The Impact of Teachers on Academic Decision Making: The Case of School Choice

Rosie Li

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Abstract

Previous literature has found that teachers meaningfully impact the test scores and academic behaviors of students. I find that teachers can also influence the schooling decisions of students in educational environments with school choice. I analyze three distinct contexts that reflect popular school choice policies using administrative data in North Carolina: (1) charter or magnet schools versus traditional public schools, (2) schools in Charlotte before and after the open enrollment reform, (3) schools in Charlotte impacted by No Child Left Behind (NCLB) that were required to offer alternative school options versus non-NCLB schools in Charlotte. In each, I assess how teachers' test-score value-added (VA)—a measure of their ability to improve student test scores from the beginning to the end of the school year—affects the quality of middle schools attended by their students. In all three settings, I find evidence of stronger effects of teacher VA on middle school quality in schools with more choice, relative to schools with less choice. Random effect analyses suggest that teachers could explain up to 10% of the variation in student middle school quality in choice-rich environments. I provide suggestive evidence that teacher counseling may play a role. I show that improved test scores explain only a small portion of the observed effects, while higher teacher VA is associated with a broader range of schools selected by students. These findings suggest that as school choice expands, disparities in teacher quality have broader conse-

quences beyond test scores, potentially amplifying educational inequalities through differences in school selection guidance.

1 Introduction

Teachers play a critical role in shaping the long-run academic outcomes of students. Both quasi-experimental and experimental evidence demonstrate that teachers who can improve students' contemporaneous test scores also positively influence their long-term outcomes. More recently, studies have shown that teachers' ability to improve students' behaviors in the classroom also contributes significantly to their long-term success. Building on previous research that highlights the multi-dimensional impact of teachers, this project explores a new channel through which teachers could impact students: academic decision-making. It is difficult to observe decision-making empirically. However, the increasing access to school choice offers a setting to study the impact of teachers on a crucial academic decision: middle school choice.

In addition, K-12 school choice is becoming increasingly prevalent in the U.S. A recent report from Navigate School Choice reveals that over 10% of students are enrolled in charter and magnet schools, open enrollment policies exist in 43 states, and 36% of students have access to public aid for private school tuition. While recent studies highlight variation in the quality of school choices made by families, and the benefits of providing information to improve decision-making, little is known about the role of teachers in guiding the school choice process. This paper addresses that gap by examining whether elementary school teachers can influence the quality of middle school selections when choice is available to students.

In most cases, public schools follow a residential assignment system, which limits teacher involvement in student school choices. To address this challenge, I identify three specific settings where students are likely to have access to choice in middle school selection. The first setting centers on magnet and charter elementary schools, where students are also likely to apply for magnet and charter middle schools. The second setting is in Charlotte, where a district-wide choice plan was implemented in 2002. The third setting,

also in Charlotte, focuses on schools subject to the No Child Left Behind choice sanction, which were required by law to provide choice for students.

In all three settings, I find that fifth-grade teacher value-added exhibits a larger effect on the average school quality their students attend, compared to settings where school choice is less accessible.

This project contributes to several strands of the literature. The first is the literature studying teachers' impact on students. A large number of studies examine the long-run implications of teachers' ability to improve test scores of students (Rockoff 2004; Rivkin, Hanushek, and Kain 2005; Chetty, Friedman, and Rockoff 2014b). More recent work, using richer data, shows that teachers who improve students' non-cognitive skills also positively affect long-term outcomes (Jackson 2018; Petek and Pope 2023). Survey evidence suggests that when needs arise, elementary school teachers communicate with parents and provide advice (Gill et al. 2008). This paper presents quantitative evidence that teacher advice may act as an independent channel of teacher impact, beyond their effect on students' cognitive and non-cognitive skills.

The second strand of literature focuses on school choice. Research has shown that parental behaviors can influence the school choice outcomes of students (Jabbar and Lenhoff 2019; Kapor, Neilson, and Zimmerman 2020). Kapor, Neilson, and Zimmerman 2020 finds that providing parents with additional information can significantly improve students' choice outcomes. My research suggests that teachers may also play a role in shaping students' school choices, although the specific mechanisms need further investigation.

The third strand of literature examines the impact of counseling on education decision making. Mulhern 2023 finds that exposure to high-quality counselors in high school improves the college outcomes of their students. This paper suggests the potential for studying teacher influence on academic decisions earlier in students' educational trajectories, such as during middle school choice. From a policy perspective, this underscores the potential benefit of hiring elementary school counselors in districts with significant middle school choice options.

In a random effects model, I find that teachers could explain up to 10 % of the variation in student middle school quality when students attend magnet and charter elementary schools and 5 % of the variation under the setting of school choice in Charlotte. Mechanism analyses suggest that test-score value-added explains only a small fraction of the variation.

2 Background

The K-12 education is generally divided into three stages: elementary school, middle school, and high school. The specific grade levels for each stage differ across school districts and states, but in North Carolina, the majority of elementary schools end at grade 5. As a result, most students are required to transition to a different school for sixth grade.

In most cases, students are assigned to middle schools based on their residential addresses, following attendance boundaries determined by school districts. However, in recent years, more and more students have gained access to school choice options at this transition stage. Choosing a middle school, rather than accepting an assignment, can have significant implications for students' futures, as schools influence the academic resources, peers, and teachers to which students are exposed.

Several popular choice options are available to students. The first is alternative types of schools, such as magnet schools and charter schools. Magnet schools are one of the earliest forms of school choice. In the words of Smrekar and Goldring 1999, magnet schools were established to "promote racial diversity and innovation, improve scholastic standards, and provide a range of curricular options". Charter schools have become popular recently, partly due to incentives from programs like Race to the Top (Zheng 2022). A key feature of magnet schools is that they enroll students based on school-specific application processes rather than district assignments. The family of a given student can, in theory, apply for enrollment in any alternative school of their choice, with the caveat that some schools may impose admission criteria such as test scores. Hence,

the existence of magnet and charter schools in North Carolina provides a setting where there is alternative school choice. In particular, I focus on magnet or charter elementary school students, because they had applied for enrollment in their current schools and likely have limited barriers when it comes to applying for alternative middle schools.

Generally, both types of schools do not follow traditional residential assignment policies, allowing families to apply regardless of where they live, though some schools may have admission requirements such as test scores. I focus on magnet and charter elementary school students, as they have previously navigated the application process and are likely to face fewer barriers when applying to middle schools.

The second option is intra-district or inter-district open enrollment. 26 states mandate intra-district policies, and 8 states mandate inter-district policies, according to a 2008 report by Education Commission of the States. Intra-district open enrollment allows students to choose schools within their own districts, while inter-district open enrollment enables students to attend schools outside their home districts. I analyze a case of intra-district choice reform implemented in Charlotte, North Carolina.

The third option is private school vouchers. Vouchers subsidize students to attend private schools. The vouchers are typically provided for disadvantaged students, such as those from low-income families or those with disabilities. While the No Child Left Behind choice sanction setting I study in this paper is not a private school choice program, it shares similarities with the voucher programs in that the policy aims to provide school choice for specific students populations who are more likely to come from disadvantaged background.

3 Data

I use administrative data from North Carolina, obtained from the North Carolina Education Research Data center. Data at the level of schools, students and teachers are used and analyzed, which I will detail more below.

