Research Article

Educational Evaluation and Policy Analysis
June 2022, Vol. 44, No. 2, pp. 283–312
DOI: 10.3102/01623737211047265

When the Walls Come Down: Evidence on Charter Schools' Ability to Keep Their Best Teachers Without Unions and Certification Rules

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Theories of market-based school reform suggest that teacher labor markets may be inefficient because schools lack autonomy to incentivize performance in hiring, retention, and compensation. We test this empirically by comparing teacher exits in the deregulated market of New Orleans with neighboring traditional school districts. We find that the relationship between teacher performance and retention is stronger in the deregulated market. We also find positive associations between salary and performance, but only when teachers transfer from one charter school to another. While teacher retention is more closely tied to performance in New Orleans, this did not yield a net gain in teacher quality, because new teachers in New Orleans were of lower average quality than their peers in neighboring districts.

Keywords: *economics of education, educational policy, educational reform, school/teacher effectiveness, teacher assessment, charter schools, econometric analysis, longitudinal studies, policy analysis, regression analyses*

Over the past decade, policies governing teacher labor markets have changed markedly. Many states and districts have implemented teacher evaluation systems, eliminated traditional job protections, and experimented with compensation strategies that depart from traditional step-and-ladder salary schedules (e.g., Kraft, 2018). With increasing evidence that teachers are critical to student outcomes (e.g., Chetty et al., 2014; Hanushek & Rivkin, 2010; Rivkin et al., 2005; Rockoff, 2004), these policy changes seek to improve the quality of teaching by providing school and district leaders with authority to make staffing and compensation decisions based on performance—a strategy restricted by many union contracts (Marianno, 2015; Moe, 2011; Strunk et al., 2018), as well as many state tenure laws (Barrett et al., 2021; Kraft

et al., 2020), although some states have weakened their tenure statutes over the past decade (Kraft et al., 2020).

At the same time, a number of districts across the country have also transitioned to more market-based school governance models by implementing a system of autonomous schools—often referred to as a "portfolio" system—that relies on private organizations to run schools and advance a larger goal of introducing market forces into the education system (Hill et al., 2013). Recent accountings by the Center for Reinventing Public Education identify at least 25 large districts across the United States that have moved toward a portfolio system, including Nashville, New York City, Baltimore, Denver, and Los Angeles, among others (Campbell et al., 2017; Lake et al., 2016). Texas has had almost 20 districts sign onto its recent System of Great Schools initiative, an effort designed to assist districts in their transitions to a portfolio system. In short, transitions toward portfolio systems have been among the most common systemic reform initiatives in recent years, and these transitions show little sign of abating.

A key tenet of the portfolio strategy, and market-based education systems more generally, is that the government should hold school operators responsible for school performance and, in turn, operators are granted autonomy to make decisions regarding curriculum, scheduling, budgeting, and services. Autonomy over personnel decisions, such as recruiting, hiring, training, compensation, and dismissal, may be particularly important (Chubb & Moe, 1990). To access this autonomy, many cities making the transition to a portfolio system rely heavily on charter schools (Campbell et al., 2017; Lake et al., 2016). These schools are operated by private organizations under contracts with government agencies or other state-approved authorizers and, as private employers, are typically free from union contracts and district and state rules governing teacher employment. Thus, a transition to a portfolio of charter schools is a de facto deregulation of a substantial portion of the teacher labor market. Charter schools must attract students and reach authorizer performance goals to survive. In theory, this will drive charter operators to staff their classrooms with highly effective teachers. Thus, a combination of choice, competition, contracting, and autonomy could result in an improved teacher workforce. Whether these reforms actually produce any meaningful change in the distribution of teacher quality, however, relies on assumptions about teacher labor supply and school management that might not be met in practice.

New Orleans provides the most extreme case of market-based school reform in the United States. Since reopening in 2006 after Hurricane Katrina, the city's schools have evolved into a portfolio model where virtually all schools are charter schools with considerable autonomy over the terms of teacher employment, and school managers face strong performance incentives. We leverage these conditions to analyze how market-based portfolio management shapes the distribution of teacher quality. Specifically, we assess whether schools operating in market-based portfolio settings are more likely to attract and retain effective teachers, relative to traditionally governed districts.

Both because and in spite of its status as a policy outlier, New Orleans is an ideal setting for this analysis. As the country's purest manifestation of a market-oriented school system, New Orleans represents the context in which the theoretical claims of market proponents—such as a greater likelihood of retaining high-quality teachers—are most likely to be empirically detected. As we review in more detail below, prior studies have returned little evidence that that the relationship between teacher quality and retention differs in charter versus traditional public schools (Bruhn et al., 2020; Cowen & Winters, 2013). This work, however, was conducted in contexts that lack key features of a market-oriented school system, including robust competition, strong school-level performance incentives, and near-complete autonomy over school operations. These characteristics define the New Orleans context. While our results may not be immediately generalizable to a large number of school systems across the country, they are instructive to the dozens of cities in the midst of transitioning to an educational system resembling New Orleans's.

Based on analysis of 7 years of teacher employment and salary data, we find that the New Orleans teacher labor market has been more responsive to teacher value-added measures—a

proxy for performance—than similar schools in neighboring districts with traditional school governance. We find evidence that, relative to traditional schools, low-performing teachers in market settings are more likely to exit, whereas high-performing teachers in market settings are less likely to exit. For example, we estimate that a one standard deviation *decrease* in teacher value-added is associated with an *increase* in the likelihood of exiting a school of about 9.5 percentage points in New Orleans, compared with 2.8 percentage points in neighboring traditional settings. While we cannot identify whether teacher exits are voluntary or involuntary, our findings do not appear to be driven by forced job loss due to school closure or takeover, which frequently occurred in New Orleans during this period (Bross et al., 2016; Lincove et al., 2020). These findings are also highly robust to multiple definitions of "portfolio" or "market" schools, multiple measures of teacher value-added, disaggregation by race and teacher performance level, and comparison with other Louisiana school districts outside of the regional labor market.

One potential reason that high-performing teachers might be more likely to stay in New Orleans is that they are rewarded with higher pay. We find some evidence that charter schools link pay increases to performance, but only when teachers switch from one charter school to another; we find no evidence of pay for performance within schools, that is, that salaries of returning charter school teachers vary according to their value-added.

Retention of high-performing teachers is only one element of improving teacher quality. We also compared the quality of exiting teachers with replacement teachers in each setting over time. Despite exhibiting a tighter relationship between teacher value-added and retention than traditionally governed districts, we find that, in New Orleans, the teachers who replace exiting faculty have lower value-added than those entering in neighboring districts, and that these countervailing forces roughly balance out over time. In other words, the fact that New Orleans schools are better able to retain quality teachers does not seem to translate into increased average teacher quality.

We proceed by first providing background and context for our analysis, situating our work within the literatures on market-based approaches to education, teacher quality, and teacher recruitment and retention. We then outline the data that serve as the basis for our analyses and describe the empirical strategy we use to analyze how reshaping the teacher labor market within a governance model that promotes choice and competition affects the distribution of teacher quality. We present the results of our analysis before closing the article with a discussion of their implications for policies like those implemented in New Orleans, as well as for research on those initiatives.

Choice and Competition, School Autonomy, and Teacher Effectiveness

The theoretical argument that greater levels of school autonomy could increase educational quality can be traced back at least to Friedman (1955) and, more recently, Chubb and Moe (1990) who argued that the institutional arrangements governing public education in the United States were the root cause of persistently poor educational outcomes. Proponents of deregulation argue that with greater autonomy over human resources, schools will incentivize performance, thereby leading to increased teacher effectiveness and, ultimately, improved student outcomes.

The theory that simply providing schools with a greater degree of autonomy will produce better outcomes, however, relies on several potentially problematic assumptions. First, schools must be willing to leverage their increased autonomy in ways designed to attract high-quality teachers. Plans to compensate teachers on the basis of performance are among the most commonly proposed policies in this realm, and there is a large empirical literature on the effects of merit pay in education. The bulk of the evidence indicates these programs have small positive effects on student achievement (see Pham et al., 2020, for a meta-analysis of the literature) but lack long-term sustainability due to tepid teacher support (Chiang et al., 2017; Murnane & Cohen, 1986). Importantly, previously studied merit pay programs often operate within the strictures of union contracts and are thus different from the New Orleans context in a fundamental way.

More similar to the New Orleans context is the post–Act 10 era in Wisconsin. In 2011, the

Wisconsin state legislature enacted Act 10, legislation that freed school districts from the requirement to collectively bargain teacher salaries with the local union. Recent analyses of this legislation reveal that a majority of districts took advantage of this freedom to implement flexible pay schemes, which allowed districts to differentiate teacher pay on the basis of performance (Biasi, 2021; Heneman et al., 2019). Perhaps unsurprisingly, teachers with high value-added disproportionately migrated to districts with flexible pay—migrations that raised these teachers' salaries—whereas teachers with low value-added sorted to districts that maintained fixed salary schedules (Biasi, 2021). The end result of this sorting process was an increase in student achievement in districts that implemented flexible pay schemes (Biasi, 2021).

Second, for the market-driven model to improve student outcomes, schools must have the capacity to identify effective teachers and be willing to actively remove ineffective ones. In an analysis of New York City public schools, Rockoff et al. (2012) demonstrate that providing principals with teacher performance information increased the probability that low-performing teachers leave their positions. In Chicago, Jacob (2011) similarly found that probationary teachers with relatively low value-added were more likely to be dismissed, although more than half of those dismissed were subsequently rehired into a different teaching position in the district. Consistent with this significant degree of rehiring, qualitative evidence on the teacher hiring practices of New Orleans school leaders—the vast majority of whom led charter schools—suggests that the ability to improve student learning outcomes was just one of many factors taken into consideration when making hiring decisions. Leaders also valued teacher experience, community connections, and the willingness to "go the extra mile" (Jabbar, 2018). Thus, it remains an open question whether school leaders will prioritize the ability to raise achievement in the teacher hiring process and, if they do, whether they can obtain the information needed to identify effective teachers and use that information to make potentially difficult personnel decisions.

Third, for personnel flexibility to increase the quality of the teaching force, the supply of teachers must give school leaders access to higher quality replacements. The option to offer higher salaries might induce higher performing teachers to enter the market, but it is also possible that the teacher employment protections typically offered by contracts and regulations might be necessary to attract and retain the best teachers. Through simulations, Rothstein (2015) illustrates that a loss of employment protections that make teaching a relatively low-risk, lifelong profession might need to be offset with substantial pay increases to fill existing positions without loss of quality. Empirically, evidence from the rollout of Chicago's teacher evaluation system indicates increased exit rates of low-performing teachers, with their replacements being of higher quality on average (Sartain & Steinberg, 2016). Of course, it remains to be seen whether such dynamics continue to operate several years after implementation. The increased draw on the pool of replacement teachers has the potential to lower the average quality of that pool over time.

Fourth, Chubb and Moe's (1990) theory assumes that schools in a market setting have incentives to hire, develop, compensate, and dismiss teachers based on performance. With intense performance-based school contracting, this seems likely in New Orleans. More than 40 schools have been closed or taken over for low performance or mismanagement since the initial state takeover (Bross et al., 2016). However, with regard to market competition, parents have relatively few high-quality schooling choices and limited information about school quality. Schools' incentives might lead them to focus on recruiting and selecting more successful students, rather than genuine quality improvements (Harris, 2020; Jabbar, 2015). Lincove et al. (2018) illustrate that supply constraints allow most New Orleans schools to maintain adequate enrollment to operate even with low performance and low demand among parents. The accountability incentives and pressures facing schools are therefore complex and ambiguous.

