers than their proxy replacements. In addition, estimated value-added in ELA among extended leavers was 20 percent of a standard deviation lower than among the proxy replacements.
- Schools vary in the proportion of teachers approved, extended and denied tenure. In particular, schools with higher percentages of black students and lower percentages of white students have been more likely to extend and deny teachers for tenure than those with relatively fewer black and more white students. These differences are largely explained by differences in teachers' effectiveness ratings as assigned by principals based on the district-developed Effectiveness Framework. Because extended teachers are more likely to exit, schools with larger enrollments of black students may disproportionately benefit from the reform given that relatively more effective teachers replace extended teachers who voluntarily exit.

Introduction

This paper describes teacher tenure reforms first enacted by the New York City Department of Education (NYCDOE) during the 2009-10 academic year (AY) and the changes in the district's teacher workforce following the reforms. We show that the reforms dramatically changed the proportion of eligible teachers receiving tenure, as well as the career paths of early career teachers, more generally.

Teacher tenure has been controversial since the first tenure provisions were enacted over a century ago. Proponents typically argue that tenure prevents teacher dismissal for political purposes or due to capricious decisions by administrators or politicians. Tenure could guard against dismissal of more experienced, higher paid teachers during periods of tight budgets when school leaders may be more focused on reducing costs while meeting class size requirements than they are on student learning. Tenure does not require schools or districts to retain ineffective teachers but instead provides a due process mechanism to dismiss tenured teachers for cause. Critics, however, argue that the cost of due process does, in practice, lead districts to retain ineffective teachers and as a result tenure not only allows poor teachers to stay in the classroom but also reduces the incentive for teachers to be as effective as they could be. They argue that the due process mechanisms for removing teachers with tenure are so burdensome that they rarely are pursued.

With the availability of large-scale student performance measures linked over time has come clear evidence that teachers vary substantially in their effectiveness at improving student test performance and that these differences can have meaningful effects on students in both the short run and the long run (Chetty, Friedman, & Rockoff, 2012; Rivkin, Hanushek and Kain, 2005; Rockoff, 2004). At least partially as a result, education reforms in the US recently are focusing on improving the quality of teaching through human resource policies such as improved evaluation systems and differentiated pay. Given the controversial nature of teacher tenure, it is not surprising that interest also has increased in changing teacher tenure provisions so that the due process is less onerous and so that school leaders have greater control over their workforce. Yet, the evidence on which to base reform decisions is scarce. We know little about what types of tenure provisions improve the quality of teaching and what types do not. Similarly, we know little about how long the probationary period prior to tenure should be, if there is tenure, in order for school systems to accurately assess teachers' effectiveness so that they can make well informed decisions about tenure.

Part of the reason that we have little evidence on the effects of tenure is that until recently tenure laws have been relatively stable over time and similar, though not the same, across states. New Jersey passed the nation's first teacher tenure law in 1909. Over the next several decades other states adopted similar laws: New York in 1917, California in 1921, and Michigan, Pennsylvania, and Wisconsin in 1937. The state statutes used a variety of synonyms for tenure: continuing contract or service, permanent status, career status, and post-probationary status. Regardless of the terminology, these laws have three main components: tenure requirements, reasons for dismissal, and process for appeals. The first specifies the length of the probationary period after which teachers are eligible for tenure. Employers can dismiss a non-tenured teacher at any time for any reason so long as the decision is neither arbitrary or capricious nor discriminatory, but tenured teachers can only be dismissed for the reasons provided in the law. The third component details the appeals process a dismissed tenure teacher can pursue in an effort to be reinstated. Of the 48 states in which public elementary and secondary teachers are awarded tenure, the minimum probationary period exceeds three years in 11 states (National Council on Teacher Quality, 2012). In most states it is three years, although in a few states, such as California, teachers typically receive tenure with fewer than three years of experience.

The last decade or so have seen substantial change in tenure laws in the US. In 2000, Georgia eliminated due process rights for teachers hired after 1 July 2000, but reinstated these rights three years later. Florida eliminated teacher tenure in 2011. That same year Idaho enacted a law that would have eliminated teacher tenure had it not been repealed by voters the following year. Voters in South Dakota turned back an effort to repeal a 2012 law thereby allowing a law eliminating tenure after 1 July 2016 to take effect. Most recently, North Carolina's governor signed a bill into law that

eliminates teacher tenure by 2018. Though almost all states currently grant tenure, more than half now require meaningful evaluation during the tenure process. As an example, in 2009 only four states used student test performance as a criterion for tenure; by 2012, 20 states did and 25 states require multiple categories for teachers in their evaluation, not just satisfactory and unsatisfactory (National Council on Teacher Quality, 2012). Most recently, the conflicting perspectives on tenure has played out in *Vergara v. California*, the law suit challenging teacher tenure in California.

A recent reform by the NYCDOE provides an unusual opportunity to learn about the role of tenure in teachers' career outcomes including both strategic retention on the district side and choice-based retention stemming from teachers' decisions. In what follows, we start by describing the reform. We then use data from NYCDOE and the New York State Education Department (NYSED) to provide initial evidence on the magnitude of responses to the reform, concluding with a discussion of the results.

The Teacher Tenure Process in New York City

The criterion for tenure in New York City is that a teacher possesses "significant professional skill and a meaningful, positive impact on student learning." This criterion is not new. However, prior to AY 2009-10 the tenure process in New York City was similar to that in many other large urban districts. The receipt of tenure had become an expectation for nearly all teachers and frequently was based on little evidence of accomplishment. In 2007-08 and 2008-09, well into the period of accountability reforms, 94 percent of all eligible teachers were approved for tenure.

Beginning in 2009-10, New York City changed the tenure review process, infusing more information and increasing the responsibility and accountability of principals to insure that teachers met challenging performance standards. Tenure decisions in 2009-10 were informed by sources of information that had been available previously: classroom observations, evaluations of teacher work products including lesson plans, and the annual rating sheet that principals completed giving teachers a Satisfactory, Doubtful, or Unsatisfactory rating. In addition, tenure decisions in 2009-10 included new student learning measures from the Teacher Data Reports (which included teacher value-added), in-class assessments aligned with the New York State standards, and other evidence of student progress (NYCDOE, 2009).