3.1 School-Level Data

I use school-level data to construct two different types of school quality measures. For the first measure, I merge Stanford Education Data Archive data to the North Carolina administrative data, which provides a measure of the mean test score achievement standardized using the National Assessment of Educational Progress to ensure comparability across grades and years. For the second, I use school report cards, which are available starting from 2001, to obtain information on the quality of schools. The data include fraction of students scoring at or above the grade level at each school, for each of the grade they serve from grade 3 to 8. I take the average of the fractions in Math and English across grade 6 through grade 8.

In addition, the dataset includes geo-locations and the NCES school IDs for schools, allowing me to link schools to external data sources, such as attendance boundary files.

3.2 Student-Level Data

Through end-of-grade and masterbuild files, end-of-grade test scores and student demographics are available for each grade from 3 to 8, starting in 1996-1997 and up until 2012-2013. [1] I winsorize the test scores for the top and bottom percent of observations, to limit the influence of outliers that have extremely high or low test scores.

It is possible to follow a student from grade 3 up to middle school. However, the wider grade span one studies, the higher the attrition of the sample is. Therefore, to maximize statistical power, I focus on the transition of grade 5 to grade 6.

Following the literature, I apply the following sample restrictions to the student-level data: 1) students who are matched to the list of teachers obtained from the analysis procedure applied to the teacher-level data 2) students with valid current scores and lagged scores 3) students who have only one single end-of-course record under regular administration record in a year 4) students whose teachers proctor only one grade in a given year 5) students whose class size is between 10 and 39 6) students whose class has

[1] Test scores at the beginning of grade 3 are also available, although math scores are not available in 2006 and reading scores are not available in 2008.

fewer than 50% of students under special education status.

3.3 Teacher-Level Data

The personnel files of teachers contain information about the subjects taught by teachers in a given year. One category that constitutes a substantial share in the elementary school sample is self-contained, where the same teachers teach in the same self-contained classrooms all day. Another broad category is block course, which consists of combinations of disciplines that vary across classrooms. The third category is departmentalized course, which is of a single discipline such as Language Arts, Math, and Social Studies.

This project focuses on elementary school teachers who teach both Reading and Math, to ensure that a given student's Math and Reading scores are both associated with the same teacher. Hence, I handle the personnel data in the following way. I keep all teachers who teach self-contained classrooms and block courses containing both Reading and Math in the combination. For teachers who teach block or departmentalized courses that contain no Math or no Reading in a given year, I examine all their subject records and keep the teacher-year observations where both Reading and Math are found in the records in that year. Further, I focus on non-special-education and non-honors classes, because the school choice processes of students with special education and students in honors programs may be different from the majority of students.

3.4 School Attendance Boundary Data

The school attendance boundary files for grade 5 and grade 6 from 2009 to 2010 are used. The data come from School Attendance Boundary Information System, IPUMS (Manson et al. 2023).

The school attendance boundary data are used to infer the neighborhood grade-6 schools for students assigned by default. While the assignment is based on residential addresses, it is still possible to infer the assignment for a significant number of students. Both grade-5 and grade-6 attendance zones are used. As the grade-5 attendance zones are typically much smaller than the grade-6 attendance zones, there are a number of grade-

5 attendance zones that are completely or largely contained within grade-6 attendance zones. If a student's grade-5 zone has more than 80 % of its area within a grade-6 zone, then I assign the grade-6 school in that corresponding zone as the default school for that student.

4 Teacher Value-Added

I follow the conventional method in constructing teacher value-added as developed by Chetty, Friedman, and Rockoff (2014a). I outline the intuition here. The estimation consists of four steps. The first is to residualize the effect of confounding student characteristics and educational environments from observed test scores. The residualization is performed using variation within teachers across years. For expository purposes, I refer to average residualized scores in a class in a given year as the raw value-added for that class.

The control vectors include gender, parental education, ethnicity, limited English status, special education status, free or reduced lunch price status, academically gifted status, repeated grade status, indicators for missing values of the demographics, prior-year test scores in Math and English as well as their quadratic and cubic polynomials. In addition, the class-level averages of all student-level controls, the school-year averages of student-level demographics, and the school-grade averages of prior year test scores are included as well. It is worth noting that controlling school-level characteristics can absorb unobservable confounders at student level, under a school choice model when the relevant conditions are satisfied (Altonji and Mansfield 2018).

The second step is to obtain the raw value-added for every class for every year in the sample. Then, the (final) value-added for a teacher in a given year will be constructed using the weighted sum of the raw value-added measures of that teacher in all *other* years.

The third step is to construct weights as inputs for estimating value-added for a given teacher in a given year, repeated for every year in which the teacher taught. Note that the weights change depending on which year of value-added is the estimand of interest.

Intuitively, the weights will be higher if the raw value-added estimates covary more with the raw value-added in the year of interest. The weights will be lower in years where raw value-added estimates have high variance.

The fourth step is to compute the final value-added. Note that value-added estimates will be missing if a teacher appears in the sample for only one year.

Table 1 reports the autocorrelation of VA, for Math and English separately. Following the VA literature, I report both classroom-level standard deviation of scores, as well as the error-corrected standard deviation based on the auto-covariance quadratic interpolation. [2]

5 Construction of School Value-Added as a Measure of School Quality

In order to measure school quality in a different dimension, I construct school value-added measures to capture a given middle school's ability to improve student test scores. I use 6th-grade test scores as the baseline measure, and 7th-grade test scores as the endline measure. I use the following standard specification to estimate school value-added:

$$y_{isht} = \lambda_s y_{isht-1} + \theta_{sh} + \alpha_t + \varepsilon_{isht} \tag{1}$$

where y_{isht} denotes the 7th-grade test score of student i in subject s at school h in year t and y_{isht-1} is hence the 6th-grade test score of the same student in the same subject. The parameter of interest is θ_{sh}, the subject-specific school value-added. After obtaining school value-added in Math and English, I average the two as the final school value-added measure.

[2] The error-corrected variance is obtained by regressing estimated auto-covariance on the number of years apart and its quadratic, and then extrapolate to value 0. The predicted value at year 0 is the estimated variance purged of classroom-level shocks.

6 Empirical Analysis for Magnet and Charter Schools

Elementary school students in magnet schools and charter schools are more likely than their peers in regular public schools to consider alternative options of public middle schools. Figure 1 shows the distribution of the fraction of students attending magnet or charter middle schools, in comparison to regular public schools.

I regress school quality of the middle school attended by student i, referred to as $y_{sd(i)}$, on teacher value-added in grade 5 $m_{j(i)t(i)}$, conditioning on a rich set of controls and elementary school and year fixed effects. The control vectors include gender, parental education, ethnicity, limited English status, special education status, free or reduced lunch price status, academically gifted status, repeated grade status, indicators for missing values of the demographics, 4th-grade test scores in Math and English as well as their quadratic and cubic polynomials. The equation is as follows:

$$y_{sd(i)} = \alpha + \beta_1 m_{j(i)t(i)} + \zeta X_i + \delta_{t(i)} + \eta_{so(i)} + \epsilon_i \tag{2}$$

where $y_{sd(i)}$ is the quality of the middle school attended by student i and $m_{j(i)t(i)}$ is the test score value-added of the elementary school teacher for student i in year t when i is in the 5th grade, scaled by the standard deviation of the teacher value-added distribution in the respective subject.