Ultimately, whether increased school autonomy will result in a more effective system-level teacher workforce is an empirical question. A handful of studies provide inconsistent evidence. Notably, most prior studies are from settings where charter schools represent only a small portion of public schools. Two studies in North Carolina find that charter schools have high

turnover rates and hire less effective teachers than traditional public schools, as measured by estimated value-added (Carruthers, 2012; Jackson, 2012). Such a pattern could reduce the quality of education provided by the North Carolina charter sector and, perhaps more importantly, casts at least some doubt on claims that school autonomy will generate higher quality teaching.

Cowen and Winters (2013) use data from Florida to study the exit patterns of charter teachers compared with traditional school teachers. They note that charter school teachers of all quality levels are more likely to exit the profession than peers employed by school districts. In both sectors, less effective teachers exit the profession at greater rates than their more effective peers, but they find no difference across sectors in the relationship between performance and exit. Bruhn et al. (2020) studied the teacher labor market in Massachusetts, comparing the charter sector with traditional public schools. They also find mixed evidence on whether charter schools are more effective at retaining high-performing teachers. They find a more U-shaped relationship between performance and turnover; relative to average performers, both low- and high-performing teachers were more likely to exit charter schools. A comment by Cowen and Winters (2013, p. 14) sums up both studies well: "Whatever administrative or organizational differences may exist in charter schools, they do not necessarily translate into a discernible difference in the ability to dismiss poorly performing teachers."

This limited existing empirical evidence calls into question the presumption that a greater degree of school autonomy will lead to increased quality of the teaching force. But no prior study has been conducted in a context like New Orleans, where most of the characteristics of a theoretical deregulated labor market are realized. In this setting, hiring is substantially decentralized with many competing employers, most schools have teacher performance data, and there are strong incentives for schools to improve due to performance-based contracts. Prior studies in the New Orleans context show that during the immediate post-Katrina period, New Orleans saw accelerated exit among experienced teachers (Lincove et al., 2018); a demographic shift from a majority Black, highly experienced labor market to younger, White teachers; and elevated teacher turnover rates (Barrett & Harris, 2015). There is also evidence that frequent accountability-based school closures disrupt the teacher labor market by accelerating teacher exit (Lincove et al., 2020). Such findings provide important context for considering how portfolio management and market forces more generally shape the distribution of teacher quality.

Data and Measures

Our analyses primarily draw on elements from the Louisiana Department of Education's (LDOE) administrative records. Personnel records include annual, de-identified records for all teachers employed in Louisiana public school systems, including traditional public schools and charter schools. It contains information on teacher demographics, teaching certificates, college degrees, salary, teaching experience, school assignments, and district hire dates. These records allow us to observe teachers as they move across public schools within the state. We are also able to measure performance, which we operationalize as value-added, for teachers employed from fall 2009 to fall 2015, and to observe exits from public school employment at the end of each academic year.[1]

We use information in student records to construct several school-level measures that might be associated with both teacher retention and performance. These records contain annual, individual-level information on student demographics and educational needs, such as race/ethnicity and free or reduced-price lunch eligibility. We aggregated individual student records to generate these school-level measures. From other published state records, we also identify whether schools are charter or district-run and each school's status (passing or failing) in LDOE's annual accountability reporting.

The key independent variable in our analysis is teacher performance. We estimate this using the two-step value-added modeling approach described in the appendix. The data allow us to generate annual estimates of teacher effectiveness for teachers of the four tested subjects (reading, math, science, and social studies) in Grades 4 to 8. Many teachers in these grades teach more

than one subject. For each year, we create unique effectiveness measures for each teacher by averaging scores across all available subjects taught. Value-added scores can be estimated for approximately 30% of all teacher-by-year observations. Because we are interested in performance-related teacher exit, we omit teachers who begin a school year with 24 or more years of experience as teachers who have accrued 25 years of state pension participation are eligible to retire with full benefits.

We use multiple teacher value-added measures in our analyses, reflecting the various possible decision processes and outcomes of interest. In our main specifications, we use measures based on student growth in the prior academic year, and we standardize value-added estimates within year using the regional mean and standard deviation, where we define the region as the three school districts we draw upon in our empirical analysis below. This has the advantage of allowing us to easily compare the estimates across schools and districts, as they are on the same scale. On the contrary, school leaders might be most likely to dismiss the teachers who are lowest performing within their own schools. This calls for within-school standardization of teacher value-added measures, which we accomplish by adding school fixed effects to the value-added models. We use within-school value-added as a robustness check and report in the text any substantive differences between these and the main specifications. We also test a value-added estimate based on up to 3 prior years of information on student performance and an estimate that is averaged across all years in the data. The latter assumes that annual variance is mostly noise. Finally, while our main specification controls for students and classroom aggregate socioeconomic status (SES) characteristics, we also test a value-added measure that omits these covariates. We describe these value-added models in the appendix. Our results and conclusions are not sensitive to the various specifications of value-added.

Our value-added estimates proxy for information teachers and their employers would likely discern from internal assessment of annual exams and benchmark assessments. Louisiana passed a statewide teacher evaluation policy in 2010 that included teacher value-added. Beginning in fall 2013, teachers in tested subjects at both traditional and charter schools, as well as their principals, received value-added measures based on a similar model estimated by LDOE. Data on the prior years' students arrived in October or November—too late to be used in voluntary or involuntary decisions about exit in the subsequent school year. This information was meant to guide human capital decisions but carried no enforceable high-stakes consequences during the time of our study. The only substantive difference between our calculation and that of LDOE is that, due to data limitations, ours omits student attendance from the model. Prior research, however, suggests that the specific set of covariates has limited influence on estimated value-added, especially after inclusion of measures of prior achievement and other student demographics (Harris & Sass, 2006). Of course, it is possible that getting a value-added measure from the state changed the underlying relationship between our researcher-estimated value-added score and teacher exit decisions by making the information more transparent. We assess this possibility by formally testing whether the relationship between teacher effectiveness and exit differs before and after state provision of teacher value-added scores. This test fails to reject the null of no difference.

Empirical Method

We designed our analysis to test the hypothesis that schools operating in a competitive labor market like New Orleans will exhibit a tighter relationship between teacher effectiveness and retention than schools operating in traditional district settings. In our main analysis, we compare schools operating in the market setting of New Orleans with schools in neighboring parishes that operate in traditional district settings. New Orleans district and charter schools together comprise the Orleans Parish School District and represent all public school options for students in the city (we use the designations Orleans Parish and New Orleans interchangeably). Our analyses compare these Orleans Parish schools with those in traditional school districts in neighboring Jefferson Parish and St. Bernard Parish. This allows us to hold constant local economic and labor market conditions that might influence both supply and demand for teachers and has the

advantage of a stark contrast between the nearly complete charter saturation of New Orleans and very low charter presence in Jefferson and St. Bernard. A disadvantage is that while student poverty is similar across these parishes, only Orleans Parish has a majority of Black students and teachers. In robustness checks, we compare Orleans Parish with the East Baton Rouge Parish School System (EBR). EBR is demographically more similar to New Orleans, but the parishes are approximately 80 miles apart, and EBR also has a small but growing share of charter schools. By contrast, 100% of teachers in St. Bernard Parish and more than 97% of teachers in Jefferson Parish were employed by the local school district.

In Orleans Parish, a majority of teachers (74%) were employed by charter management organizations (CMOs), and the remaining teachers were employed by one of the two school districts, the state Recovery School District (RSD) or the Orleans Parish School Board (OPSB). In the immediate wake of the hurricane, the Louisiana Board of Elementary and Secondary Education (BESE) took over more than 100 OPSB schools and shifted control to the RSD to either close, contract out to CMOs, or run directly. By 2009, the year our study begins, RSD had contracted out a large majority of schools to CMOs, but still directly operated a small number of schools in Orleans Parish. OPSB also operated a handful of schools in the district. Together, these two school districts employed about a quarter of teachers in New Orleans over the time period we study.

Our analysis requires us to differentiate schools that operate in decentralized market settings for comparison with schools that operate in traditional regulated settings. Prior studies focus on the distinction between charter and traditional public schools. The New Orleans setting is more complex than this simple dichotomy, because all schools enjoyed a greater degree of autonomy over human resources than neighboring district schools. Thus, we define the "market" to include all schools located in Orleans Parish (charter, RSD-run, and OPSB-run), with Jefferson Parish and St. Bernard Parish traditional schools serving as a comparison group. As, during the period we study, Orleans Parish charter schools and RSD-run schools were afforded more autonomy than their OPSB-run peers, we conduct a supplementary analysis where we examine the relationship between teacher performance and exit separately for each of the three types of schools in Orleans Parish.

When constructing our analytic sample, we were faced with the question of how to handle teachers who exit their school due to its closure. There were more than 50 closures in New Orleans over the period we study (Lincove et al., 2020). On one hand, closure-driven exits are fundamentally different from those resulting from human resources processes, either teachers electing to leave or being dismissed. Such a consideration might suggest excluding this form of exit from our analytic sample. On the other hand, as an argument for their inclusion, closures are a means by which CMOs or other governing entities operating in a market setting may encourage large-scale exits of low-performing teachers. That is, closure, and the teacher exits they induce, is a potential lever that market actors may pull in an effort to shape the teacher quality distribution. We elect to include closure-driven teacher exits in our primary analysis but conduct a supplementary analysis where we exclude them.

Table 1 illustrates the differences between the characteristics of teachers and the schools in which they teach across all Orleans Parish schools, Orleans Parish charter schools, and district-run schools in Jefferson and St. Bernard Parishes. The left-hand panel of the table reports means and standard deviations for teacher-by-year observations with value-added estimates. These observations serve as our analytic sample in our analyses that follow. The right-hand panel of the table reports the same statistics for teacher-by-year observations without value-added estimates, allowing for assessment of whether the two groups of teachers are observably different from one another.

When we define the market setting as all Orleans Parish schools (Column 1), our analytic sample contains nearly 3,300 observations from 1,445 unique teachers, numbers broadly similar to the approximately 3,600 observations from 1,240 unique teachers in traditional district settings (Column 3). As a first indication of differential turnover and retention, in the market setting more than 21% of teacher-by-year observations end in exit from the parish, compared

with only 12% in the nonmarket setting. Without controlling for experience, average teacher pay is very similar in both settings. Similar patterns hold when we only include teachers in Orleans Parish charter schools in the calculations.

Importantly, Table 1 also shows that teacher and school characteristics vary across settings. Reflecting segregation patterns in the region, the proportion of Black students and teachers is substantially higher in Orleans Parish than neighboring districts, although rates of student economic disadvantage (measured through eligibility for free or reduced-price lunch) are approximately 80% in both settings. In terms of teacher qualifications, teachers in the market setting are more likely to have attended college out-of-state and to be trained by Teach for America or The New Teacher Project (TFA/TNTP) than their peers in nonmarket settings. However, overall rates of alternative certification and specialty certification in STEM (science, technology, engineering, and mathematics) are similar across the groups. Again, these takeaways hold regardless of whether we include teachers employed in district-run Orleans Parish schools in the calculations.