As in previous years, principals sent recommendations to the superintendent about whether a teacher should be denied tenure, have their probationary period extended or be granted tenure, but starting in 2009-10 principals had to provide a rationale for this decision if the evidence available at the district level suggested either a strong case to approve or deny tenure and this information ran counter to the principal's recommendation. The district provided principals with tenure guidance for teachers for whom there was evidence that performance was particularly strong or weak. For a teacher whose value-added results had been in the lowest 50 percent over the past two years (with a 95 percent confidence interval), who had previously received an Unsatisfactory annual rating, or whose tenure decision had previously been extended, the principal received guidance from the district that the teacher should be considered to have "tenure in doubt". A principal recommendation to extend or approve tenure for these teachers required a supporting rationale for the superintendent to consider in his or her review. The principal received guidance of "tenure likely" for a teacher whose value-added results had been in the highest 50 percent over the past two years (with a 95 percent confidence interval). Principals recommending denying tenure or extending the probationary period for these teachers similarly needed to provide supporting evidence to the superintendent (NYCDOE, 2009).

The process introduced in 2009-10 remained in place in 2010-11 with some notable changes (NYCDOE, 2010). New in 2010-11, principals were asked to evaluate all teachers up for a tenure decision based a four-point effectiveness rating scale (Highly Effective, Effective, Developing and Ineffective) as described in the district-developed Effectiveness Framework.¹ As in the prior year, the evidence for these ratings came from measures of the teacher's impact on student learning such as value-added measures from the Teacher Data Reports, student work products and tests aligned to the New York State standards. Principals also could use evidence from measures of instructional practice coming from their own classroom observations, teacher work products, and the annual rating sheet that principals complete for each teacher.² In addition to these sources of information, which were available in the prior year as well, principals in 2010-11 gained information about professional contributions from surveys of students and parents, from measures of attendance, from colleague feedback, and from work products related to the Comprehensive Educational Plan for each school. In contrast to 2009-10, principals in 2010-11 no longer received "tenure likely" or "tenure in doubt" guidance from the district but rather were given flags indicating a "low value add" teacher as an "Area of Concern" and a "high value add" teacher as a "Notable Performance". Low and high value-added scores were defined as in the previous year. Other problematic teacher behaviors flagged as Areas of Concern included: low attendance (defined as exceeding 20 days in the previous two fiscal years), an Unsatisfactory or Doubtful rating on a prior Annual Review Sheet, having been previously extended, having been previously excessed or currently in the Absent Teacher Reserve pool.

The tenure review process for 2011-12 was very similar to that in 2010-11, but with two important changes. As before, teachers were evaluated on impact on student learning, instructional practice and professional contributions. Principals were provided guidance as to the expected (though not required) alignment between the effectiveness ratings they determined using the Effectiveness Framework and their tenure recommendations: Highly Effective and Effective ratings were evidence in favor of granting tenure; a Developing rating, evidence for an extension; and an Ineffective rating, evidence for denying tenure. Additionally, responsibility for producing teacher value-added estimates shifted from the district to the New York State Education Department beginning with 2010-11 and no measures were available for principals to incorporate them into their 2011-12 tenure decisions (NYCDOE, 2011).

The state-provided value-added estimates did inform principals' 2012-13 recommendations. Teachers received a growth score (0-20) that corresponded to a HEDI rating (Highly Effective, Effective, Developing, and Ineffective). No explicit guidance was provided to principals as to how to incorporate these growth ratings into their tenure recommendations. They were only told these ratings are a source of evidence for a teacher's impact on student learning.

Research Questions

Conceptually, the changes in the tenure process could well affect tenure outcomes. As new information on teacher performance becomes available to principals and pressures to be selective in granting tenure increase, the proportion of teachers receiving tenure could decrease. These changes

¹ These effectiveness ratings are distinct from the ratings built into the new statewide teacher evaluation system which was not implemented until 3 years later in 2013-14. Although they use the same ratings scale, both the evidence synthesized and the relative weight assigned to the evidence differs between the two.

² These sources of evidence were employed in 2009-10 tenure decisions but they were not aggregated in the effectiveness ratings.

could then lead to changes in teachers' choices. Teachers whose likelihood of receiving tenure diminishes may be more likely to leave teaching in the district even if they are not dismissed. Alternatively, some teachers may put more focus on improving the measures of their performance to improve their probability of receiving tenure. Because school principals play a central role in the process and because the teacher workforce differs across schools, we might expect the changes to differ across schools. In keeping with these potential effects, we address the following three research question in this paper:

1. Tenure Decisions – How did tenure rates change following reform?
2. Workforce Composition – Of teachers who become eligible for tenure, how did the composition of those continuing to teach in NYC change following reform?
3. School Differences – How have schools varied in their tenure decisions and the subsequent behaviors of their teachers?

Data

In order to assess the effects of NYCDOE tenure reforms, we must accurately identify teachers eligible for tenure, as well as other teachers potentially affected by the changes. The Tenure Notification System (TNS) tracked the tenure review process for all probationary teachers in New York City public schools between 2007-08 and 2012-13. Each school year, the district made tenure decisions for teachers whose probationary period was scheduled to conclude between November 1st of the current school year and October 31st of the following school year. The probationary period for the 2009-10 cohort, for example, concluded between November 1, 2009 and October 31, 2010. The TNS provided principals with a list of teachers at their school eligible for tenure as well as all official guidance concerning each teacher's job performance prior to the current year (e.g., prior Unsatisfactory annual performance ratings, low attendance, value-added classification, etc.). Principals enter their preliminary and final ratings and recommendations into the TNS and district superintendents make and record final tenure decisions into the system.