I conduct the above regression analyses in the sample of magnet and charter schools as well as regular public schools separately. To increase comparability, I study major urban school districts: Wake County Schools, Charlotte-Mecklenburg Schools, Guilford County Schools, Durham County Schools, Union County Public Schools, Cabarrus County Schools, Gaston County Schools, and Iredell-Statesville Schools.

Figure 2 shows that teacher VA has a positive effect on school quality in elementary magnet and charter schools, and a null or small effect in regular public schools. One standard deviation increase in teacher VA is associated with an 0.067 standard deviation increase in SEDA school quality on average. The effect on school value-added is around

0.018 standard deviation and is not statistically significant.

7 Empirical Analysis for Charlotte

I use the school choice reform in Charlotte as policy shock that changes the choice environment of students. I use both school value-added and the fraction of students scoring at or above the grade level in Math and Reading from grades 6 to 8 as measures of school quality.

7.1 Reform in Charlotte

In early 2002, Charlotte implemented a district-wide family choice plan, after a court ruled that declared the school district under unitary status. At the beginning of the reform, the parents of each student were required to submit their top 3 choices of schools (Hastings and Weinstein 2008). More than 95% of CMS families submitted their choices for the 2002–2003 academic year (Godwin et al. 2006).

However, a few years later, the district scaled back the policy, with choice reportedly being limited according to some studies, especially after 2005 (Liebowitz and Page 2014). While the choice plan is still in place, families are no longer required to submit a choice form, and some schools that are over-subscribed are no longer available for school choice. Given that it is difficult to know exactly in which year choice became more limited to students, I use descriptive data to infer the changes in the strength of policy implementation. Specifically, I use data to calculate the fraction of students enrolled in the most attended grade-6 school for a given grade-5 school in a given year, and report its average by year in Charlotte and in nearby school districts. Figure 3 shows that in Charlotte, the 2002 reform substantial increased the amount of choice students have. Moreover, it shows that after 2008, choice became less available to students. In comparison, the trend is relatively flat in the control group.

7.2 Econometric Specification

I adopt an analysis similar to the magnet and charter school analysis above, where I regress middle school quality on teacher value-added, controlling for student-level characteristics, school fixed effects, and year fixed effects in pre-reform Charlotte and post-reform Charlotte.

Figure 4 shows that teacher VA has little effect on middle school quality in Charlotte before the school choice reform, but a positive effect of around 0.04 standard deviation in SEDA school quality and average percentage of students at or above grade level. The effect on school value-added is around 0.015 standard deviation and is not statistically significant.

Then, I adopt the following difference-in-difference specification:

$$y_{sd(i)} = \alpha + \theta m_{j(i)t(i)} \times \mathbb{1}\text{Treated}_{\text{so(i)}} \times \mathbb{1}\text{PostReform}_{\text{t}} + \tag{3}$$

$$\lambda_1 m_{j(i)t(i)} \times \mathbb{1}\text{Treated}_{\text{so(i)}} + \lambda_2 \mathbb{1}\text{Treated}_{\text{so(i)}} \times \mathbb{1}\text{PostReform}_{\text{t}} + \tag{4}$$

$$\lambda_3 m_{j(i)t(i)} \times \mathbb{1}\text{PostReform}_{\text{t}} + \tag{5}$$

$$\beta_1 m_{j(i)t(i)} + \beta_2 \mathbb{1}\text{Treated}_{\text{so(i)}} + \beta_3 \mathbb{1}\text{PostReform}_{\text{t}} + \tag{6}$$

$$\zeta X_i + \delta_{t(i)} + \eta_{so(i)} + \epsilon_i \tag{7}$$

where $so(i)$ denote the origin school attended by individual i and $sd(i)$ denote the destination school attended by individual i. $y_{sd(i)}$ denotes the school quality of the middle school attended by individual i in grade 6. $m_{j(i)t(i)}$ is the test score value-added of the elementary school teacher for student i in year t when i is in the 5th grade, scaled by the standard deviation of the teacher value-added distribution in the respective subject. Math and English value-added are averaged to obtain one single value-added measure for a teacher in a given year. $\text{PostReform}_{\text{t}}$ is an indicator variable for post-reform period, which starts in 2002. $\text{Treated}_{\text{so(i)}}$ is an indicator variable for being inside the treated school district Charlotte-Mecklenburg County Schools. Two-way interactions of the teacher VA, policy indicator variable, and treatment district indicator variable are included. The key

parameter is θ, which captures how the policy changes the impact of teacher VA on school quality, relative to the control districts. I include year fixed effects and elementary school fixed effects.

Hence, the variation comes from comparing the differences in the effects of teachers on school quality before and after the choice reform in Charlotte relative to nearby districts.

7.3 Results

Table 2 show the effect of teacher value-added on the school quality of students. I report the coefficients for teacher VA $m_{j(i)t(i)}$, teacher VA interacted with indicator variable for treated schools (i.e. schools in Charlotte) $m_{j(i)t(i)} \times \mathbb{1}\text{Treated}_{\text{so(i)}}$, teacher VA interacted with indicator variable for Charlotte choice reform $m_{j(i)t(i)} \times \mathbb{1}\text{PostReform}_{\text{t}}$, and the three way interactions $m_{j(i)t(i)} \times \mathbb{1}\text{Treated}_{\text{so(i)}} \times \mathbb{1}\text{PostReform}_{\text{t}}$. Across the school quality outcomes I look at, there is little significant effect of teacher VA on school quality in control schools before or after the reform, or in Charlotte before the choice reform. However, after the reform, teacher VA exerts a positive influence on the middle school quality of students for all of the outcomes and is statistically significant for SEDA school quality. A one standard deviation increase in teacher value-added (approximate corresponding to raising student Reading test scores by 0.11 and student Math test scores by 0.18) on average is associated with an additional increase in school quality of 0.087 standard deviation of SEDA school quality attributable to the choice reform in Charlotte.

8 No Child Left Behind School Choice

8.1 Background

The federal policy, known as No Child Left Behind (NCLB), implemented a suite of education policies in the early 2000s. Among them was a stipulation on school choice provision targeted at low-performing Title I schools. The stipulation requires Title I schools that are "Title-I improving", which is defined by failing Adequate Yearly Progress (AYP) for two consecutive years, to provide choices of better schools for their students.

In practice, Title I choice options were not offered in all districts, especially at the middle school and high school level. According to a RAND report on the state and local implementation of NCLB, only 20% and 17% of the districts required choice at the middle school and high school levels, respectively. In contrast, 70% of the districts required choice for elementary schools (Gill et al. 2008).

However, the Charlotte–Mecklenburg Schools (henceforth, CMS) district, a large school district in North Carolina did offer choice at the elementary school and middle school levels. As reported in Hastings and Weinstein (Hastings and Weinstein 2007), in the year of 2004, the district determined that six middle schools were designated as Title-I improving, and hence were subject to the NCLB sanction.