There are also substantial differences in estimated school and teacher performance across settings. Schools in the market setting of New Orleans are more likely to be identified as failing in the Louisiana school accountability system, a state-produced measure based primarily on student proficiency levels. However, estimated teacher value-added contributions to student growth are substantially higher in the market settings than in nonmarket settings. This is particularly true when we restrict the sample to teachers employed in Orleans Parish charter schools. These teachers exhibit a mean value-added of 0.12, which is significantly higher than the mean of −0.03 in the traditional district setting. In short, teachers and schools in our defined market settings are generating greater test score growth than teachers and schools in traditional settings, but measured through student performance levels, market schools perform worse on average.

Comparing observations with and without value-added scores reveals these two groups of teachers to be broadly similar on multiple dimensions, most notably salary, school performance, and our three exit measures—exit from school, employer, and parish. We do note some slight differences between the two groups. First, teachers for whom we are unable to estimate value-added are, on average, slightly more experienced and less likely to be female, a TNTP or TFA participant, or hold a STEM certificate. Second, on average, teachers for whom we cannot estimate value-added work in schools with a slightly lower percentage of students eligible for free or reduced-price lunch. In general, though, the main story that emerges from comparing the left-hand and right-hand panels of Table 1 is the general lack of observable differences between teachers for whom we can and cannot estimate value-added.

A plausible comparison across settings requires that teachers are selected from overlapping ability distributions (i.e., common support). Prior research cited above suggests that charter teachers in some settings reflect a lower quality region of the distribution relative to district teachers. Figure 1 illustrates the full distribution of teacher quality, relative to all teachers in the state, for Orleans Parish teachers (solid line) and Jefferson Parish–St. Bernard Parish combined (dotted line). We see substantial overlap suggesting that we can estimate effects for similar teachers across settings, despite substantial difference in governance.

Difference-in-Differences (DD) Model

We compare employment outcomes of teachers in market versus traditional school districts by estimating several variants of the following DD model:

$$\begin{aligned} Y_{ijz,t+1} = {} & \beta_0 + \beta_1 \text{Market}_z + \beta_2 \text{Performance}_{izt} \\ & + \beta_3 \left(\text{Performance}_{izt} \times \text{Market}_z \right) \\ & + \delta_t + \varepsilon_{ijzt}, \end{aligned} \tag{1}$$

where $Y_{ijz,t+1}$ is an indicator of exit for teacher i with experience level j who worked for school z in year t. In this model, performance_{izt} is the value-added measure of teacher productivity in year t estimated using the approach described in the appendix, and $market_z$ is a binary sector indicator equal to one if the teacher is employed in a school in a market setting and equal to zero if the teacher is employed in a nonmarket setting. The coefficient of greatest interest is β_3, which is an estimate of the difference in the relationship

TABLE 1

Summary Statistics for Analytic Sample and Teachers Without Value-Added Scores

	Observations with value-added scores			Observations without value-added scores		
	All Orleans Parish	Orleans Parish charter schools	Comparison district schools	All Orleans Parish	Orleans Parish charter schools	Comparison district schools
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Employment outcomes						
Exit from school	0.397	0.378	0.225	0.396	0.369	0.212
Exit from employer	0.346	0.332	0.125	0.338	0.321	0.115
Exit from parish	0.211	0.214	0.124	0.217	0.218	0.114
Salary	$46,263	$45,929	$46,599	$46,269	$45,623	$47,037
	(5,933)	(5,822)	(5,206)	(7,899)	(7,622)	(7,187)
Teacher performance						
Value-added score	0.034	0.120	−0.029			
	(1.074)	(1.053)	(0.927)			
School performance						
School average Vam Grades 4–8	0.053	0.085	0.045	0.015	0.047	0.046
	(0.200)	(0.183)	(0.146)	(0.182)	(0.164)	(0.140)
F-graded school	0.111	0.081	0.031	0.145	0.085	0.040
	(0.315)	(0.273)	(0.172)	(0.352)	(0.278)	(0.196)
Next year fully closed	0.022	0.009	0.018	0.039	0.018	0.014
	(0.145)	(0.094)	(0.133)	(0.193)	(0.131)	(0.119)
Teacher characteristics						
Years of teaching experience	5.581	4.967	9.996	6.152	5.327	10.698
	(6.102)	(5.593)	(6.614)	(6.521)	(6.039)	(6.930)
Black	0.472	0.429	0.176	0.447	0.395	0.173
Female	0.765	0.761	0.891	0.710	0.718	0.782
TNTP or TFA participant	0.248	0.263	0.064	0.199	0.216	0.054

(continued)

TABLE 1 (CONTINUED)

	Observations with value-added scores			Observations without value-added scores		
	All Orleans Parish	Orleans Parish charter schools	Comparison district schools	All Orleans Parish	Orleans Parish charter schools	Comparison district schools
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Louisiana college graduate	0.524	0.481	0.845	0.518	0.472	0.831
Alternative certification program	0.302	0.309	0.272	0.300	0.299	0.282
STEM certificate	0.220	0.223	0.137	0.159	0.147	0.136
School characteristics						
Percent on free/reduced-price lunch	83.838	83.091	80.622	79.945	78.796	77.776
	(20.072)	(21.245)	(15.627)	(20.923)	(22.850)	(15.776)
Percent Black students	87.559	86.091	44.053	86.151	83.582	44.016
	(19.811)	(21.035)	(20.945)	(21.710)	(23.650)	(21.273)
Percent teacher retention	53.759	55.342	65.223	51.903	52.879	66.616
	(32.611)	(31.157)	(36.051)	(33.237)	(31.830)	(35.187)
Percent Black teachers	49.071	44.827	18.281	46.853	40.831	18.737
	(28.103)	(27.694)	(14.225)	(27.785)	(26.805)	(14.447)
Percent TNTP/TFA teachers	20.416	22.189	4.320	19.565	21.613	4.368
	(20.644)	(21.261)	(7.260)	(19.203)	(19.946)	(6.369)
Median teacher experience	7.114	5.903	14.467	7.055	5.455	15.320
	(6.379)	(5.335)	(5.567)	(6.644)	(5.197)	(5.885)
Teacher × Year observations	3,295	2,813	3,628	7,350	5,809	8,322
Unique teachers	1,445	1,266	1,240	2,900	2,452	2,451
Schools	99	69	88	133	90	101

Note. Mean values (standard deviations). Includes teachers with up to 23 years of experience in the fall of each year. Sample with value-added scores includes those who taught in a tested subject in Grades 4 to 8 from fall 2009 to spring 2015. Employment outcomes are measured through fall 2016. "All Orleans Parish" includes teachers employed by charter schools, the Recovery School District, or the Orleans Parish School Board. "Comparison district schools" include teachers employed by Jefferson or St. Bernard Parish school districts. TNTP = The New Teacher Project; TFA = Teach for America; STEM = science, technology, engineering, and mathematics; Vam = value-added measure; SPED = special education; LEP = limited English proficiency.

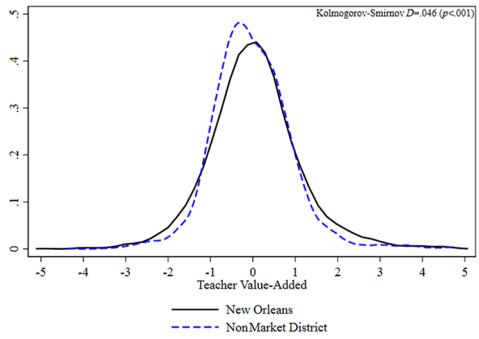

FIGURE 1. *Baseline teacher value-added distribution of all teachers by setting.*

between teacher performance and exit for the market setting, relative to the traditional district setting. We include δ_t, academic year fixed effects, to account for other state policy changes and economic conditions that affected teachers across sectors. Finally, e_{ijzt} is a random error. We estimate this model via ordinary least squares (OLS) and cluster standard errors by both teacher and school.

A typical DD approach intends to estimate the causal effect of a policy or intervention, addressing selection into treatment by comparing the pre- and postpolicy difference for the treatment and comparison groups. It is important to note that our approach, in contrast, compares schools operating in market and nonmarket settings (first difference) in their retention of low versus high value-added teachers (second difference). In doing so, our analysis is not intended to estimate a causal effect of the market setting but rather to describe whether schools operating in that setting retain high value-added teachers at greater rates than schools operating in traditional districts.

With this in mind, we direct attention to β_3, which may reflect actions on both the demand side (e.g., schools making efforts to retain their best teachers or dismiss their worst ones) or the supply side (e.g., teachers in market and nonmarket settings differing in their willingness to stay in teaching when they are low- vs. high-performing). Unfortunately, as in most labor data, we are unable to distinguish voluntary and involuntary separations. In an effort to gain at least some insight into whether these patterns are driven by the supply or demand sides, we estimate two additional specifications. The first includes fixed effects for teacher experience to account for employment outcomes for teachers who would be treated differently in district salary schedules. The second includes both fixed effects for teacher experience and measures of observable teacher qualifications (preparation programs, certificates, and education level) and demographics (race, gender, and college graduation year), as well as observable school characteristics that reflect teacher working conditions (school poverty rate, percent minority students, and school accountability status). Through this third specification, we attempt to isolate the effect of the market setting, while controlling for differential selection of teachers into market and nonmarket schools due to factors of supply and demand.

Potentially relevant to the interpretation of β_3 is the possibility that teacher value-added—our measure of performance—is itself a function of employment within the market setting. It is conceivable that features of such settings could result in teachers having systematically higher or lower value-added. Indeed, the summary statistics in Table 1 illustrate that the average value-added of teachers in New Orleans is noticeably higher than that of their peers in traditional district settings. In theory, such a scenario could prove problematic if it resulted in little overlap in value-added across the two settings, leaving open the possibility that the estimate of β_3 is driven by functional form assumptions, rather than true differences in the relationship between teacher performance and exit across the two settings. In Figure 1, though, we empirically demonstrate substantial overlap in value-added across the market and traditional district settings. And, more generally, as long as we correctly specify the functional form of our teacher performance measure, β_3 can be validly interpreted as the difference in the relationship between teacher performance and exit across the market and traditional district settings.

We examine the role that teacher performance, employment in a market setting, and the interaction of the two play in shaping three binary outcomes: (a) exit from the current school, (b) exit from the current employer, and (c) exit from the parish school system. Teachers in traditional district settings with monopsony-like hiring can switch schools but must stay within the same employer. The portfolio model, however, creates more employers and thus more labor market

competition. In our data, New Orleans teachers can switch across more than 40 independent employers (RSD, OPSB, and many charter schools and CMOs) without exiting the parish, while public school teachers in Jefferson or St. Bernard Parish are all employed by a single local school district. Analyzing these three outcomes provides insight into whether market settings generate additional internal teacher churn, as well as system-wide responses to teacher quality.

In addition to analyzing teacher exit, we also examine whether market systems link performance and pay by estimating a variant of Equation 1 where we specify the outcome as annual teacher salaries, as reported in the state personnel data. In this specification, we predict salary at time $t + 1$ using a version of the specification in Equation 1 that contains salary at time t on the right-hand side. In effect, we estimate how teacher performance, employment in a market setting, and the interaction of the two relate to changes in teacher pay; these estimates are necessarily restricted to teachers who are still employed in the following year.