We assembled additional information on all teachers, not just those in the TNS, from a variety of sources. NYCDOE provides basic teacher demographic characteristics, the value-added calculations for 2008-09 and 2009-10, the state's value-added calculations for 2011-12 and annual performance ratings used in the tenure review process. We identify teachers' pathways into the teaching profession from state certification records and rosters for the New York City Teaching Fellows program and Teach for America corps members in the New York City region. State certification files provide scores on certification exams. From the College Board we obtain teachers' SAT scores for those teachers who attended a New York public school from 1980 to 2008 or a New York private school from 1980 to 2001. Characteristics of the schools in which teachers teach (e.g., race/ethnicity, free/reduced-price lunch eligibility, AYP status, etc.) come from the annual state-level School Report Cards database and Institutional Master Files and the federal Common Core of Data.

Finally, leveraging data from the NYCDOE Teacher Data Initiative, we observe characteristics of the students taught by specific teachers of grades 4 through 8 mathematics and English language arts (ELA) including demographic and achievement information. We use these data to estimate our own value-added measures of teacher effectiveness using a residuals-based approach controlling for individual student, classroom, and school characteristics. Currently, 2010-11 is the final year for which we can calculate these estimates.

Table 1 provides summary statistics for our analytic sample of teachers receiving a tenure decision in 2010-11 or 2011-12. Just over three quarters of the teachers in our sample are female, approximately 19 percent are black and approximately 17 percent are Hispanic. They have average math and verbal SAT scores of approximately 500 points each. Approximately half of the teachers entered teaching through traditional teacher preparation programs that recommended certification, while 24 percent came through the Teaching Fellows Program, the largest early-entry route serving New York City. These teachers work at schools where 44 percent of students are Hispanic students and 31 percent are black, with 74 percent eligible for subsidized lunch.

Table 1 also includes performance measures for teachers. Recall that principals complete an Annual Rating Sheet for each teacher. Just 2.3 percent of teachers in our sample received an Unsatisfactory rating and one tenth of one percent of teachers received a Doubtful rating, with the remaining 97.6 percent receiving a Satisfactory rating. On the four-point effectiveness rating scale assigned by their principals, most teachers received either a Developing (29 percent) or an Effective (41 percent) rating, while 17 percent received Highly Effective and two percent received Ineffective ratings. Principals provided no effectiveness rating for 11 percent of teachers. Eight percent of teachers had what the district classified as low attendance (more than 20 absences over prior two years), and 12 percent had low value-added.

Results

Tenure Decisions

As described in Figure 1, 94 percent of teachers were approved for tenure during AY 2007-08 and 2008-09, the two years prior to the introduction of the policy. The approval rate dropped to 89 percent in the first year of the policy (2009-10) and averaged 56 percent in the three subsequent years. Virtually all of the decrease in the tenure approval rate resulted in an increase in the percentage of teachers whose tenure decisions were extended, which averaged less than 4 percent prior to the policy, but 41 percent in 2010-11 through 2012-13. The percentage of teachers denied tenure increased marginally following the introduction of the program from an average of two percent pre-policy to three percent post-policy.

Principals have played an important role in the determination of tenure decisions. As shown in Table 2, principal effectiveness ratings using the Effectiveness Framework of teachers are highly predictive of tenure outcomes under the new policy. Ninety-four percent of teachers rated Highly Effective and 83 percent of those rated Effective were approved for tenure. In contrast, less than two percent of those rated Developing and less than one percent of those rated Ineffective were approved. The vast majority (97 percent) of teachers rated Developing were extended, while the vast majority (81 percent) of those rated Ineffective were denied tenure. Given that almost all teachers were approved for tenure prior to the reform, many teachers who would have been approved prior to the reform received a different outcome under the new system.

Tenure decisions also correspond with other teacher performance measures as shown in Table 3. For teachers in tested grades and subjects, value-added estimates track tenure decisions.³ Teachers denied tenure have math value-added estimates that are a full standard deviation in teacher effectiveness lower than those approved for tenure. On average, extended teachers are 13 percent of a standard deviation in student achievement less effective than the average teacher and 38 percent of a standard deviation less effective than those who are approved. Value-added differences in ELA are smaller but demonstrate the same pattern. Similarly, extended teachers are far more likely to have

³ We estimate the value-added measures reported in the results section employing a method described in data section.

had prior Unsatisfactory or Doubtful annual performance ratings and to have had Low Attendance than are teachers approved for tenure.

Even though there are substantial differences across the three tenure outcomes in teacher characteristics such as mean value-added estimates and the percent of teachers receiving Unsatisfactory or Doubtful rating or with low attendance, there remains substantial overlap in performance measures among accepted, extended, and denied teachers. For example, as shown in Figure 2, which graphs the distribution of value-added scores for extended and approved teachers, many higher value-added teachers are extended and many lower-value-added teachers are approved.

Table 3 also shows patterns between tenure decisions and teachers' background characteristics. While the differences are relatively small, teachers who are approved for tenure have somewhat higher SAT math and verbal scores and teacher certification (LAST) exam scores than those who are extended. Extended teachers, in turn, have somewhat higher test scores than those denied tenure. We find some differences in tenure decisions by pathways as well with New York City Teaching Fellows and teachers entering through Individual Evaluation (IE) less likely to receive tenure than teachers entering the district from college recommending (traditional teacher education) programs.

Overall, the reforms dramatically reduced the percentage of teachers who received tenure, but because most teachers who became eligible for tenure were extended and not dismissed it is unclear a priori whether the reform meaningfully altered the workforce.

Workforce Composition

Changes in the tenure process can affect the quality of teaching by denying tenure to less effective teachers. We found some evidence of this mechanism in Table 3 in that denied teachers had lower value-added in both math and ELA than teachers who were extended or approved. However, even under the new policies, few teachers are dismissed. Larger changes in the workforce instead may come from changes in voluntary turnover, particularly of teachers who are extended or who receive indications that they are likely to be extended.