While entering 6-graders may not necessarily be provided with the choice policy, when they are, they are more likely to take up the policy compared to most other grades. The table below is reproduced from Exhibit 6 of a RAND report on the implementation of NCLB (Gill et al. 2008). It shows that students enrolling in the 6th grade are more likely to utilize the school choice option, compared to most other grades. As discussed in the report, this is likely because students were moving from elementary schools to middle schools at this grade.

Hence, I examine students in CMS who are bound to attend a grade-6 school under improvement status. This analysis provides a third setting where the choice environment of students was significantly changed due to an exogenous federal education policy.

In terms of research design, ideally, if I have access to students' residential addresses, I could identify students' eligibility for the school choice program using information on their addresses and their school attendance zones. However, as I do not have data on addresses, I infer the assigned grade-6 schools from grade-5 schools by using the maps of attendance zones for grade-5 and grade-6.

Figure 5 provides a visual representation of the geographical data. I use geographical information from 2009-2010, the earliest year for which data are available. I identify grade-5 elementary school zones that are completely contained within failing grade-6 middle school zones. The elementary school attendance zones are graphed, and the dark

color shaded regions denote the zones in which students are affected by the No Child Left Behind policies.

I use the information from Billings, Brunner, and Ross 2014, with modifications made for 2004 based on North Carolina administrative data and the report that six middle schools were classified as under improvement status in 2004 from Hastings and Weinstein 2007. Then, I identify the set of grade-6 boundaries where students have choice through NCLB, using crosswalk files provided in the SABINS project (Manson et al. 2023). Next, I collect a set of grade-5 attendance boundaries. Finally, I link the grade-5 boundaries to grade-5 schools using the crosswalk files, thereby identifying the set of grade-5 schools that are "feeder schools" to the grade-6 schools under the NCLB choice provision policy.

In Charlotte, the NCLB choice provision was first implemented in 2004. Figure 6 shows that for non-NCLB schools, choice became less available in 2004, but remained similar for NCLB schools. Overall, NCLB schools experienced greater amount of choice, even though both types of schools were treated in Charlotte.

This is consistent with the policy background discussed in Hastings and Weinstein 2007, where it reported that the district expanded capacity at schools to accommodate NCLB students and parents in NCLB schools were provided with information sheets.

8.2 Econometric Specification

To study how the effect of VA on school quality differs by choice availability, I interact teacher VA with an indicator variable of whether a student is assigned to an NCLB failing grade-6 school, in the sample of post-reform Charlotte. Formally, the specification is as follows:

$$y_{sd(i)} = \alpha + \beta m_{j(i)t(i)} + \lambda \mathbb{1}\text{NCLBSanctioned}_{\text{so(i)t}} + \tag{8}$$

$$\theta m_{j(i)t(i)} \times \mathbb{1}\text{NCLBSanctioned}_{\text{so(i)t}} + \tag{9}$$

$$\zeta X_i + \delta_{t(i)} + \eta_{so(i)} + \epsilon_i \tag{10}$$

where $y_{sd(i)}$ is the quality of the middle school attended by student i and $m_{j(i)t(i)}$ is the test score value-added of the elementary school teacher for student i in year t when i is in the 5th grade, scaled by the standard deviation of the teacher value-added distribution in the respective subject. $\mathbb{1}\text{NCLBSanctioned}_{\text{so(i)t}}$ is an indicator variable denoting whether a student is in a grade-5 elementary school whose attendance boundary area falls inside an NCLB failing grade-6 middle school in a given year. The key parameter θ captures how the policy changes the impact of teacher VA on school quality in NCLB schools, relative to non-NCLB schools.

8.3 Results

As for the alternative school analyses and the Charlotte choice reform above, I begin by simply regressing middle school quality on teacher value-added in the sample of No Child Left Behind (NCLB) Schools in Charlotte and the sample of non-NCLB schools in Charlotte during the choice reform period, to see how the strength of the choice provided affects the dynamics of teacher impact. Given that NCLB provided stronger choice for a set of schools (as shown in Figure 6), as expected, the effect sizes are bigger in NCLB-schools, although they are noisier as well. The results are presented in Figure 7.

Then Table 4 show the results of the regression analyses with interaction terms. The coefficients are noisy due to the relatively small number of observations so there is no conclusive result. However, for most of the school quality outcomes, teacher VA exhibits a greater association with school quality in NCLB schools, compared to non-NCLB schools.

9 Mechanism

While it is difficult to precisely pin down the mechanisms, I provide some suggestive evidence that teacher counseling may play a role in the observed effect through two analyses.

First, I examine how grade-5 test scores mediate the effects, by including both grade-5 Math and grade-5 Reading test scores as controls in the above regression analyses. I find

that while these two covariates are positive and significant predictors of middle school quality attended by students, they do not mediate the effect of teachers on middle school quality. This suggests that improvement of test scores is not the main way through which teachers impact middle school quality. The supporting evidence for each of the three analyses above is presented in Figure 8 to 10.

Then, I examine the total number of non-default schools attended within a class as an outcome, to see whether students who have higher-VA teachers tend to be enrolled in a wider variety of middle schools. I take the number of schools chosen by students under a given teacher, excluding the default middle schools under school assignments. I construct default schools using school attendance boundaries. If an elementary school attendance boundary overlaps with more than one middle school attendance boundary, I assign all the middle schools as default schools for that elementary school and hence exclude these middle schools from the total count of schools attended by students. I use the total number of non-default middle schools chosen by students under a given teacher as the outcome variable, and regress it on teacher VA (conditioning on the same control variables as the above analyses, including elementary school fixed effects). Table 5 and 6 reports the results. Teacher VA is associated with a positive and statistically significant increase in the number of schools selected by students in the context of magnet schools and NCLB schools in Charlotte, but not in regular schools or in Charlotte before the choice reform.

10 Random Effects Model

To further understand the potential magnitude of the impact of teachers, I use a random effects model to estimate how teachers account for the variation in middle school quality, conditioning on the same set of controls in the above analyses as well as teacher value-added.

Table 7 to Table 8 report the results in the settings of magnet and charter schools and in Charlotte during the choice reform. Teachers account for about 9.7% of the variation

in SEDA school quality in magnet and charter schools and 4.8% in Charlotte during the choice reform, after including the teacher test score VA.

11 Conclusion

I find that the value-added of teachers impacts the quality of next-stage schools attended by students when choice is provided for students. I show this in the context of popular school choice settings, including alternative public schools, district-wide choice provision, and targeted choice provision for disadvantaged students. In addition, the improvement of test scores does not explain much of the effect. Counseling on which schools to attend may play a role, though I have only indirect evidence on this rather than direct reports.

The findings suggest that the nature of teacher impact on students may become more nuanced as K-12 choice becomes increasingly available to students. In addition, it suggests that teachers may play a role in shaping students' school choice outcomes in the school choice system, in addition to the behaviors of parents.

However, it remains to be further investigated how teachers impact the school choice outcomes of students. Future research could conduct surveys to understand whether teachers provide advice for their students on which middle schools to attend.