Results

Teacher Exit, Retention, and Switching

Table 2 presents results from our analysis of the relationship between teacher value-added and employment outcomes for teachers at schools in market and nonmarket settings. As a reminder, we define the "market" as all schools in Orleans Parish, and "nonmarket" schools as district-run schools in the neighboring parishes of Jefferson and St. Bernard. For the three outcomes of exiting the current school (left-hand panel), the current employer (middle panel), and the current parish (right-hand panel), the table presents results for the three specifications of Equation 1 described above: (a) academic year fixed effects only, (b) academic year and teacher experience fixed effects, and (c) both sets of fixed effects along with the full covariates (with teacher and school characteristics). Because we estimate each specification as a linear probability model, the coefficient estimates can be interpreted as marginal effects on the probability of exit. Teacher value-added is standardized using the regional labor market mean and standard deviation.

In our baseline specification for school exit (Table 2, Column 1), we estimate a substantial difference in teacher retention by market setting, a finding consistent with previous research (e.g., Carruthers, 2012; Cowen & Winters, 2013; Jackson, 2012). Teachers employed in market settings are 17.8 percentage points more likely to exit their school than teachers employed in nonmarket settings. With respect to teacher performance, we estimate that a one standard deviation increase in value-added decreases the likelihood of exit by 4.5 percentage points in nonmarket settings. However, Columns 2 and 3 show that estimated coefficients for the market indicator (β_1) and the standardized value-added score (β_2) decline in size and significance when we add the fixed effect for teacher experience and, especially, teacher and school characteristics. This pattern of results suggests that much of the *absolute* difference in turnover between market and nonmarket settings is driven by differences in the characteristics of students and teachers in the two settings.

We are primarily interested in the interaction between our indicator for market context and teacher value-added scores (β_3), and here estimates are consistent in size and significance across the three specifications. In particular, the coefficient estimates on the interaction term are negative and significant in all nine specifications reported in Table 2, suggesting that the relationship between teacher performance and exit is stronger in schools operating in market settings than in schools in nonmarket settings. For example, the results in Column 3 indicate that, combining β_2 and β_3, a one standard deviation increase in a market teacher's estimated value-added decreases the likelihood of exiting a school by 9.3 percentage points, compared with about 2.8 percentage points in the nonmarket setting. We draw the same general conclusions when we specify the outcome as exit from the employer (see middle panel of Table 2). By contrast, the turnover–performance relationship is noticeably weaker when we specify the outcome as exit from the parish. A one standard deviation increase in the value-added score is estimated to reduce the probability of exit from the market context by 4.2 percentage points, compared with 2.0 percentage points in the traditional district setting.

TABLE 2

Estimated Effects of Market Setting and Value-Added on Teacher Exit Probabilities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	Exit school			Exit employer			Exit parish		
Market	0.178***	0.115***	−0.037	0.226***	0.164***	0.071**	0.090***	0.030**	−0.022
	(0.022)	(0.021)	(0.030)	(0.018)	(0.018)	(0.027)	(0.015)	(0.013)	(0.026)
Vam	−0.045***	−0.040***	−0.028***	−0.030***	−0.025***	−0.018***	−0.029***	−0.025***	−0.020***
	(0.010)	(0.009)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Vam × Market	−0.070***	−0.068***	−0.065***	−0.075***	−0.072***	−0.068***	−0.023**	−0.021**	−0.022**
	(0.013)	(0.013)	(0.013)	(0.011)	(0.011)	(0.012)	(0.011)	(0.010)	(0.011)
Constant	0.223***	0.253***	0.251***	0.124***	0.153***	0.205***	0.123***	0.151***	0.188***
	(0.013)	(0.013)	(0.050)	(0.009)	(0.009)	(0.050)	(0.009)	(0.009)	(0.045)
Observations	6,923	6,923	6,923	6,923	6,923	6,923	6,923	6,923	6,923
R^2	.077	.117	.143	.106	.153	.173	.028	.083	.101
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Experience FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Covariates	No	No	Yes	No	No	Yes	No	No	Yes
Teachers (*n*)	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
Schools (*n*)	187	187	187	187	187	187	187	187	187

Note. Coefficients from linear probability models estimating teacher exit. Standard errors in parentheses are clustered within teachers and schools. Estimates include observations of fourth- to eighth-grade teachers during years they taught in a tested subject and were not eligible for retirement between 2009 and 2015. The market group includes all teachers in Orleans Parish. The nonmarket group includes teachers employed by the Jefferson Parish or St. Bernard Parish school districts. Teacher value-added is standardized within the regional labor market. Teacher covariates include race, gender, in-state college graduate, alternative certificate program, TFA/TNTP participant, STEM certificate, and SPED certification. School covariates include failing state accountability, percent FRPL, percent Black students, percent Black teachers, teacher retention rate, median teacher experience, and percent TFA/TNTP teachers. FE = fixed effect; TFA = Teach for America; TNTP = The New Teacher Project; STEM = science, technology, engineering, and mathematics; FRPL = free or reduced-price lunch ; Vam = value-added measure; SPED = special education; LEP = limited English proficiency.

*$p < .1$. **$p < .05$. ***$p < .01$.

Our next set of results provides evidence on the relationship between performance and exit for Black teachers employed at schools in market and nonmarket settings (Table 3). The exit of Black teachers is a particular concern in New Orleans, where a large majority of students are Black, and the proportion of Black teachers fell considerably after the post–Katrina school reform initiatives (Barrett & Harris, 2015; Lincove et al., 2018). The proportion of Black teachers is also one of the largest differences between Orleans Parish and neighboring school systems. We perform this analysis by estimating a variant of Equation 1, where we expand the interaction between the market indicator and a teacher's value-added to also include an indicator for the teacher identifying as Black in personnel data. We also include the corresponding main effect as well as interactions between the indicator for a teacher identifying as Black and the measures of performance and the market setting, respectively.

We present the results of this analysis in Table 3. For the outcome of exiting the school, the point estimates indicate that the relationship between performance and retention in the market setting is stronger for Black teachers than their non-Black peers. Our results indicate that, in the market setting, a one standard deviation increase in value-added is associated with a 4 to 6 percentage point decrease in the probability that non-Black teachers exit their school, but an 8 to 9 percentage point decrease for Black teachers. Notably, though, the imprecision of the coefficient estimates on the triple interaction between an indicator for employment in the market context, teacher value-added, and an indicator for a teacher identifying as Black leave us unable to reject the null that the estimates for Black and non-Black teachers are not different from one another. For the outcomes of exiting the employer and exiting the parish, the results in Table 3 make clear that the relationship between performance and exit does not differ, either statistically or substantively, for teachers of different races.

Teacher Compensation

Our next analysis focuses on the relationship between performance and compensation for teachers working in market and nonmarket settings. Without collective bargaining agreements, market schools are not tied to salary schedules and, in theory, could use salary to reward performance. Furthermore, with competitive hiring, salary increases might be necessary to prevent teachers from leaving for positions in competing schools, and salary decreases might be experienced by low-performing teachers seeking employment following an exit. Using the three specifications of Equation 1 described earlier and still defining the market setting as all schools in Orleans Parish, we predict teacher's next year salary as a function of the value-added score, employment at a market school, and the interaction of the two. In addition, our model contains a covariate measuring current-year salary, meaning that the coefficient estimates should be interpreted as providing evidence on how the variables in our model are related to changes in salary from 1 year to the next. Because current and potential employers have different information about teachers, we report results in Table 4 separately for two sets of teachers: (a) teachers who were employed by the same school at times t and $t + 1$, and (b) teachers who were employed by different schools at times t and $t + 1$.

The first three columns present results for teachers who switched schools from 1 year to the next. Of these teachers, those employed in the market setting commanded a premium of up to $2,000, compared with their peers in traditional district settings (see Column 3). Notably, the point estimates for the measure of teacher value-added are close to zero and statistically insignificant in all specifications, indicating little relationship between performance and salary changes in traditional district settings. However, the coefficient estimates on the interaction between teacher value-added and the indicator for teaching in the market context are in the range of $850 to $900. Substantively, this means that, for teachers in market settings that switch schools, each standard deviation increase in value-added is related to an additional $900 in salary, relative to their peers in traditional districts. We note, however, that the coefficients on the interaction fall short of conventional levels of statistical significance. The right-hand panel of Table 4 presents results from a specification where we restrict the sample of teachers in the market settings to those employed by CMOs. We exclude teachers employed by either OPSB or the RSD. Under this sample restriction,

TABLE 3

Estimated Effects of Market Setting and Value-Added on Teacher Exit Probabilities–Teacher Race Interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	Exit school			Exit employer			Exit parish		
Market	0.203***	0.107***	−0.037	0.253***	0.161***	0.072**	0.147***	0.067***	0.000
	(0.030)	(0.027)	(0.030)	(0.025)	(0.023)	(0.028)	(0.020)	(0.018)	(0.027)
Vam	−0.046***	−0.039***	−0.028***	−0.028***	−0.022***	−0.015**	−0.027***	−0.022***	−0.016**
	(0.011)	(0.010)	(0.009)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Black	0.038*	0.068***	0.014	0.009	0.036**	0.003	0.010	0.033**	0.012
	(0.022)	(0.022)	(0.021)	(0.015)	(0.015)	(0.016)	(0.015)	(0.015)	(0.016)
Vam × Market	−0.059***	−0.052***	−0.041**	−0.080***	−0.072***	−0.063***	−0.030**	−0.023*	−0.021
	(0.017)	(0.017)	(0.019)	(0.015)	(0.016)	(0.019)	(0.013)	(0.014)	(0.015)
Market × Black teacher	−0.078**	−0.037	−0.009	−0.062**	−0.021	−0.005	−0.127***	−0.090***	−0.062***
	(0.034)	(0.030)	(0.026)	(0.028)	(0.024)	(0.021)	(0.023)	(0.021)	(0.021)
Vam × Black teacher	0.009	0.005	−0.001	−0.012	−0.016	−0.018	−0.011	−0.015	−0.019
	(0.022)	(0.021)	(0.020)	(0.016)	(0.015)	(0.014)	(0.016)	(0.015)	(0.014)
Market × Vam × Black × teacher	−0.031	−0.035	−0.043	0.014	0.009	0.003	0.014	0.011	0.010
	(0.027)	(0.026)	(0.028)	(0.022)	(0.023)	(0.024)	(0.020)	(0.020)	(0.021)
Constant	0.217***	0.243***	0.242***	0.122***	0.148***	0.201***	0.121***	0.144***	0.172***
	(0.015)	(0.013)	(0.051)	(0.010)	(0.009)	(0.051)	(0.010)	(0.009)	(0.046)
Observations	6,923	6,923	6,923	6,923	6,923	6,923	6,923	6,923	6,923
R^2	.079	.120	.145	.108	.153	.174	.040	.086	.102
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Experience FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Covariates	No	No	Yes	No	No	Yes	No	No	Yes
Teachers (*n*)	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
Schools (*n*)	187	187	187	187	187	187	187	187	187

Note. Coefficients from linear probability models estimating teacher exit. Standard errors in parentheses are clustered within teachers and schools. Estimates include observations of fourth- to eighth-grade teachers during years they taught in a tested subject and were not eligible for retirement between 2009 and 2015. The market group includes all teachers in Orleans Parish. The non-market group includes teachers employed by the Jefferson Parish or St. Bernard Parish school districts. Teacher value-added is standardized within the regional labor market. Teacher covariates include gender, in-state college graduate, alternative certificate program, TFA/TNTP participant, STEM certificate, and SPED certification. School covariates include failing state accountability, percent FRPL, percent Black students, percent Black teachers, teacher retention rate, median teacher experience, and percent TFA/TNTP teachers. VAM = value-added measure; SPED = special education; FE = fixed effect; TFA = Teach for America; TNTP = The New Teacher Project; STEM = science, technology, engineering, and mathematics; FRPL = free or reduced-price lunch. *$p < .1$. **$p < .05$. ***$p < .01$.

the coefficient estimates on the interaction are somewhat larger in magnitude, in the range of $1,200 to $1,250, with *p* values below .10.