Extended teachers may voluntarily exit from New York City, creating vacancies which can be filled by more effective teachers. We find some evidence of this phenomenon. As shown in Figure 3, extended teachers were more likely to transfer to other New York City schools and exit from New York City in the year following their decision than teachers who were approved for tenure. Ninety percent of approved teachers return to their schools, while only 75 percent of extended teachers did so.

Being extended meaningfully increases the likelihood of transfers and exits even after controlling for teacher and school characteristics. Table 4 gives the results of regressions with controls for the final principal effectiveness rating of the teachers as well as school fixed effects. The probability of transferring increases by 9 percentage points if the teacher had been extended rather than approved. This represents a *50 percent increase* in the probability of transferring following a tenure decision. Similarly, extended teachers exit NYC at a rate that is 4 percentage points higher than approved teachers, holding other factors constant. This represents a *66 percent increase* in the probability of exiting. These results provide evidence that the new tenure process is having a substantial effect on the composition of the teaching workforce even without substantially increasing the percentage of teachers directly denied tenure.

Among extended teachers, those who remain in the same school have somewhat different measured attributes than those who transfer or exit the system. As shown in Table 5, teachers with

higher academic qualifications, such as teacher certification exam scores, are less likely to stay in the same school than to exit. Extended teachers entering through alternative routes such as the New York City Teaching Fellows program or Teach for America are less likely to remain in the same school than teachers entering through college recommended programs. In contrast, the average value-added estimates of extended teachers who remain in the same school are higher than those who do not, but the sample sizes are smaller for these measures and the differences are not statistically significant at traditional levels.

Are the relatively less effective teachers who are induced to voluntarily leave as a result of tenure reform replaced by more effective teachers? We explore this question by comparing the effectiveness of teachers who were extended and left schools in 2010-11 or 2011-12 with teachers hired at these schools.⁴ Teacher effectiveness measures for teachers hired at these schools in 2011-12 and 2012-13 (actual replacements) are unavailable. Rather we employ the effectiveness of teachers hired at these schools in 2008-09 and 2009-10.⁵ For each school with an extended leaver, we compare the average effectiveness of extended leavers with that of their proxy replacements, and then average these within school differences across all such schools. In this way we examine the difference in teacher effectiveness between extended leavers and proxy replacements in the typical school.

As shown in Table 6, there are substantial differences in the effectiveness of extended leavers and their proxy replacements. For example, there are 45 percentage points fewer teachers rated as highly effective or effective among all extended leavers than their proxy replacements (14 percentage points Highly Effective and 31 percentage points Effective). Estimated value-added in ELA is 20 percent of a standard deviation higher among the proxy replacements than the extended leavers.⁶ Although proxy replacement teachers are estimated to outperform extended leavers in math value-added, this difference is not statistically significant at traditional significance levels, due primarily to relatively few observations (N=158).

From a principal's perspective, these are large effects relative to almost any other intervention they might contemplate. For example, many principals rightly privilege experience when hiring teachers as the value-added of a teacher with six years of experience is estimated to be up to 15 percent of a standard deviation higher than a novice teacher (Atteberry, Loeb and Wyckoff, 2013). Extending the probationary period of teachers with insufficient skills to be approved for tenure and thereby nudging some teachers to leave the school who are then replaced with a new teacher has an effect on teacher effectiveness about the same as the gains of hiring a teacher with six years of experience rather than a novice.

⁴ Teachers who were hired include both those new to teaching and teachers who transferred from other schools.

⁵ The vast majority of teachers with tenure decisions in 2010-11 and 2011-12 began their probationary periods in 2008-09 or 2009-10. We therefore are comparing the extended leavers to other teachers hired under similar circumstances to themselves. We are making the assumption that the teachers hired in 2008-09 and 2009-10 at the schools where an extended teacher left in 2010-11 or 2011-12 have measured effectiveness similar to those teachers who hired at these schools in 2011-12 and 2012-13. We have also created a replacement comparison group of teachers by examining teachers who were hired at these schools from 2006-07 through 2009-10.

⁶ Employing the sample of teachers entering schools between 2006-07 and 2009-10 as the proxy replacement comparison group, we estimate the percentage of teachers rated highly effective or effective is 44 percentage points higher for the proxy replacements than the extended leavers. Estimated value-added is 13 percent of a standard deviation higher in ELA and 14 percent of standard deviation higher in math, which are both significant at the 0.06 level.

School Differences

While implementation of the policy may have varied across schools, most schools experienced a substantial change in the percentage of teachers who were approved for tenure under the new policy. More than 70 percent of schools granted tenure to fewer than 80 percent of their teachers following the introduction of the policy as shown in Figure 4. While a cluster of schools approved 100 percent of eligible teachers, most schools approved far less, with another large cluster of schools with between 50 and 70 percent approval.

The variation in approval rates seen in Figure 4 corresponds to some school characteristics, particularly average student attributes, as shown in Table 7. On average, teachers approved for tenure work in schools in which the percentage of white students is nearly twice as large as the schools where teachers were denied tenure. Black students experience the reverse. In schools where teachers are approved for tenure, black students comprise 27 percent of all students, but they comprise 40 percent of students in schools where teachers are denied tenure. The achievement of students in schools where teachers receive tenure is nearly a quarter of a standard deviation better in math and 18 percent of a standard deviation better in ELA than the average achievement in schools where teachers are denied tenure.

Given the strong link between principal effectiveness ratings and tenure decisions shown above, it is not surprising that the pattern of differences in school attributes across principal effectiveness ratings mirror the differences across tenure outcomes as shown in Table 7. For example, the average highly effective teacher works in schools where the percentage of white students is twice as large as it is for the average ineffective teacher. The average ineffective teacher is located in a school with 65 percent more black students than their average highly effective colleague. As is also shown in Table 7, the average ineffective teacher is located in a school where the ELA performance of students is more than a quarter of standard deviation lower and more than 30 percent of a standard deviation lower in math than that of the average highly effective teacher. This suggests that replacing ineffective and developing teachers with a teacher whose performance is closer to the average would disproportionately improve the quality of teaching in schools with higher percentages of black students.