Years Apart	Autocorrelation Reading	Autocorrelation Math
Lag 1	0.33	0.54
Lag 2	0.30	0.49
Lag 3	0.25	0.44
Lag 4	0.22	0.41
Lag 5	0.21	0.38
Lag 6	0.18	0.35
Lag ≥ 7	0.18	0.33
Classroom-level SD	0.140	0.216
Interpolated SD	0.113	0.184

Table 1: Autocorrelation in Reading and Math Teacher Value-Added Over Time

Notes: This table reports the autocorrelation of Reading and Math value-added by the number of years apart, up to 7 years and above. The classroom-level standard deviation reports the observed variation in teacher VA at the class level. The interpolated standard deviation reports the extrapolated value, by regressing autocovariance on the number of years apart and its square and take the fitted value at 0 year apart.

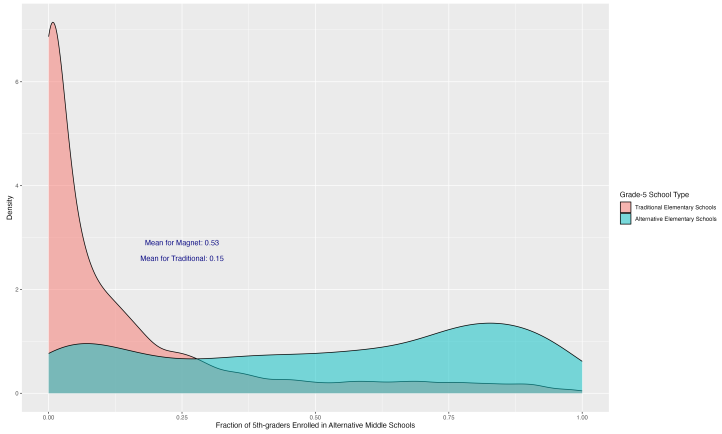

Figure 1: Fraction of 5th-graders from Traditional and Alternative Public Elementary Schools Enrolled in Alternative Middle Schools

Notes: This figure is a density plot of the fraction of students attending alternative middle schools within a given elementary school at the elementary school level. The red shows the density for traditional public elementary schools, while the green shows the density for alternative elementary schools.

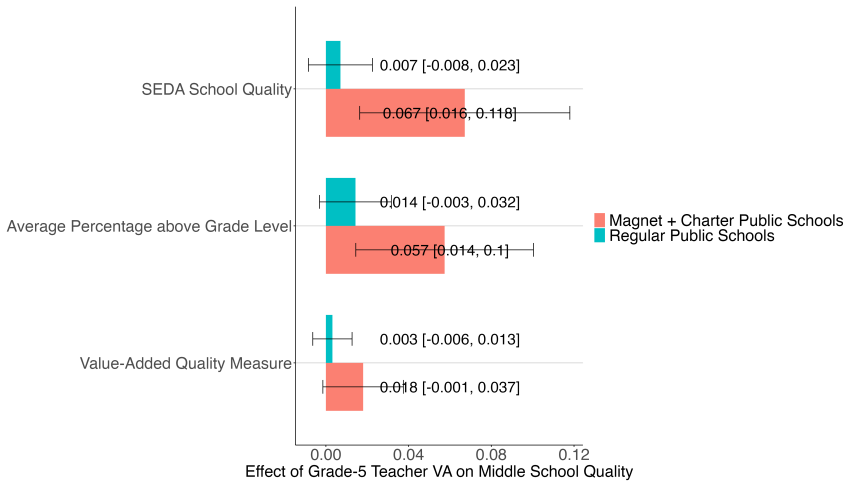

Figure 2: Effect of Teacher VA on Middle School Quality in Alternative vs. Regular Public Elementary Schools

Notes: This figure reports the effect of teacher VA on middle school quality by elementary school type. The Y-axis labels the outcome variable, the measure of school quality that is used. The green bars represent regular public schools, while the red bars represent alternative public schools. The point estimates are provided, and the confidence intervals are included in brackets.

Figure 3: Trend in Middle School Choice Availability in Charlotte-Mecklenburg School Districts and nearby school districts

Notes: This figure reports the average percentage of students enrolled in their non-default middle schools, as defined by the most attended destination school in a given elementary school. The blue points represent schools in Charlotte-Mecklenburg School District, while the blue points represent schools in nearby districts.

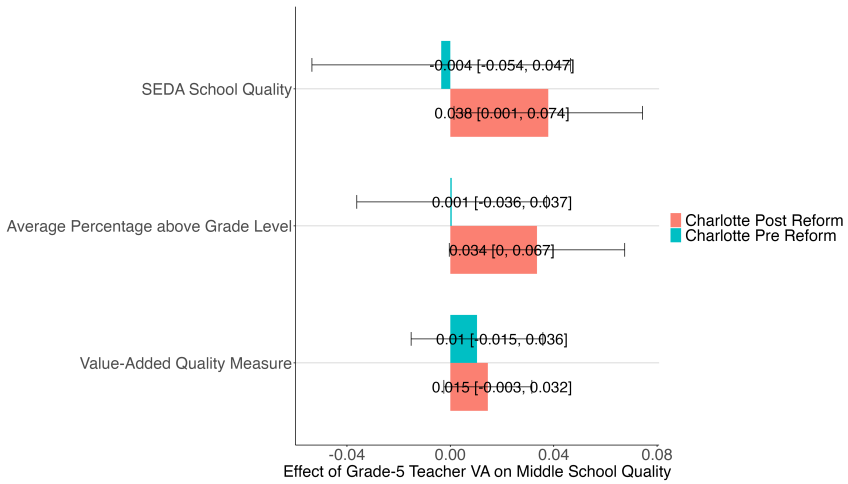

Figure 4: Effect of Teacher VA on Middle School Quality in Charlotte Pre and Post Choice Reform

Notes: This figure reports the effect of teacher VA on middle school quality before and after the choice reform in Charlotte. The Y-axis labels the outcome variable, the measure of school quality that is used. The green bars represent the before-reform period, while the red bars represent the after-reform period. The point estimates are provided, and the confidence intervals are included in brackets.

	Dependent variable:		
	SEDA School Quality	Average Percentage Above Grade Level	Value-Added Quality Measure
	(1)	(2)	(3)
Teacher VA	-0.030^{*}	-0.016	-0.003
	(0.017)	(0.015)	(0.005)
VA $\times$ $\text{Treated}_{\text{so(i)}}$	0.005	0.016	0.006
	(0.040)	(0.034)	(0.018)
VA $\times$ $\text{PostReform}_{\text{t}}$	0.008	0.006	0.003
	(0.017)	(0.018)	(0.005)
VA $\times$ $\text{Treated}_{\text{so(i)}}$ $\times$ $\text{PostReform}_{\text{t}}$	0.087^{**}	0.042	0.017
	(0.043)	(0.039)	(0.020)
Observations	75,501	83,483	60,908
R^2	0.643	0.622	0.803

Table 2: Difference-in-Difference Results

Notes: The table reports results from the difference-in-difference analysis which compares Charlotte and nearby schools districts after the school choice reform in Charlotte. The outcome variables are SEDA average school achievement, Percentages Above Grade Level averaged across grade 6 through 8, and School Value-Added Measures. Standard errors are heteroskedasticity-consistent and clustered at the teacher-year level. *p<0.1; **p<0.05;***p<0.01.