Results for the sample of teachers who returned to the same school (Columns 4–6) suggest that, controlling only for value-added, prior salary, and school year, the average change in salary for teachers in market schools is $340 greater than that for teachers in traditional schools (Column 4). And controlling for teacher experience, we find that teachers employed in market settings exhibit salary changes roughly $700 greater than the changes of teachers employed in traditional settings (Column 5). Adding a set of variables measuring demographic characteristics and schooling contexts results in little change in the $700 estimate (Column 6). However, the very small and insignificant interaction coefficients between value-added and market suggest that any use of these financial incentives for retention purposes is largely unrelated to quality.

In summary, our analysis of teacher pay suggests that any connection between performance and pay in the market setting occurs only when teachers move across schools, and even that relationship is somewhat tenuous. We see no evidence of selective pay increases within schools for current teachers with relatively better performance. Together, these results suggest that schools in the market and nonmarket settings do not differ in the extent to which they reward their teachers for performance, but that teachers in the market setting can leverage their performance to achieve pay increases if they are willing to switch schools.

Setting aside the relatively imprecise estimates, a positive relationship between salary and turnover in this model could reflect at least two distinct processes. First, it is possible that some market schools set salaries for newly hired teachers according to their performance. That is, they paid entering high-performing teachers more than they paid newly hired teachers with lower demonstrated performance. Second, schools may not differentiate pay according to the performance but vary in their average teacher salary, and high-paying schools may disproportionately hire high-performing teachers. Of course, these processes can operate simultaneously and work together to produce the pattern of results seen in Table 4.

Supplementary Analyses and Robustness Checks

Specification With a School Fixed Effect

Table 1 shows a number of differences in the characteristics of schools operating in market and nonmarket settings, and our richest specification includes covariates measuring these characteristics. However, there may be other fixed school characteristics correlated with both exit and either the market indicator or teacher value-added (or both) that go unmeasured in our model, thereby affecting the estimate of β_3 in Equation 1. That is, even controlling for observable school characteristics, it is possible that some portion of the estimate of β_3 in Equation 1 is driven by differences in the characteristics of schools across the two settings, rather than the market structure itself. In an effort to assess such a possibility, we estimate a variant of the model presented in Equation 1 that includes a school fixed effect. In doing so, we estimate the extent to which schools operating in market and nonmarket settings differ in their retention of teachers with different estimated value-added using only within-school variation.

We present results from this specification in Supplemental Appendix B1 (online version of the journal), with the main takeaway being their qualitative similarity to our primary results. For each one standard deviation increase in teacher value-added, the probability of the teacher exiting the school is nearly 5 percentage points lower in schools operating in a market setting, relative to those operating in traditional districts. Results for the outcomes of exiting the employer and exiting the parish are also broadly similar to their analogs in Table 2. This suggests that the positive, statistically significant estimates of β_3 in Table 2 are not driven by differences in the fixed characteristics of schools across market and nonmarket settings. We note, however, that the qualitative similarity between our primary results and the specification with a school fixed effect belies some quantitative differences between the two specifications. In particular, including a school fixed effect reduces the magnitude of the estimated relationship between teacher value-added and exit—in both market and nonmarket settings—by about one quarter.

TABLE 4

Estimated Effects of Market Setting and Value – Added on Next Year's Salary

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Market = all New Orleans teachers						Market = New Orleans charter teachers only					
Variables	New school			Same school			New school			Same school		
Market	1,130**	1,641***	2,041*	340*	697***	658**	849	1,267**	1,460	466**	802***	717**
	(510)	(544)	(1,150)	(187)	(226)	(328)	(563)	(605)	(1,198)	(202)	(249)	(328)
Vam	177	184	128	182**	179**	203**	192	215	127	171**	171*	196**
	(426)	(437)	(431)	(85)	(89)	(93)	(427)	(439)	(432)	(85)	(88)	(91)
Vam × Market	846	910	902	−4	−49	−3	1,246*	1,178*	1,250*	−45	−98	−18
	(554)	(577)	(599)	(148)	(155)	(154)	(652)	(672)	(686)	(155)	(159)	(162)
Sample mean salary	$45,523	$45,523	$45,523	$47,330	$47,330	$47,330	45,317	45,317	45,317	47,274	47,274	47,274
Observations	1,254	1,254	1,254	4,845	4,845	4,845	1,110	1,110	1,110	4,584	4,584	4,584
R^2	0	0	0	0	0	0	0	0	0	0	0	0
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Experience FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Covariates	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Teachers (*n*)	1,042	1,042	1,042	1,927	1,927	1,927	952	952	952	1,831	1,831	1,831
Schools (*n*)	168	168	168	177	177	177	140	140	140	153	153	153

Note. Coefficients from OLS models estimating next year's teacher salary. Standard errors in parentheses are clustered within teachers and schools. All specifications control current-year salary. Estimates include observations of fourth- to eighth-grade teachers during years they taught in a tested subject and were not eligible for retirement between 2009 and 2015. Columns 1 to 3 and 7 to 9 include teachers who move to a new school next year. Columns 4 to 6 and 10 to 12 include teachers who return to the same school. In Columns 1 to 6, the market group includes all teachers in Orleans Parish; in Columns 7 to 12, the market group includes only charter school teachers in Orleans Parish. The nonmarket group includes teachers employed by the Jefferson Parish or St. Bernard Parish school districts. Teacher value-added is standardized within the regional labor market. Teacher covariates include race, gender, in-state college graduate, alternative certificate program, TFA/TNTP participant, STEM certificate, and SPED certification. School covariates include failing state accountability, percent FRPL, percent Black students, percent Black teachers, teacher retention rate, median teacher experience, and percent TFA/TNTP teachers. FE = fixed effect; OLS = ordinary least squares; TFA = Teach for America; TNTP = The New Teacher Project; STEM = science, technology, engineering, and mathematics; FRPL = free or reduced-price lunch ; Vam = value-added measure; SPED = special education; LEP = limited English proficiency.
*$p < .1$. **$p < .05$. ***$p < .01$.

Although this analysis does not allow us to identify the factors generating these reductions, the fact that they are proportionate across the two settings suggests a factor common to the two settings, with perhaps the most natural candidate being the distribution of teacher performance across schools in each setting. Perhaps unsurprisingly, teacher performance is not evenly distributed across schools within each sector, with some schools employing a disproportionate number of high-performing teachers while others having more than their share of low-performing teachers on faculty. Empirically, low-performing teachers exit their school more frequently than their high-performing peers. This reality shows up in our primary results with the tight relationship between performance and exit, particularly in the market setting. With a distribution of teacher performance like that described above, it is easy to see how including a school fixed effect could attenuate the relationship between performance and exit. In particular, relative to our primary analysis, reliance on within-school variation likely homogenizes the comparison group, comparing low-performing exiting teachers with their relatively low-performing peers in the same school, rather than to higher performing teachers in other schools. While the cross-school distribution of teacher performance is a plausible explanation for the observed pattern of results, we reiterate that are unable to identify the precise mechanism at work. And we highlight that our specification with a school fixed effect still cannot adjudicate between supply- and demand-side explanations for our results. The disproportionate exits of low-performing teachers, particularly in the market setting, could stem from decisions by either school leaders or teachers themselves. Even with those caveats, the results in Online Appendix B1 (online version of the journal) instill additional confidence in the substantive conclusion that the relationship between value-added and teacher retention is stronger in schools operating in the market setting of New Orleans than in neighboring traditional districts.

Hazard Models

In our primary analysis, we model employment outcomes as a linearly separable function of market conditions and teacher performance. Such a model is appropriate when the comparison groups have the same average rate of turnover. However, because charter schools, particularly those in market settings, have higher rates of turnover, it is possible that β_3 in Equation 1 is positive only because the overall rate of turnover is higher among schools in the market setting. This is fundamentally an issue of functional form, with our primary specification assuming either that there is no difference in the baseline turnover rate or that the relationship between market status and turnover is additive rather than proportional. Above we showed that the former assumption does not hold, but the latter assumption is empirically testable using a proportional hazard mode, which we perform by estimating:

$$h\left(t \mid \mathbf{x}_i\right) = h_0\left(t\right)\exp\left\{\mathbf{x}_i'\beta\right\}, \tag{2}$$

where $h(t \mid \mathbf{x}_i)$ is the probability of the hazard (teacher exit) conditioned on a vector of teacher-level covariates $\mathbf{x}$. $h_0(t)$ is the baseline hazard probability. In our case, the basic proportional hazard model assumes the ratio between the probability of teacher exit and the vector of teacher-level covariates is constant over time employed (t). The hazard analysis accounts for the likely possibility that baseline hazards are substantively different in market and nonmarket settings. Therefore, instead of an interaction term for market and performance like that contained in Equation 1, we estimate Equation 2 separately for the market and nonmarket samples. Thus, our baseline hazard is the group-specific probability of exit for teachers with a standardized value-added score equal to zero (exactly average performance).

In practice, teacher value-added can vary from year to year, and the effects of poor performance on exit probabilities might also vary over time employed at school. We address this possibility by estimating three variations of Equation 2. First, we estimate Equation 2 as a Cox proportional hazard model[2] that assumes that the effects of $\mathbf{x}$ do not vary over t, where $\mathbf{x}$ includes teacher experience and a value-added measure based on performance in the prior school year. This provides a direct comparison between the estimates of Equations 1 and 2. Next, we replicate this model with a value-added measure that is stable over time for each teacher. We do this

by averaging, for each teacher, all available value-added measures from 2010 to 2015. Finally, we explicitly model the interaction of **x** and t in an extended Cox model that includes a time-varying effect of the value-added measures and experience through interaction terms.[3] To parallel the results for Equation 1, we estimate Equation 2 with academic year fixed effects, controls for teacher experience, and full teacher and school covariates. In the hazard models, we set $t = 0$ in the first year the teacher is observed as employed by the school, employer, or parish. Because our employment data begin in fall 2000, this is the earliest entry date we can observe.[4]

We present results from the hazard models in Table 5. The table contains exponentiated coefficients, so values greater than one reflect a positive association with the probability of exit, and values less than one reflect a negative association. Panel A includes estimates based on the 1-year value-added measure used in our primary specification. Panel B uses the teacher's average value-added across all years in our data. The results are quite similar in both panels and are consistent with the linear probability estimates presented in Table 2. Once again, we find that value-added is negatively associated with hazard probabilities in both market and nonmarket settings, but effect sizes are substantially larger in the market setting. The hazard results are also consistent across models with and without covariates. Finally, and again similar to the results in Table 2, market–nonmarket differences are larger for school and employer exits than for parish exits.

We display survival probabilities for teachers in the different settings in Figure 2. The figure compares two sets of New Orleans teachers—those with value-added scores in the top 5% statewide and those with scores in the bottom 5%—to the same two sets of teachers in neighboring traditional districts. At both performance levels, New Orleans teachers are more likely to exit and, in both settings, low-performing teachers are more likely to exit. Regarding exit from employers, we see substantially larger gaps in survival probabilities between high- and low-performing teachers by market setting. This again suggests that, given the opportunity to switch employers after poor performance, New Orleans teachers are highly mobile within the school system, as well as being more mobile out of system.