Table 8 describes the relationship between school characteristics and tenure decisions in a multivariate framework controlling for teacher performance measures. When we estimate the model including only the attributes of the students in the school, the percentage of students who are black is the only measure that corresponds to the likelihood of being extended. When teacher attributes are added to the model, they dominate the determination of whether a teacher is extended. The estimate for the percent of black students drops substantially in magnitude such that a 1 standard deviation increase in the percentage of black students (26.4 percentage points) is estimated to increase the likelihood of a teacher being extended by just over 1 percent.

Discussion

Teacher tenure has been a hotly debated issue for decades, but there is surprisingly little research that documents the effects of various tenure policies. This paper examines an unusual change in the tenure policy in New York City as a step toward providing evidence to support the design of teacher workforce policies.

Our analysis documents substantial changes in tenure decisions following the NYC reforms. While almost all eligible teachers received tenure prior to the change, after the reforms a large share of teachers did not receive tenure when they were first eligible, and instead had their probationary

periods extended to provide more opportunity for them to demonstrate the skills necessary for effective teaching and for district decision makers to better assess teachers' performance. Not surprisingly, low-performing and less qualified teachers were more likely to be extended. Teachers in schools with disproportionate shares of black and low-performing students also were more likely to be extended. Our analyses provide some evidence that this differential reflects a uneven distribution of less effective teachers, which is consistent with recent research (Isenberg et al., 2013; Sass et al., 2012), although we cannot rule out differential application of tenure rules. Finally, we found evidence that the tenure policy resulted in additional voluntary attrition of teachers who were extended, as well as additional involuntary dismissal of the small share of teachers who were denied tenure. Among extended teachers, those with lower effectiveness, as measured by principals' ratings, but higher qualifications (e.g. SAT scores) were more likely to leave, potentially further benefiting the teacher workforce. Extended teachers who leave their schools are less effective as measured by principal ratings and value-added estimates than are those likely to replace them. Because teachers with poor effectiveness ratings are more likely to be in schools with higher percentages of black students, these schools are most affected by the policy change and most likely to see attrition of these less effective teachers as a result of the reforms. These schools on average were able to hire more effective teachers to fill these vacancies.

New York City's reforms to the tenure process are still in their early stages. Our results suggest large effects but provide only preliminary evidence because we have not fully ruled out the effects of other factors that may have been at play in the district simultaneously. With additional data a causal analysis will be more feasible and we can address additional questions. While the direct effects of the tenure reforms are felt by teachers facing tenure decisions, the labeling of teachers and increased likelihood of receiving an extension may induce other teachers in the same school, subject, and/or grade to reassess their positions. These processes may encourage principals to reassign teachers across grades and subjects or to reallocate responsibilities in other ways.

Changes in human resource practices including new hiring and evaluation policies have been hallmarks of many recent reforms. While the tenure process has been the subject of continual debate, reforms have been slower and less sustained in this area. In part as a result, research on tenure policies and variety of possible approaches to probationary periods and screening is sparse. Nearly all districts grant some form of tenure based at least in theory on teachers demonstrating proficiency. Yet many districts do only cursory evaluation during the tenure process. As such, adopting tenure reform similar to that presented here may be comparatively easy relative to other much discussed human resource policies that require more controversial policy changes.

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Figures

Figure 1. Percentage of Teacher Tenure Cases by Tenure Outcome 2007-08 to 2012-13

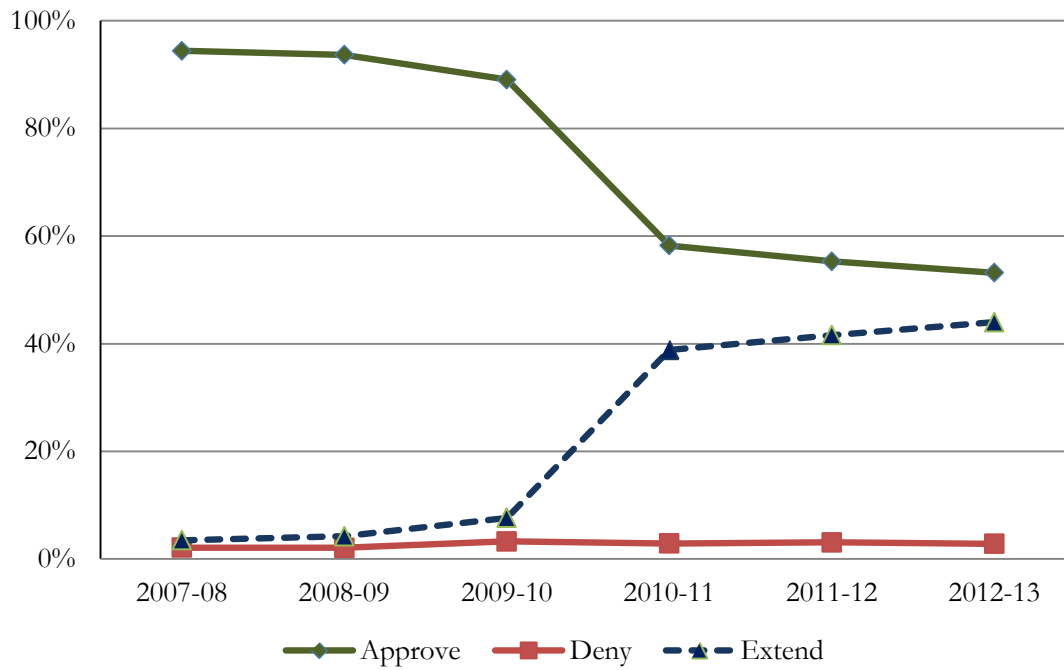


Figure 2. Distributions of Teacher Value-Added of Approved and Extended Teachers, Math and ELA, 2010-11