Grade	Percentage of Eligible Students Participating in School Choice
K	4.1%
1	0.9%
2	0.6%
3	1.0%
4	0.7%
5	0.6%
6	**1.5%**
7	0.6%
8	0.4%
9	0.4%
10	0.4%
11	0.2%
12	0.4%

Table 3: No Child Left Behind School Choice Participation Statistics from Gill et al. 2008

Notes: This table, reproduced from Gill et al. 2008, provides information on the implementation of the school choice sanction policy under No Child Left Behind by grade level from Kindergarten to grade 12. The reasons that the overall participation rate is low are manyfold. One important reason is that only 29 % of districts notified the students of the title I school choice option before the start of the academic year. For another, other school choice options already existed, especially in urban school districts.

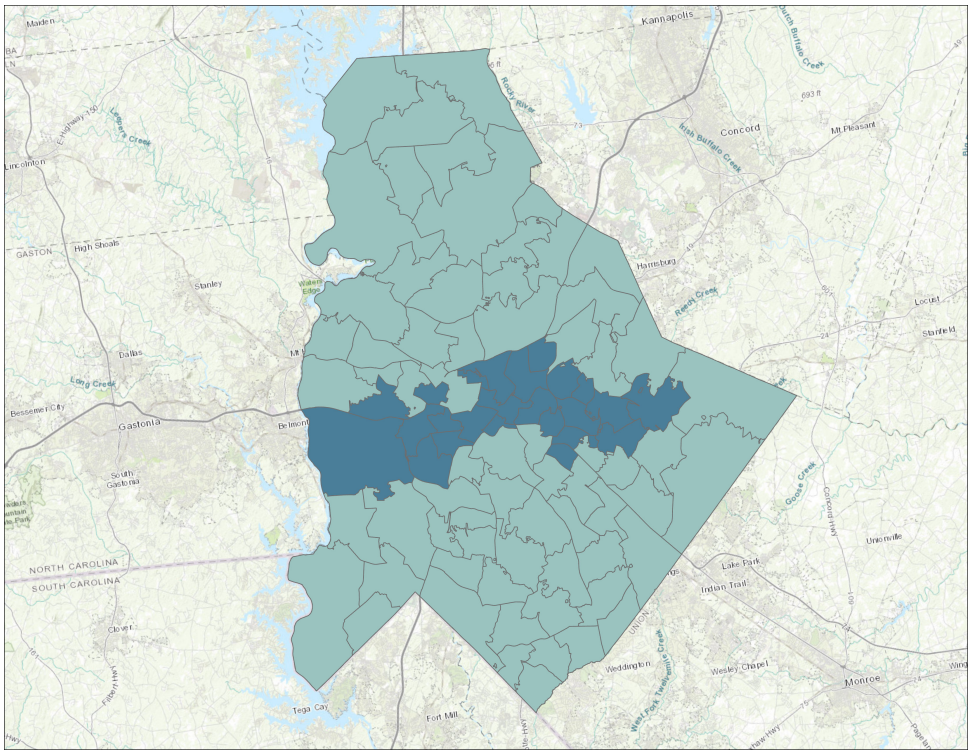

Figure 5: Elementary Schools Contained in the Attendance Boundaries of Grade-6 Failing Schools

Notes: This figure shows the relationship between middle school attendance boundaries and elementary school attendance boundaries, with an emphasis on the catchment zones of NCLB failing schools in 2004. The elementary school attendance zones in Charlotte are graphed, and the dark color shaded regions denote the zones in which students were affected by the No Child Left Behind policies.

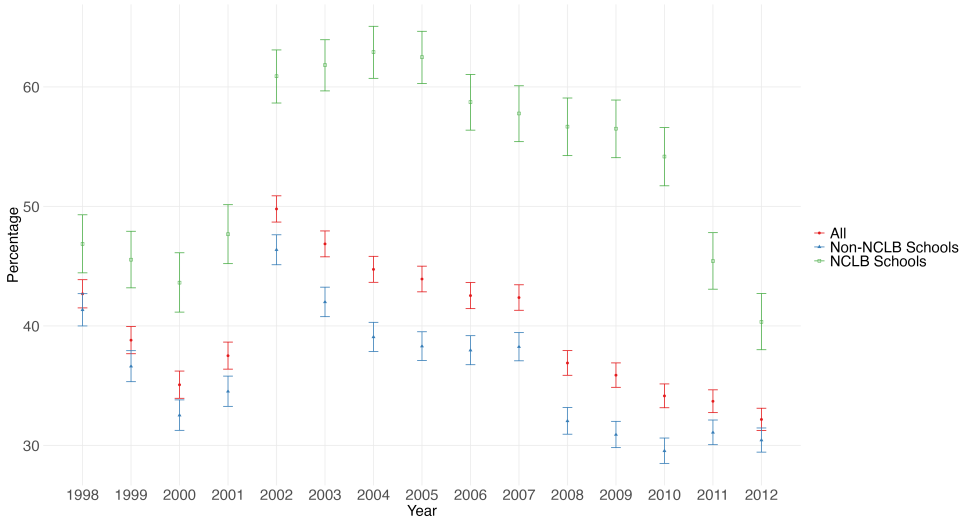

Figure 6: Trend in Middle School Choice Availability in Charlotte by No Child Left Behind Sanction Status

Notes: This figure reports the average percentage of students enrolled in their non-default middle schools, as defined by the most attended destination school in a given elementary school. The red points represent all schools in Charlotte-Mecklenburg School District. Additionally, the green points represent schools in Charlotte that are NCLB sanctioned, while the blue points represent schools in Charlotte that are not NCLB sanctioned.

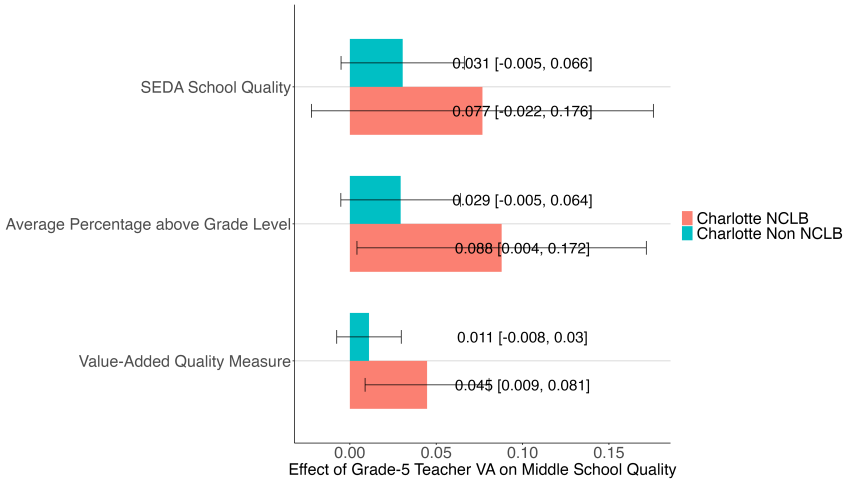

Figure 7: Effect of Teacher VA on Middle School Quality in NCLB vs. Non-NCLB Schools in Charlotte Post Choice Reform

Notes: This figure reports the effect of teacher VA on middle school quality in NCLB sanctioned schools and non-sanctioned schools after the choice reform in Charlotte. The Y-axis labels the outcome variable, the measure of school quality that is used. The green bars represent the before-reform period, while the red bars represent the after-reform period. The point estimates are provided, and the confidence intervals are included in brackets.