Heterogeneity by School Type

Our primary analysis defines all public schools in Orleans Parish as operating in a market setting, a decision motivated by the fact that they all face significantly fewer regulations and constraints than schools operating in traditional district settings. However, this definition elides the fact that two distinct school districts—OPSB and the RSD—and dozens of CMOs operated schools in the city, and each organization faced somewhat different legal frameworks and incentive structures regarding teacher employment. OPSB operated under governance and incentive structures most closely resembling that of a traditional school district, while CMOs had near-complete autonomy over all aspects of school operation. In the handful of schools that RSD operated directly, it hired a principal to run the school and gave them broad discretion over nearly all dimensions of school operation, including human resources decisions. Indeed, principals' broad discretion, coupled with the RSD's intense focus on test scores and the temporary nature of the schools it operated, arguably made it easier for RSD principals to make performance-driven decisions around teacher employment, relative to their OPSB or CMO peers.

Such differences provide a foundation for potential heterogeneity in the relationship between performance and teacher retention. To explore this possibility, we create indicators for each of the three types of Orleans Parish schools noted above and estimate a variant of Equation 1 where we interact those indicators with our measure of teacher value-added. The coefficient estimates for the interactions can be interpreted as the conditional mean difference in exit between teachers employed in traditional district settings and those in each of the three types of schools in Orleans Parish—schools operated by OPSB, the RSD, and CMOs, respectively.

We present the results of this analysis in Online Appendix B2 (online version of the journal). Looking first at school exits, the results make clear that the relationship between teacher performance and exiting the school is significantly stronger in schools operated by the RSD

TABLE 5

Hazard Estimates of the Effects of Value-Added on Teacher Exit Probabilities by Market Setting

Panel A: Prior year value-added measure

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	Exit school						Exit employer						Exit Parish					
	Market	Nonmarket	Market	Nonmarket	Market	Nonmarket	market	Nonmarket	Market	Nonmarket	market	Nonmarket	Market	Nonmarket	Market	Nonmarket	Market	Nonmarket
Vam	0.776***	0.848***	0.764***	0.846***	0.787***	0.891***	0.764***	0.850***	0.758***	0.838***	0.773***	0.883**	0.810***	0.846***	0.808***	0.835***	0.794***	0.882**
	(0.021)	(0.038)	(0.021)	(0.039)	(0.022)	(0.039)	(0.021)	(0.048)	(0.020)	(0.048)	(0.023)	(0.055)	(0.030)	(0.048)	(0.029)	(0.049)	(0.032)	(0.056)
Observations	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Experience FE	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Covariates	No	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes
χ^2	104.8	34.60	218.8	171.4	332.5	385.8	123.8	11.51	222.7	20,800	426.2	29,236	37.20	11.48	1,0846	19,055	11,974	195.3
Schools (*n*)	99	88	99	88	99	88	99	88	99	88	99	88	99	88	99	88	99	88
Failures (*n*)	1,309	816	1,309	816	1,309	816	1,141	452	1,141	452	1,141	452	696	450	696	450	696	450
Panel B: Mean value-added measure																		
Vam	0.770***	0.853***	0.749***	0.849***	0.784***	0.910*	0.765***	0.851***	0.752***	0.832***	0.780***	0.899	0.786***	0.848***	0.786***	0.831***	0.774***	0.900
	(0.022)	(0.047)	(0.021)	(0.047)	(0.025)	(0.045)	(0.023)	(0.052)	(0.022)	(0.053)	(0.027)	(0.060)	(0.032)	(0.053)	(0.033)	(0.054)	(0.038)	(0.062)
Observations	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628	3,295	3,628
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Experience FE	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Covariates	No	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes
χ^2	100.7	31.65	228	152.8	334.1	391.7	101.8	10.80	2,318	2,7724	320.9	30,635	38.87	10.46	280.7	21,358	313.1	23,686
Schools (*n*)	99	88	99	88	99	88	99	88	99	88	99	88	99	88	99	88	99	88
Failures (*n*)	1,309	816	1,309	816	1,309	816	1,141	452	1,141	452	1,141	452	696	450	696	450	696	450

Note. Hazard ratios estimated from Cox models, assuming non-time-varying effects. Standard errors in parentheses are clustered within teachers and schools. Estimates include observations of fourth- to eighth-grade teachers during years they taught in a tested subject and were not eligible for retirement between 2009 and 2015. The market group includes all teachers in Orleans Parish. The nonmarket group includes teachers employed by the Jefferson Parish or St. Bernard Parish school districts. Teacher value-added is standardized within the regional labor market. In Panel A, teacher value-added is estimated based on student growth in the prior year, as described in the appendix. In Panel B, teacher value-added is the mean across all annual observations of the teacher from 2010 to 2015. Teacher covariates include gender, in-state college graduate, alternative certificate program, TFA/TNTP participant, STEM certificate, and SPED certification. School covariates include failing state accountability, percent FRPL, percent Black students, percent Black teachers, teacher retention rate, median teacher experience, and percent TFA/TNTP teachers. FE = fixed effect; TFA = Teach for America; TNTP = The New Teacher Project; STEM = science, technology, engineering, and mathematics; FRPL = free or reduced-price lunch ; Vam = value-added measure; SPED = special education; LEP = limited English proficiency .

*$p < .1$. **$p < .05$. ***$p < .01$.

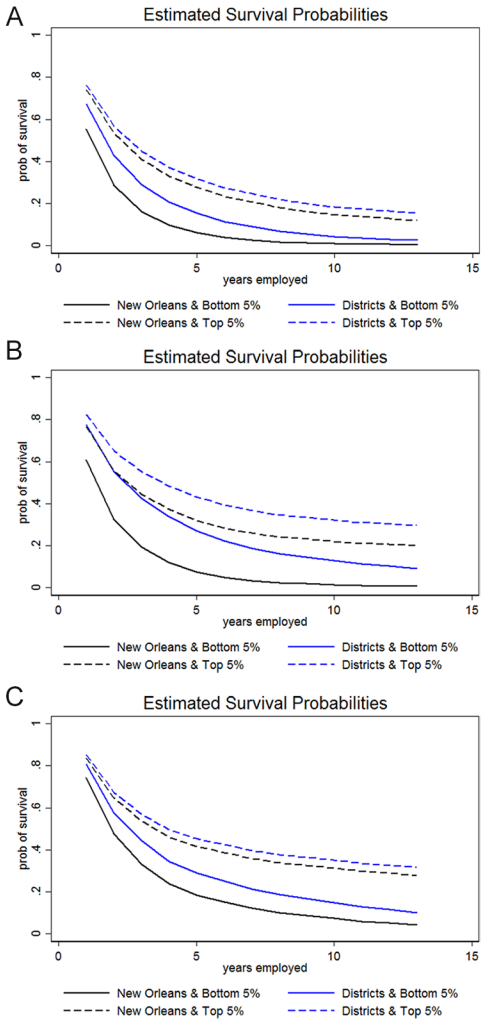

FIGURE 2. *Estimated survival rates over years employed for market and nonmarket teachers: (A) exit from current school, (B) exit from current employer (district or CMO), and (C) exit from current parish school system.*
Note. CMO = charter management organization.

and by CMOs, relative to schools in traditional district settings. For each one standard deviation increase in teacher value-added, the probability of the teacher exiting an RSD school is about 10 percentage points lower than it is in schools in traditional district settings. The analogous estimate for CMO-operated schools is 5 to 6 percentage points. The relationship between a teacher's value-added and their probability of exiting the school is not significantly different in traditional districts and schools operated by OPSB. The fact that the tighter link between performance and retention in the market setting is driven by the entities with relatively more autonomy over school operations reinforces the theory that it may be necessary to more fully deregulate to see measurable changes in the teacher labor market.

Alternative Comparison Group

Our primary analysis compares teachers in the market setting of New Orleans with the traditional districts in Jefferson and St. Bernard Parishes, a comparison motivated by the common labor market and economic conditions. Table 1, however, shows that the demographic makeup of students in the two contexts differs in important ways, most notably racial/ethnic composition. These differences motivated us to conduct an analysis where we used East Baton Rouge as the comparison group for New Orleans. Although East Baton Rouge is approximately 80 miles away from New Orleans, its student body is more demographically similar to New Orleans's, making it a useful alternative comparison group with a small number of charter schools. We present the results of this analysis, which we conducted using the same approach used in our primary analysis, in Online Appendix B3 (online version of the journal). The results are remarkably similar in sign, size, and significance. For each one standard deviation increase in teacher value-added, the probability of the teacher exiting a New Orleans school is 7 to 8 percentage points lower than it is in East Baton Rouge, a traditional district setting. The fact that we obtained similar results from two separate traditional district settings lends additional support to the conclusion that teacher exit and performance are more tightly linked in the market setting of New Orleans than in districts operated in a more traditional manner.

Value-Added Quintiles

Our primary specification imposes linearity on the relationship between teacher exit and the interaction between teacher value-added and employment in the market setting. However, it is easy to imagine this relationship exhibiting a degree of nonlinearity. To assess this possibility, we binned teacher value-added into quintiles and

then estimated a specification that interacts indicators for each of the quintiles with the indicator for market employment. We also include the quintile indicators as main effects in the specification.

We present results from estimating this specification in Online Appendix B4 (online version of the journal), and they provide evidence of nonlinearity in the relationship between teacher exit and the interaction between teacher value-added and employment in the market setting. For example, when analyzing teacher exits from their school, teachers employed in the market setting with a value-added score in the second quintile are about 12 percentage points less likely to exit their school than a teacher with a value-added score in the lowest quintile. The difference in exit probabilities increases to approximately 20 percentage points when comparing teachers in the first versus third quintiles. Interestingly, the point estimates for teachers in the two highest value-added quintiles are not markedly different from the middle-quintile estimates. Substantively, this indicates that moves between the lowest three value-added quintiles are associated with large—and approximately equally sized—differences in the probability of teacher exits from the school. By contrast, moving among the top three quintiles does not meaningfully change the likelihood of school exit for teachers in the market setting. Online Appendix B4 (online version of the journal) illustrates broadly similar results when we turn to analyzing exit from the employer. And the results for exiting the parish exhibit a similar pattern, albeit at different levels.

Alternative Value-Added Specifications and Additional Robustness Tests

Our primary analyses draw upon teacher value-added estimates standardized within the set of teachers employed in Orleans, Jefferson, or St. Bernard parishes. Such standardization has the advantage of allowing us to easily compare the estimates across schools and districts, as they are on the same scale. However, school leaders might be most likely to dismiss the teachers who are lowest performing within their own schools and pay relatively less attention to the regional value-added distribution. The possibility of such behavior suggests the utility of an analysis conducted using value-added estimates standardized within schools. Online Appendix B5 (online version of the journal) presents the results of such an analysis and, relative to our primary results, the coefficient estimates for the interaction terms are smaller (in absolute value terms) for the outcomes of exit from school and exit from employer, but larger for exit from parish. The results for exit from school might seem surprising as they seem to imply that schools push teachers out based more on their performance relative to the average teacher in the region, rather than the school. Importantly, though, the switch to within-school estimates makes high-value-added teachers in low-value-added schools look relatively better than they did with regional standardization, but the opposite is true for high-value-added teachers in high-value-added schools. The pattern of results therefore suggests that high-value-added schools are more likely to retain their best teachers, which of course might be how they became high-value-added schools to start with.