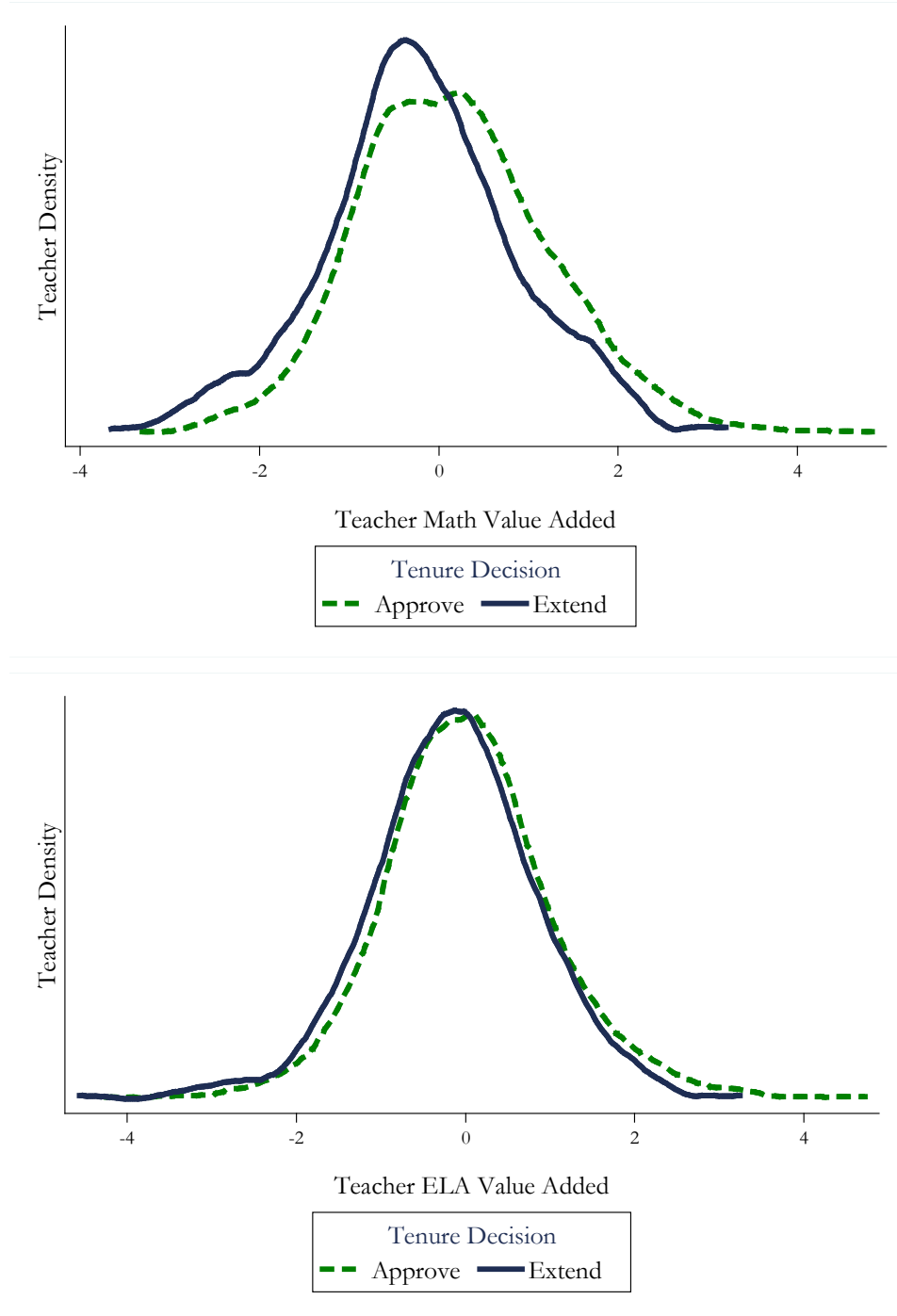


Figure 3. Location of Teachers in Year Following Tenure Decision, by Tenure Outcome, 2010-11 and 2011-12

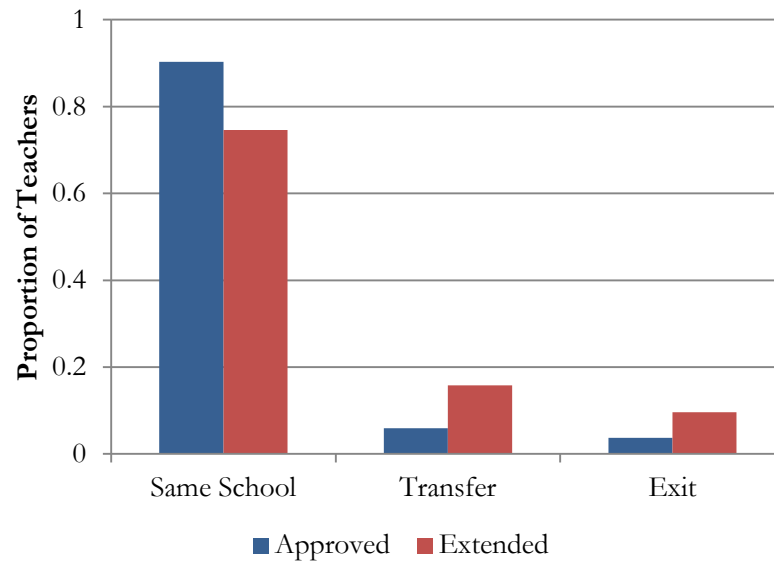
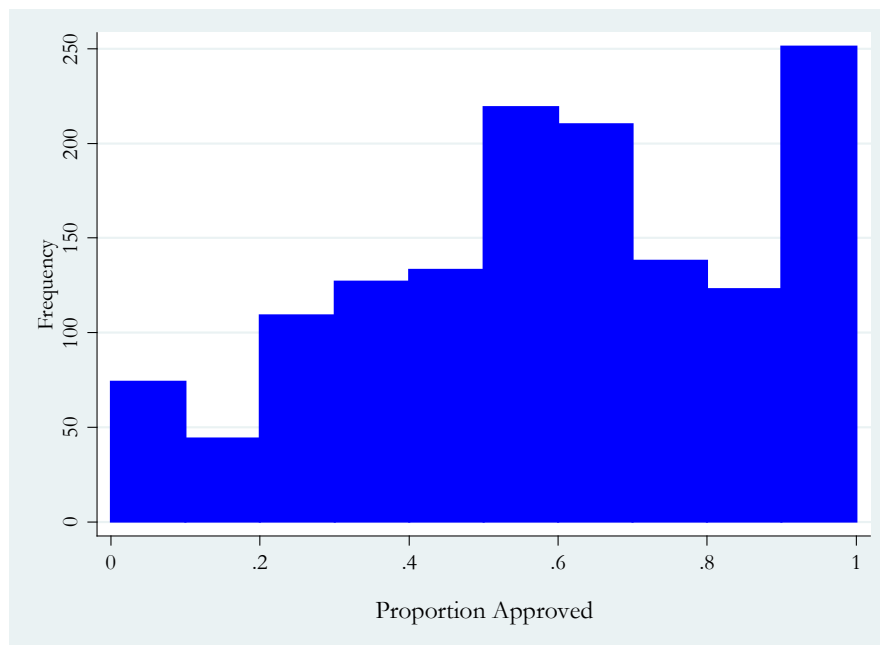