	Dependent variable:		
	SEDA School Quality	Average Percentage Above Grade Level	Value-Added Quality Measure
	(1)	(2)	(3)
Teacher VA	0.034^{**}	0.032^{**}	0.011
	(0.014)	(0.012)	(0.008)
NCLB Choice Sanctioned	-0.168^{***}	-0.168^{***}	-0.043^{***}
	(0.029)	(0.026)	(0.016)
Interaction of VA and NCLB Status	0.036	0.022	0.019
	(0.033)	(0.030)	(0.018)
Observations	26,540	27,565	19,116
R^2	0.588	0.594	0.664
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 4: No Child Left Behind Policy Regression Results

Notes: The table reports results from the interaction analysis which compares NCLB schools and non-NCLB after the school choice reform in Charlotte. The outcome variables are SEDA average school achievement, Percentages Above Grade Level averaged across grade 6 through 8, and School Value-Added Measures. Standard errors are heteroskedasticity-consistent and clustered at the teacher-year level. *p<0.1; **p<0.05;***p<0.01.

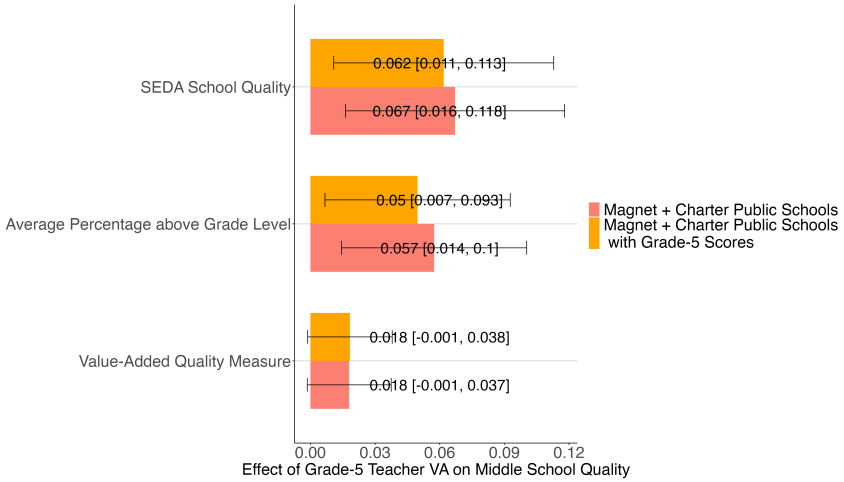

Figure 8: Effect of Teacher VA on Middle School Quality in Alternative Public Elementary Schools, Before and After conditioning on Grade-5 Scores

Notes: This figure reports the effect of teacher VA on middle school quality in alternative public elementary schools, before and after conditioning on grade-5 test scores. The Y-axis labels the outcome variable, the measure of school quality that is used. The green bars represent after conditioning on grade-5 test scores, while the red bars represent before. The point estimates are provided, and the confidence intervals are included in brackets.

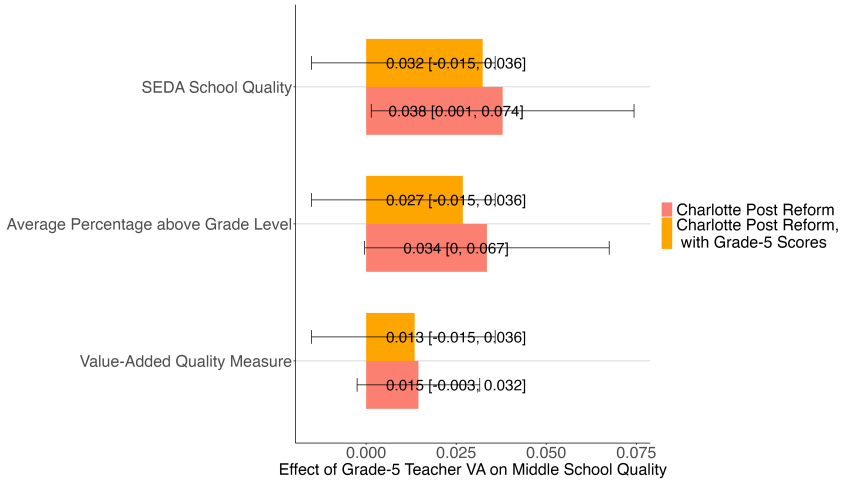

Figure 9: Effect of Teacher VA on Middle School Quality in Charlotte, Before and After conditioning on Grade-5 Scores

Notes: This figure reports the effect of teacher VA on middle school quality in Charlotte after the choice reform, before and after conditioning on grade-5 test scores. The Y-axis labels the outcome variable, the measure of school quality that is used. The green bars represent after conditioning on grade-5 test scores, while the red bars represent before. The point estimates are provided, and the confidence intervals are included in brackets.

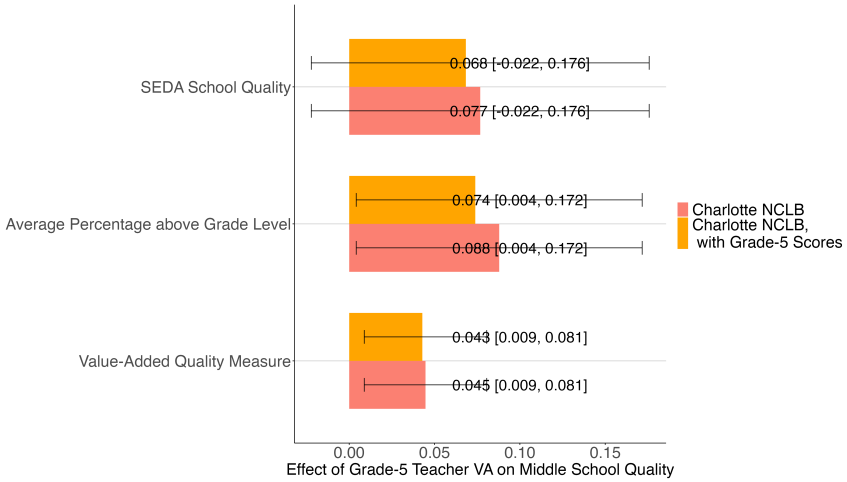

Figure 10: Effect of Teacher VA on Middle School Quality in Charlotte NCLB Schools, Before and After conditioning on Grade-5 Scores

Notes: This figure reports the effect of teacher VA on middle school quality in No Child Left Behind sanctioned schools in Charlotte, before and after conditioning on grade-5 test scores. The Y-axis labels the outcome variable, the measure of school quality that is used. The green bars represent after conditioning on grade-5 test scores, while the red bars represent before. The point estimates are provided, and the confidence intervals are included in brackets.

	Dependent variable:	
	Number of Schools Within a Class	
	Magnet + Charter	Regular Public Schools
Teacher VA	0.051	−0.005
	(0.105)	(0.047)
Observations	23,643	86,022
R^2	0.584	0.498
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 5: Mechanism Analysis: The effect of Teacher VA on Variety of Schools

Notes: The table reports results from the mechanism analysis which examines alternative and regular public schools. The outcome variable is the number of schools chosen by students under a given teacher, excluding the default middle schools under school assignments. *p<0.1; **p<0.05;***p<0.01.