The value-added specification underlying our main results contains covariates measuring classroom characteristics, a decision designed to separate potential peer effects from the estimates of teacher effectiveness. However, if there is systematic sorting of more or less effective teachers to classrooms with different characteristics, then inclusion of classroom characteristics can condition away some of the true teacher effect (Goldhaber et al., 2016). Given this possibility, we perform a robustness test where we estimate teacher value-added using a specification that does not contain student SES measures or classroom characteristics and then estimate Equation 1 with these alternative value-added estimates. We present the results of this analysis in Online Appendix B6 (online version of the journal), with the main takeaway being their remarkable similarity in sign, size, and significance to our primary results in Table 2.

In additional robustness checks, we show that our main results in Table 2 are robust to a number of further changes in either sample or specification, including limiting the sample to the bottom 25% of teachers in terms of statewide performance (see Online Appendix B7), switching from annual teacher value-added to 3-year rolling averages in an effort to minimize imprecision

(see Online Appendix B8), interacting teacher value-added with school characteristic and school performance measures (see Online Appendix B9), and excluding teachers from schools closed in year $t + 1$ to test the potentially confounding effects of accountability-based closure (see Online Appendix B10). We note that the estimated relationship between teacher value-added and exit in the market setting is somewhat smaller when the sample is restricted to teachers in nonclosing schools, suggesting that closures are a lever pulled by actors in a market setting to link teacher performance to retention, if perhaps somewhat bluntly.

Does the Portfolio Model Lead to System-Wide Improvement Over Time?

Our results in Tables 2 to 4, coupled with our supplementary analyses and robustness checks, provide evidence that the relationship between teacher performance and exit is stronger in the market setting of New Orleans than in the more traditional, nonmarket settings of Jefferson and St. Bernard Parishes. While such a relationship has the potential to generate an improvement in teacher quality over time, it is by no means guaranteed. Realizing such improvement would require replacement teachers being more effective than those who exited, a condition called into question by the fact that teacher turnover is substantially higher in New Orleans than in its neighboring parishes. These high turnover rates signal teachers' unwillingness to supply labor to market schools, suggesting that such schools may also have trouble attracting high-quality replacement teachers. Indeed, there is evidence that low job security and longer work hours in post–Katrina New Orleans have reduced teacher job satisfaction (Weixler et al., 2018).

To gain insight into whether teacher exit and hiring patterns have generated quality increases in New Orleans, relative to the nonmarket setting of its neighbors, we analyzed the distributions of value-added for both exiting and entering teachers in each setting. We perform this analysis annually for each exit and hiring cycle from 2011 to 2015. Aggregating across years, the exiting teachers in the nonmarket settings had an average value-added of −0.223 standard deviations, or more than two tenths of a standard deviation below the state average; the replacement teachers averaged −0.182 standard deviations, resulting in a net teacher quality increase of 0.041 standard deviations. In New Orleans, by contrast, the analogous figures were −0.281 for exiting teachers and −0.269 for their replacements—an improvement in value-added of 0.012 standard deviations. In other words, the replacement teachers were slightly better, but these personnel moves did less to improve average teacher quality than those in the comparison group.

To provide further detail, Figure 3A presents kernel densities of the distributions of teacher value-added for exiting New Orleans teachers over our longitudinal period of study, with snapshots in 2010, 2012, and 2014. Consistent with our results above, exiting teachers in New Orleans are of lower quality, on average, relative to their exiting peers in nonmarket districts. These differences are particularly apparent in 2010 and 2012, but a Kolmogorov–Smirnov test rejects the null of distributional equality in all 3 years. To provide more detail, in 2010 the median exiting teacher in New Orleans had an average value-added of −0.42, compared with −0.06 in the comparison districts. This difference of nearly half of a standard deviation is also present at other points in the distribution. In 2012, the two contexts exhibited little difference in the median value-added of exiting teachers, but teachers in the lower half of the distribution in New Orleans had much lower value-added—0.3 to 0.4 standard deviations lower—than their peers at similar points in the distribution for traditional district contexts.

Figure 3B presents kernel densities of distributions of teacher value-added for entering teachers; the value-added estimates are from the first year with the data required for their calculation. We plot results for 2011, 2013, and 2015, which are the years following those for which we present the distributions for exiting teachers in Panel A. Here, we see that the average quality of new entrants is fairly similar in both settings, but more dispersed in New Orleans. Kolmogorov–Smirnov tests again reject the null that the distributions are equal. To provide a more concrete illustration, in 2011 a teacher at the 5th percentile in New Orleans had a value-added of −1.99 while the value-added of a teacher at the same point of the distribution in the comparison districts was

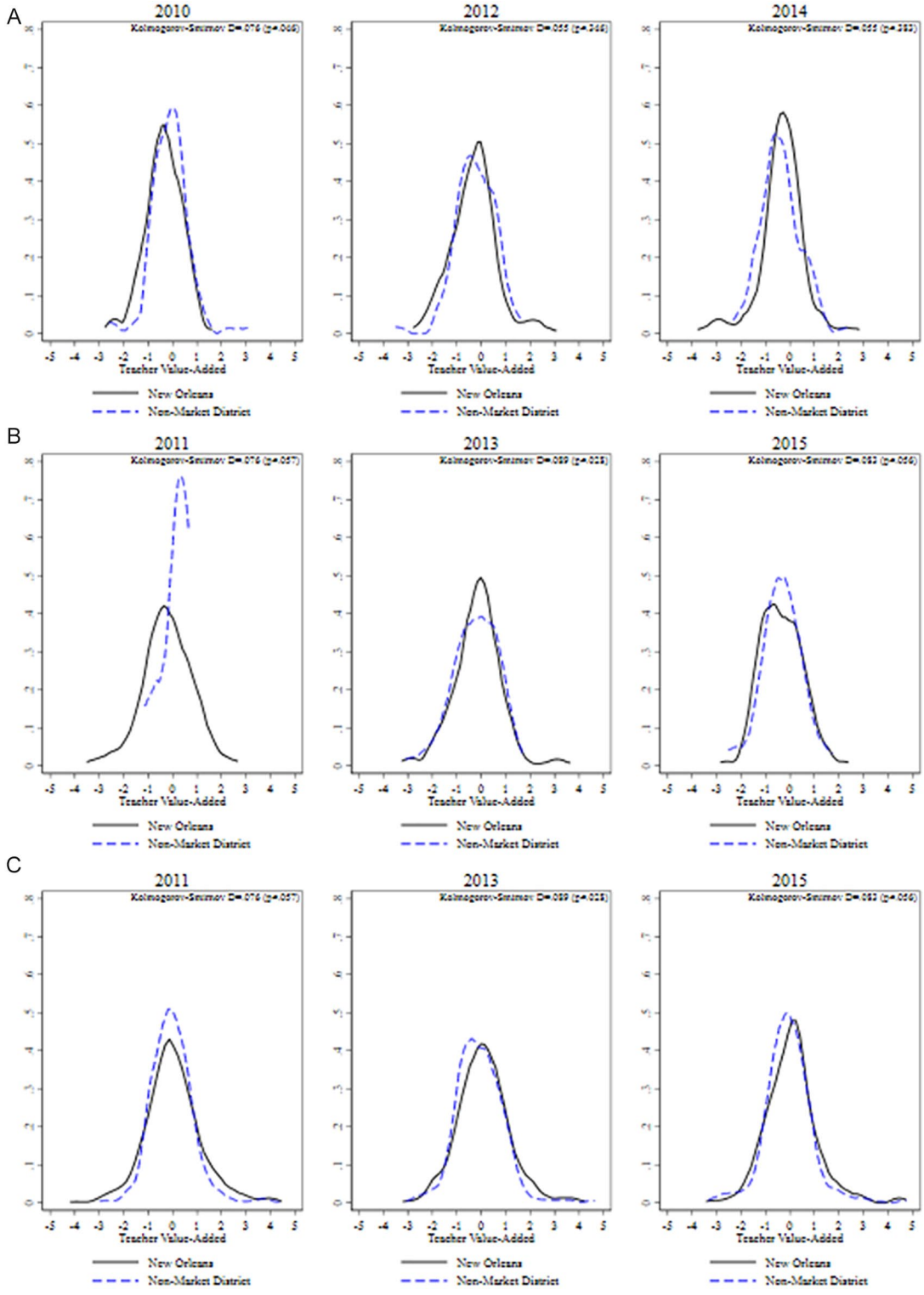

FIGURE 3. *(continued)*

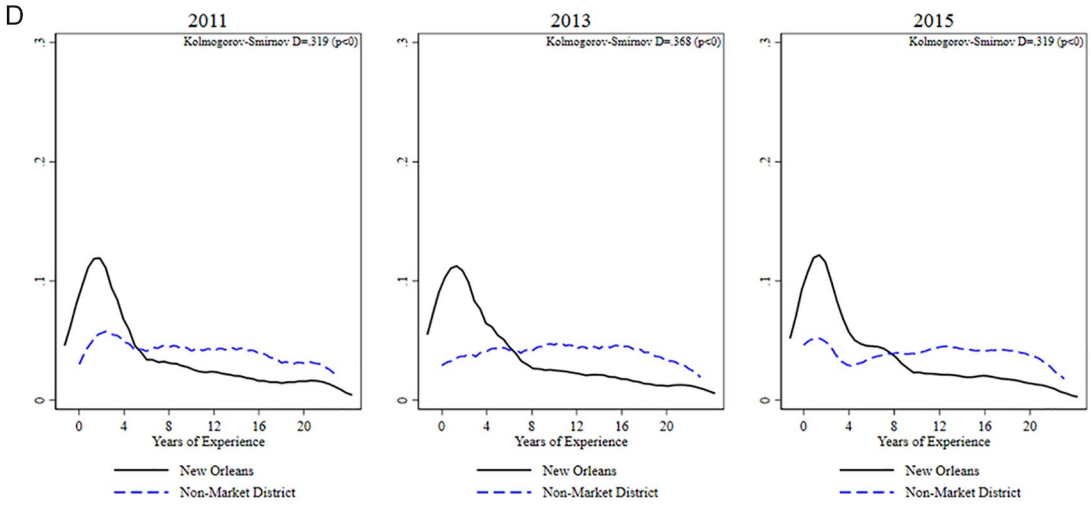

FIGURE 3. *Performance distributions over time by setting: (A) exiting teachers, (B) replacement teachers (new entrants), (C) all teachers, and (D) teacher experience.*

−1.16. By contrast, the value of a 95th percentile New Orleans teacher was 1.33, compared with 0.64 in Jefferson and St. Bernard parishes. The same general dynamics hold in 2013 and 2015, although the differences are less pronounced in these later years.

In Figure 3C, we illustrate the distribution for all teachers. Again, although New Orleans is exiting low-performing teachers more frequently, the overall distributions do not meaningfully separate over time. Indeed, distributional statistics show remarkably little change in the distribution of teacher quality in both New Orleans and the comparison districts from 2011 to 2015. In all cases, the median teacher has a value-added near zero while a 75th percentile teacher is around 0.5 and a 25th percentile teacher has a value-added in the realm of −0.6. Finally, in Figure 3D, we show differences in the distribution of teachers' years employed. Here, we see New Orleans teachers becoming relatively less experienced over time, a trend that may contribute to the stagnant average quality that we observe in Panel C.