Figure 4. Distribution of School Proportion of Tenure Cases Approved 2009-10 through 2012-13



Notes: Includes only schools with at least four tenure decisions over the period (81 percent of all schools).

Tables

Table 1. Descriptive Statistics for the Analytic Sample, 2010-11 and 2011-12

Variable	Obs.	Mean	Std. Dev.
Tenure Outcome (%)			
Approve	9,161	56.97	49.51
Extend	9,161	40.04	49.00
Deny	9,161	2.99	17.03
Teacher Attributes (% unless otherwise noted)			
Female	9,129	75.53	
Black	8,139	18.64	
Hispanic	8,139	16.89	
SAT math	4,236	499.01	103.00
SAT verbal	4,236	502.00	99.43
Preparation Path (%)			
College recommended	9,084	49.98	
Teaching Fellow	9,084	23.83	
TFA	9,084	3.64	
Individual evaluation	9,084	7.63	
Temporary license	9,084	4.60	
Student Attributes (aggregated to school)			
Hispanic (%)	8,961	44.46	25.32
Black (%)	8,961	30.81	26.42
Free lunch (%)	7,894	74.43	22.20
Reduced lunch (%)	7,894	4.25	4.15
Mean ELA score (z-score)	6,530	2.89	44.16
Mean Math score (z-score)	6,530	1.46	46.85
Teacher Performance Measures (%)			
U rated	9,161	2.33	
D rated	9,161	0.14	
Principal Final Effectiveness Ratings			
Ineffective	9,161	2.22	14.72
Developing	9,161	28.85	45.31
Effective	9,161	41.10	49.20
Highly Effective	9,161	16.97	37.54
No Rating	9,161	10.86	31.12
Low attendance	9,161	7.53	26.39
VAM ELA	1,052	-0.06	1.03
VAM Math	670	-0.06	1.09
NYC VAM low	1,101	11.99	
NYC VAM high	1,101	8.08	

Table 2. Tenure Decision Outcome by Principal Final Effectiveness Rating, 2010-11 to 2012-13

	Ineffective (%)	Developing (%)	Effective (%)	Highly Effective (%)	None (%)
Approve	0.7	1.8	82.7	93.9	53.7
Extend	18.2	96.6	17.1	6.1	41.4
Deny	81.1	1.6	0.2	0.0	4.9
N	302	3,820	5,568	2,006	1,384
% teachers	2.3	29.2	42.6	15.3	10.6

Table 3. Attributes of Teachers by Tenure Outcomes, 2010-11 through 2012-13^a

Tenure Decision	Value Added		U Rated (%)	D Rated (%)	Low Attd (%)	SAT		LAST Exam	Preparation Route (%)^b			
	<i>ELA</i>	<i>Math</i>				<i>Math</i>	<i>Verb</i>		<i>Coll Rec</i>	<i>NYCTF</i>	<i>TFA</i>	<i>Ind Eval</i>
Approve	0.081	0.248	5.7	22.2	37.1	505	505	257	59.9	49.5	60.2	55.0
Extend	-0.138	-0.129	52.1	66.7	56.2	490	494	254	37.8	47.2	38.9	40.7
Deny	-0.115	-0.740	42.2	11.1	6.7	469	490	248	2.4	3.2	0.1	4.3
Total	-0.009	0.070	100.0	100.0	100.0	498	500	255	100.0	100.0	100.0	100.0

^a Means of teachers approved exceed those of teachers extended at a p-value of 0.05 or lower for all attributes. The means of teachers extended exceed those of teachers denied at a p-value of 0.05 or lower for all variables except ELA value-added and verbal SAT.

^b The tenure approval rate is lower for teachers prepared through the NYCTF and IE preparation routes than those from CR programs at p-values of .01 or lower. There is no statistical difference between CR and TFA.

Table 4. Determinants of Teacher Disposition in Year Following Tenure Decision, 2010-11 and 2011-12

Variables	(1) Transfer	(2) Transfer	(3) Transfer	(4) Exit	(5) Exit	(6) Exit
Extend	0.145** (15.21)	0.124** (13.04)	0.087** (6.06)	0.057** (9.38)	0.055** (9.07)	0.040** (4.32)
Student Attributes						
Mean Math score	-0.024 (-0.68)			0.016 (0.68)		
Mean ELA score	-0.024 (-0.64)			-0.019 (-0.82)		
Black (%)	0.113* (4.24)			0.042* (2.46)		
Hispanic (%)	0.066~ (2.35)			0.075** (4.21)		
Free lunch (%)	-0.099** (-3.12)			-0.085** (-4.23)		
Reduced lunch (%)	-0.307* (-2.33)			-0.187* (-2.23)		
Principal Final Effectiveness Rating						
Ineffective			0.285* (4.24)			0.110* (2.54)
Developing			0.071** (3.58)			0.026* (2.02)
Effective			0.030* (2.13)			0.007 (0.74)
Missing			0.045* (2.45)			0.013 (1.11)
Constant	0.142** (4.88)	0.135** (24.56)	0.111** (9.60)	0.064** (3.48)	0.037** (10.52)	0.031** (4.22)
School Fixed Effect		X	X		X	X
Observations	6,351	8,855	8,855	6,351	8,855	8,855