	Dependent variable:		
	Number of Schools Within a Class		
	Charlotte Before	Charlotte After	NCLB schools in Charlotte
Teacher VA	−0.198	0.141	0.748***
	(0.146)	(0.092)	(0.209)
Observations	14,281	27,116	3,543
R^2	0.609	0.644	0.457
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 6: Mechanism Analysis: The effect of Teacher VA on Variety of Schools

Notes: The table reports results from the mechanism analysis which examines Charlotte before and after the choice reform and NCLB schools in Charlotte during the school choice reform period. The outcome variable is the number of schools chosen by students under a given teacher, excluding the default middle schools under school assignments. *p<0.1; **p<0.05;***p<0.01.

Measure	% **Variance Explained**
SEDA School Quality	0.097
	(0.0079)
Average Percentage Above Grade Level	0.080
	(0.0070)
Value-Added Quality Measure	0.026
	(0.0043)

Table 7: Random Effects Model: Magnet and Charter Schools

Notes: The table reports results from the random effects analysis which examines alternative public schools. Each row represents a school quality outcome. The column estimates the fraction of variance in the corresponding outcome explained by teacher value-added.

Measure	% **Variance Explained**
SEDA School Quality	0.048
	(0.0050)
Average Percentage Above Grade Level	0.038
	(0.0044)
Value-Added Quality Measure	0.009
	(0.0028)

Table 8: Random Effects Model: Charlotte during Choice Reform

Notes: The table reports results from the random effects analysis which examines schools in Charlotte during the choice reform period. Each row represents a school quality outcome. The column estimates the fraction of variance in the corresponding outcome explained by teacher value-added.

References

Altonji, Joseph G. and Mansfield, Richard K. (Oct. 2018). "Estimating Group Effects Using Averages of Observables to Control for Sorting on Unobservables: School and Neighborhood Effects". In: *American Economic Review* 108.10, pp. 2902–2946. ISSN: 0002-8282. DOI: 10.1257/aer.20141708. (Visited on 10/14/2023).

Billings, Stephen B., Brunner, Eric J., and Ross, Stephen L. (2014). "The Housing and Educational Consequences of the School Choice Provisions of NCLB: Evidence from Charlotte, NC". In: *NC (December 4, 2014)*. (Visited on 02/23/2024).

Chetty, Raj, Friedman, John N., and Rockoff, Jonah E. (Sept. 2014a). "Measuring the Impacts of Teachers I: Evaluating Bias in Teacher Value-Added Estimates". In: *American Economic Review* 104.9, pp. 2593–2632. ISSN: 0002-8282. DOI: 10.1257/aer.104.9.2593. (Visited on 10/09/2023).

— (Sept. 2014b). "Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood". In: *American Economic Review* 104.9, pp. 2633–2679. ISSN: 0002-8282. DOI: 10.1257/aer.104.9.2633. (Visited on 10/09/2023).

Gill, Brian et al. (Feb. 2008). *State and Local Implementation of the No Child Left Behind Act: Volume IV – Title I School Choice and Supplemental Educational Services: Interim Report*. Tech. rep. U.S. Department of Education. (Visited on 07/24/2024).

Godwin, R. Kenneth et al. (2006). "Sinking Swann: Public School Choice and the Resegregation of Charlotte's Public Schools". In: *Review of Policy Research* 23.5, pp. 983–997. ISSN: 1541-1338. DOI: 10.1111/j.1541-1338.2006.00246.x. (Visited on 04/08/2024).

Hastings, Justine and Weinstein, Jeffrey (Apr. 2007). *No Child Left Behind: Estimating the Impact on Choices and Student Outcomes*. Tech. rep. w13009. Cambridge, MA: National Bureau of Economic Research, w13009. DOI: 10.3386/w13009. (Visited on 04/16/2024).

— (Nov. 2008). "Information, School Choice, and Academic Achievement: Evidence from Two Experiments*". In: *The Quarterly Journal of Economics* 123.4, pp. 1373–1414. ISSN: 0033-5533. DOI: 10.1162/qjec.2008.123.4.1373. (Visited on 04/08/2024).

Jabbar, Huriya and Lenhoff, Sarah Winchell (2019). "Parent Decision-Making and School Choice". In: *Handbook of Research on School Choice*. 2nd ed. Routledge. ISBN: 978-1-351-21044-7.

Jackson, C. Kirabo (Oct. 2018). "What Do Test Scores Miss? The Importance of Teacher Effects on Non–Test Score Outcomes". In: *Journal of Political Economy* 126.5, pp. 2072–2107. ISSN: 0022-3808. DOI: 10.1086/699018. (Visited on 10/14/2023).

Kapor, Adam J., Neilson, Christopher A., and Zimmerman, Seth D. (May 2020). "Heterogeneous Beliefs and School Choice Mechanisms". In: *American Economic Review* 110.5, pp. 1274–1315. ISSN: 0002-8282. DOI: 10.1257/aer.20170129. (Visited on 06/24/2024).

Liebowitz, David D. and Page, Lindsay C. (Aug. 2014). "Does School Policy Affect Housing Choices? Evidence From the End of Desegregation in Charlotte–Mecklenburg". In: *American Educational Research Journal* 51.4, pp. 671–703. ISSN: 0002-8312, 1935-1011. DOI: 10.3102/0002831214541046. (Visited on 04/08/2024).

Manson, Steven et al. (2023). *National Historical Geographic Information System: Version 18.0*. DOI: 10.18128/D050.V18.0. (Visited on 04/18/2024).

Mulhern, Christine (2023). "Beyond Teachers: Estimating Individual School Counselors' Effects on Educational Attainment". In: *American Economic Review* 113.11.

Petek, Nathan and Pope, Nolan G. (Apr. 2023). "The Multidimensional Impact of Teachers on Students". In: *Journal of Political Economy* 131.4, pp. 1057–1107. ISSN: 0022-3808, 1537-534X. DOI: 10.1086/722227. (Visited on 10/14/2023).

Rivkin, Steven G., Hanushek, Eric A., and Kain, John F. (Mar. 2005). "Teachers, Schools, and Academic Achievement". In: *Econometrica* 73.2, pp. 417–458. ISSN: 0012-9682, 1468-0262. DOI: 10.1111/j.1468-0262.2005.00584.x. (Visited on 06/23/2024).

Rockoff, Jonah E. (May 2004). "The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data". In: *American Economic Review* 94.2, pp. 247–252. ISSN: 0002-8282. DOI: 10.1257/0002828041302244. (Visited on 10/14/2023).

Smrekar, Claire and Goldring, Ellen B. (1999). *School Choice in Urban America: Magnet Schools and the Pursuit of Equity*. Critical Issues in Educational Leadership Series. New York: Teachers College Press. ISBN: 978-0-8077-3829-0 978-0-8077-3828-3.

Zheng, Angela (May 2022). "The Valuation of Local School Quality under School Choice". In: *American Economic Journal: Economic Policy* 14.2, pp. 509–537. ISSN: 1945-7731. DOI: 10.1257/pol.20200678. (Visited on 07/22/2024).