This analysis is only descriptive and imperfectly represents the dynamics of system-wide teacher quality across market and nonmarket settings. It does not account for teacher movement between tested and nontested subjects, and it accounts for neither experience-driven quality gains nor factors other than policy and practice that might influence the quality of teachers who enter the local market. What it does do, however, is illustrate why simply examining the relationship between performance and retention is insufficient to conclude that the market model improves quality at the system level. The same policies influencing that relationship may also influence quality through the supply of replacement teachers, but in opposite directions. More broadly, it makes clear that a number of considerations are relevant to assessing the normative desirability of a market-oriented approach to teacher labor. The relationship between quality and retention is certainly one such consideration, but so are turnover rates, the distribution of teacher effectiveness, the supply of potential replacement teachers, and cost, among others.

Discussion

The theory of public school improvement through market-based reform relies on the argument that employment regulations, teacher contracts, and monopsony hiring create conditions that allow low-performing teachers to continue employment with little incentive to improve (Chubb & Moe, 1990). In this article, we examine whether schools operating in the market setting of New Orleans are more likely to recruit and retain effective teachers, compared with schools operating in more traditional governance contexts in the neighboring parishes of Jefferson

and St. Bernard. Our results make clear that there is indeed a stronger relationship between teacher performance and exit among schools operating in the market context.

To better understand the dynamics of a deregulated teacher labor market, we discuss three distinct mechanisms at work in the New Orleans context. First, as in most settings of urban education reform, turnover and exit in general are substantially higher in Orleans Parish than neighboring districts. This turnover is likely motivated in part by other components of market-based reform that change the nature of teaching, such as the lack of long-term employment security, longer school days and school years, reduced retirement benefits, and high-stakes accountability. Indeed, research suggests that turnover was much lower in New Orleans prior to market-based school reform (Barrett & Harris, 2015). The dual dynamics of large numbers of teachers exiting the system, coupled with the significant financial constraints that limit teacher pay, means that Orleans Parish, like many urban school districts, must rely on a large and consistent pipeline of new teachers.

Second, there is a dynamic aspect to the performance of teachers who remain employed in the market setting. Efforts to realize improvement through the exit of low-performing teachers implicitly assume that hiring a replacement is more efficient than further investments in current teachers. However, if teacher performance improves with experience—and a large literature documents such improvements (e.g., Harris & Sass, 2011; Rivkin et al., 2005; Wiswall, 2013)—then systems that frequently exit teachers forego some portion of the experience-driven improvements that would otherwise be realized. Of course, how the hypothetical experience-based improvements compare with quality enhancements resulting from hiring replacement teachers is an empirical question, but we do note that the average experience of New Orleans teachers in our sample is only 5.6 years, compared with nearly 10 in neighboring parishes, a disparity suggesting that New Orleans likely leaves some experience-driven quality increases on the table.

A third mechanism at play, one generally left unaddressed in theories of market-based reform, is the potential reduction in the quality of information about teachers in contexts with multiple, competing employers. In traditional governance models, school districts are essentially the sole employers of teachers, so they have data with which to assess all current teachers, which mitigates the issue of adverse selection. This is not the case for charter school managers who are likely to only have access to evaluation data for their own teachers. Such partial information, coupled with the fact that teachers possess information on their own performance that they may strategically provide to potential employers, may make two phenomena more likely to occur. First, it may be the case that low-performing teachers in market settings get rehired elsewhere. Second, high-performing teachers may use evidence of their performance to bargain for increased pay. Indeed, our empirical analyses generate results consistent with both of these phenomena, suggesting that an increased degree of adverse selection in the teacher labor market is likely an unintended consequence of expanding a system's charter sector.

Our findings contrast in important ways with the results of prior studies examining whether the relationship between teacher performance and retention differs across educational settings. Studies conducted in the contexts of both North Carolina (Carruthers, 2012; Jackson, 2012) and Florida (Cowen & Winters, 2013) found that charter school teachers are, on average, less qualified than traditional public school teachers and more likely to exit regardless of performance (Carruthers, 2012; Cowen & Winters, 2013; Jackson, 2012). Nationally representative survey data also demonstrate disproportionately high turnover rates among charter school teachers (Stuit & Smith, 2012). We also find higher turnover among teachers employed in the market setting. Unlike most prior work, though, we find that teacher exit is much more strongly related to performance in the market setting than it is in traditional district settings, with low-performing teachers much more likely to exit than their high-performing peers.

So, what explains the discrepancy between our findings and those of prior research? In our view, the most likely explanation for these differences is the nature of the contexts in which the research was conducted. Indeed, New Orleans is the purest manifestation in the country of the market-based approach to education. It is arguably

the first place where all the elements necessary to encourage performance-based retention were in place: schools held strictly accountable for student performance, an ability to measure teacher performance on those same student outcomes (i.e., teacher value-added to test scores), competition among schools for both students and teachers, and complete autonomy over compensation and employment. The circumstances in New Orleans were specifically arranged to yield links between performance and labor market outcomes, and our results indicate that such links do indeed exist. Still, the market in New Orleans does not work in quite the way that Chubb and Moe (1990) predicted. Much of the teacher movement in the market setting is churn within the system, with teachers switching schools and employers. There appear to be substantial opportunities for reemployment after poor performance in the market setting.

Overall, our set of results provides mixed support for the theory of school improvement through autonomy to hire and fire teachers. It does appear that in a fully realized market setting, teacher retention exhibits a tighter relationship with performance, compared with traditionally governed districts. However, we do not see New Orleans exhibiting a clear improvement in overall teacher quality through this mechanism, as teacher performance relative to neighboring traditional districts is not improving over time. Furthermore, performance differences are only reflected in teacher pay when teachers switch schools, a pattern that may exacerbate already-high turnover rates among teachers in the market setting. Together, our results suggest that the dozens of districts moving toward a system more closely resembling that in New Orleans might expect to see a tightening of the relationship between teacher performance and retention. However, our research also suggests there might be unintended consequences of such transitions, such as higher overall turnover, indicating the need for additional analysis that works to determine whether the downsides of human resource autonomy are offset by the benefits.

Although this work provides novel evidence on an issue at the forefront of education policy debates, it also has some limitations. Perhaps most notably, we are unable to distinguish among the different reasons that might motivate teachers' exits from their current position. We cannot distinguish whether a given exit is driven by supply-side (i.e., teacher) or demand-side (i.e., school) actions. Our inability to make such a distinction has no bearing on the validity of the estimates provided above, but it does have implications for their interpretation. Our results show that the relationship between teacher quality and retention is tighter in New Orleans than in the traditionally governed neighboring districts of Jefferson and St. Bernard Parishes. However, our results tell us less about why the relationship is tighter. Do New Orleans charter schools dismiss low-performing teachers at much higher rates? Do they work harder to retain their top performers? Do ineffective teachers determine that they would be better off in a different school, district, or even profession, and proactively resign? Like most labor data, ours leave us unable to adjudicate between these, and other, competing explanations. This opens a natural avenue for future research, one that could be particularly well suited for qualitative inquiry. Future work would also do well to analyze the specific features of the New Orleans context that contributed to the tighter relationship between teacher performance and retention. Is it the autonomy afforded to schools? The choice and competition? The strong performance incentives facing schools? The combination of all these characteristics? In addition to representing an important contribution to the research literature, work that gained insight into the role of each of these features in shaping the relationship between teacher quality and retention would be invaluable to policymakers and practitioners overseeing or considering transitions to a portfolio system.

Appendix

Teacher Value-Added Model

For a given teacher j, student i, classroom c, and school year t, we estimate a standard value-added model:

$$A_{it} = \mu + \alpha A_{it-1} + \beta X_{it} + \gamma Z_{it} + \rho C_{ct} + \theta_{jt} + \varepsilon_{it},$$

where A_{it} is postscore; A_{it-1}, prescore; X_{it}, student educational characteristics; Z_{it}, student socioeconomic status (SES) characteristics, C_{it}, classroom characteristics; θ_{jt}, value-added of teacher j in year t; and ε_{it}, error term for student i in year t.

The model is estimated by year (2009–2015) and subject (math, English language arts [ELA], science, and social studies).

Following Guarino et al. (2015), the above value-added model can be rewritten as follows:

$$y = X\gamma + Z\mathbf{b} + u.$$

X includes student demographics (race, gender, free or reduced-price lunch [FRPL] status, years of persistent FRPL status, LEP, and SPED) and prior test scores. C includes class-level mean pretest scores, standard deviation of pretest scores, and percent FRPL. Z includes course-taking dummies, u contains the unobserved student-specific effects, and $\mathbf{b}$ is the vector of teacher effects.

The shrunken value-added estimate for teacher j is then:

$$\hat{b}_j = \left(\frac{\sigma_b^2}{\sigma_b^2 + \left(\sigma_u^2 / N_j\right)} \right) \left(\bar{y}_j - \bar{x}_j \hat{\gamma} \right).$$

Let $c \equiv \dfrac{\sigma_b^2}{\sigma_b^2 + (\sigma_u^2 / N_j)}$. It represents the shrinkage factor. σ_b^2 is the variance of the teacher effects, b_j. σ_u^2 is the variance of the student-level error, u. N_j is the number of students taught by teacher j. $\bar{y}_j - \bar{x}_j \hat{\gamma}$ is the unshrunken estimate.

Alternative specifications include the following:

- Inclusion of school fixed effect (within-school measure) ϑ_{st}:

$$A_{it} = \mu + \alpha A_{it-1} + \beta X_{it} + \gamma Z_{it} + \rho C_{ct} + \theta_{jt} + \vartheta_{st} + \varepsilon_{it}.$$

- Omission of SES and classroom covariates (Z and C):

$$A_{it} = \mu + \alpha A_{it-1} + \beta X_{it} + \theta_{jt} + \varepsilon_{it}.$$

Authors' Note

The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education. Institutional support was provided by Tulane University; the University of Maryland, Baltimore County; and University of Oklahoma.

Acknowledgments

We are grateful to Joshua Cowen, Adam Kho, Scott Imberman, Matthew Steinberg, Katharine Strunk, Ron Zimmer, and participants in Association for Public Policy Analysis and Management (APPAM), Association for Education Finance and Policy (AEFP), and American Educational Research Association (AERA) national conferences and the National Center for Research on Education Access and Choice (REACH) advisory board for feedback on prior drafts.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study is a project of the National Center for Research on Education Access and Choice (REACH). The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305C100025 to The Administrators of the Tulane Educational Fund.

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Notes

1. Louisiana data linking teachers to student test scores begin in the 2009–2010 academic year, so that is when we begin our analysis of teacher quality and exit. We have access to personal data beginning in 2000–2001, so we are able to observe when teachers entered their current school, employer, and market back to fall 2000. Years of teaching experience is reported as a variable in the personnel data, so we are able to measure a teacher's full teaching career even if her entry date predates our data set.

2. Results are robust to estimate with the Weibull distribution.

3. The extended hazard model is estimated by interacting experience and value-added measures with (logged) time indicators. This allows the employment response to value-added to vary with how long teachers have been employed at the school. We obtain similar results (see Online Appendix B11) regarding differential effects of value-added in market and non-market settings when we estimate the models this way. Schoenfeld tests and mostly insignificant interaction

terms suggest that time-varying effects are null, and thus Equation 2 is preferred.

4. Because all Orleans Parish teachers were dismissed in 2005 during Hurricane Katrina and then subsequently rehired at new or reorganized schools, our data allow us to accurately observe entry for all New Orleans teachers. We are missing exact entry dates for a small number of veteran teachers in St. Bernard and Jefferson Parish for whom we assume an entry date of fall 2000.

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Manuscript received May 12, 2020
First revision received June 21, 2021
Second revision received August 6, 2021
Accepted August 20, 2021