Notes: T-statistics in parentheses. ** p<0.01, * p<0.05, ~p<0.1

Table 5. Attributes of 2011 and 2012 Extended Teachers by Disposition in the Following Year

Attrition Status	Value Added		U Rated (%)	D Rated (%)	Low Attd (%)	SAT		LAST Exam	Preparation Route (%)			
	<i>ELA</i>	<i>Math</i>				<i>Math</i>	<i>Verb</i>		<i>Coll Rec</i>	<i>NYCTF</i>	<i>TFA</i>	<i>Ind Eval</i>
Same School	-0.091~	-0.090	4.0~	0.2**	10.7	491	495	253**	77.5	70.9**	53.3**	78.8*
Transfer	-0.355	-0.421	2.7	0.2	11.2	482	486	253	16.3	15.6	9.0	17.7
Exit	-0.332	-0.145	2.9	0.0	9.1	530	539	267	6.2	13.6	37.7	3.5

Notes: ** p<0.01, * p<0.05, ~ p<0.10. For Value-Added, U Rated, D Rated, Low Attendance, SAT and LAST Exam, significance levels denote significant differences between the values of these variables for Extended teachers who remain in same school and those who either transfer or exit. For Preparation Routes, significance levels denote differences between designated route and College Recommended.

Table 6. Mean School Difference in Teacher Effectiveness Measures between Proxy Replacement and Extended Leavers in Schools with Extended Leavers, 2010-11 and 2011-12^a

Extended Leaver Status	Principal Final Effectiveness Rating (%)				Value-Added	
	<i>Highly Effective</i>	<i>Effective</i>	<i>Developing</i>	<i>Ineffective</i>	<i>ELA</i>	<i>Math</i>
All Extended leavers	14.34***	30.7***	-36.45***	1.37*	0.197**	0.119
Extended transfers	11.97***	30.16***	-34.53***	1.14	0.127	0.181*
Extended exiters	16.15***	27.55***	-33.24***	1.72	0.298*	0.037

Notes: ^a Proxy replacement teachers are all teachers hired at the school in 2009 and 2010. Only schools with an extended leaving teacher in 2011 or 2012 included in all comparisons. Positive values indicate on average within schools average value for replacement pool exceeds that for the Extended leavers. Comparing extended leavers to proxy replacements *** p<0.001, ** p<0.01, * p<0.05.

Table 7. Attributes of the Students in Teacher’s School by Tenure Decision and Principal Effectiveness Rating, 2010-11 and 2011-12

	White (%)	Hispanic (%)	Black (%)	Home Lang Eng (%)	Free Lunch (%)	Reduced Lunch (%)	Math Achieve (z-score)	ELA Achieve (z-score)
Tenure Decision ^a								
Approve	13.8	44.4	27.4	56.6	72.3	4.4	0.081	0.086
Extend	8.9	44.6	35.1	60.3	77.3	4.1	-0.066	-0.042
Deny	7.1	43.5	39.6	63.3	77.8	4.2	-0.152	-0.093
Principal Effectiveness Rating ^b								
Highly Effective	16.4	42.8	24.1	56.5	69.2	4.8	0.184	0.181
Effective	12.1	45.3	29.9	57.2	74.6	4.2	0.007	0.019
Developing	8.4	45.0	35.3	60.8	78.1	4.1	-0.068	-0.046
Ineffective	7.2	42.4	39.9	62.7	77.7	4.6	-0.161	-0.102
No rating	12.3	42.7	31.0	57.4	71.3	4.1	0.055	0.073
Total	11.7	44.5	30.8	58.3	74.4	4.2	0.015	0.029

Notes: ^a Extended teachers work in schools with different student attributes than approved teachers (p-value less than 0.01 for all attributes except the percentage of Hispanic students). Teachers denied tenure work in schools with different attributes than teachers who are extended with respect to the percentage of students who are black, the percentage whose home language is not English and mean student math scores (p-value less than 0.05). Differences in other student attributes are not significantly different from zero.

^b Teachers rated ineffective work in schools with different student attributes than teachers rated effective or highly effective (p-value less than 0.01 for all attributes except the percentage of Hispanic students and the percentage eligible for reduced-price lunch). Teachers rated developing work in schools with different student attributes than teachers rated effective or highly effective (p-value less than 0.01 for all attributes except the percentage of Hispanic students).

Table 8. Determinants of Whether Teacher is Extended Relative to being Approved, 2010-11 and 2011-12

	(1) Extended (=1)	(2) Extended (=1)
Student Attributes		
Mean Math score	-0.096 (-1.41)	-0.073~ (-1.77)
Mean ELA score	-0.010 (-0.14)	0.021 (0.49)
Black (%)	0.211** (-4.41)	0.048~ (1.80)
Hispanic (%)	0.032 (-0.62)	-0.008 (-0.27)
Free lunch (%)	0.012 (-0.20)	-0.041 (-1.13)
Reduced lunch (%)	-0.066 (-0.26)	-0.043 (-0.28)
Teacher Attributes		
Low Attendance		0.066** (3.84)
Unsatisfactory Rated		0.101** (2.85)
Doubtful Rated		-0.125 (-0.75)
Principal Final Rating		
Ineffective		0.867** (25.61)
Developing		0.906** (95.62)
Effective		0.100** (8.72)
No rating		0.334** (12.95)
Constant	0.340** (-6.12)	0.081* (2.45)
Observations	6,351	6,351
R-squared	0.033	0.613

Notes: T-statistics in parentheses. ** p<0.01, * p<0.05, ~ p<0.1