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# Climbing the College Ladder? The Effects of New Orleans School Reforms on College Outcomes and the Quality of Colleges that Students Attended

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# Climbing the College Ladder?

# The Effects of New Orleans School Reforms on College Outcomes and the Quality of Colleges that Students Attended

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December 15, 2020

*Abstract*: Multiple studies have documented the positive effect of school choice on college attendance. We focus instead on the quality of colleges, which is linked to higher graduation rates and later-in-life wages, especially for Black and Hispanic students. We examine the effect of the New Orleans school reforms, a district-wide reform creating an almost all-charter school district, on the quality of colleges that students attended. Using difference-in-differences analysis of statewide microdata, we find that the reforms led students to attend four-year colleges, and higher-quality ones, at higher rates. The reforms also increased the share of college-goers who were well matched to their colleges and this had little effect on transfer or persistence rates. Overall, these results reinforce that the reforms led students to attend higher-quality colleges that will improve long-term life outcomes.

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## 1. Introduction

A growing literature examines the effect of school choice on college attendance (Harris & Larsen, 2018; Dobbie & Fryer, 2015; Booker, Sass, Gill, & Zimmer, 2011; Deming, Hastings, Kane, & Staiger, 2014; Angrist, Cohodes, Dynarski, Pathak, & Walters, 2016). The combined results of these papers indicate that these school reforms usually increase college attendance, especially in four-year colleges. However, less attention has been paid to the quality of colleges attended, which are linked to better later-in-life outcomes, particularly for Black and Hispanic students (Dale & Krueger, 2014; Hoekstra, 2009; Black & Smith, 2004; Dillon & Smith, 2020). Higher-quality colleges, for example, tend to have higher graduation rates, a key predictor of later outcomes (Kane & Rouse, 1995; Kane, 1998). In this sense, college quality may be as important as college attendance.

We add to the small literature on this topic in two ways: first, by considering a broader range of college outcomes and quality measures and, second, by studying the comprehensive charter-based school reform in New Orleans. In contrast to prior studies, the city's reforms involved much more than adding a small number of charter schools to a market dominated by traditional public schools. After Hurricane Katrina, the state took over all but 13 of 120 schools and eventually turned all the schools under its control into non-profit charter school organizations. These schools initially had no union contracts and teachers were not subject to tenure or certification provisions. Attendance zones were largely eliminated so that families could, in theory, choose any schools they wished. In many respects, the schools that remained under the control of the local school district, the Orleans Parish School Board, followed suit. New Orleans became the most market-driven school system the country had ever seen (Harris, 2020).

The city's reforms have been actively studied. Harris and Larsen (2018) found the New Orleans school reforms improved numerous medium-term outcomes, including college attendance, persistence, and graduation. Students' likelihood of four-year college enrollment increased by 8-15 percentage points, the likelihood of four-year college persistence increased by 4-7 percentage points, and the likelihood of four-year college graduation increased by 3-5 percentage points. The increase in college graduation is especially noteworthy, considering the large wage premium on a college degree (Kane & Rouse, 1995; Kane, 1998). One contribution of the present study is extending the timeframe of the Harris and Larsen (2018) study with two additional post-Katrina cohorts.

The closest Harris and Larsen (2018) get to examining quality, however, is distinguishing two-year colleges (which show no increase in enrollment among New Orleans high school graduates) from four-year colleges (which New Orleans students started attending at much higher rates). We go further in this study by examining various indicators of institutional quality, including college input levels and typical student outcomes. We analyze these measures individually and in combination, based on a college quality index created through principal component analysis (PCA) (Dillon & Smith, 2020). We also include the index of college social mobility created by Chetty, Friedman, Saez, Turner, and Yagan (2017) and measure changes in student-college match (Goodman, Hurwitz, Smith, & Fox, 2015).

We study these aspects of college choice because the decision to apply to and attend high quality colleges appears to pay off later in life, especially for minority groups. Multiple papers find that attending a higher quality college results in a higher likelihood of graduation (Melguizo, 2010; Cohodes & Goodman, 2014; Dillon & Smith, 2020). Dale and Krueger (2014) find attending a selective college increases wages in the medium term after graduation for Black and

Hispanic students. Other papers also find increases in wages for non-minority students (Long, 2008; Black & Smith, 2006; Hoekstra, 2009).

How do students end up at a particular college? While the most obvious answer may be that colleges only admit some applicants, research also indicates the importance of student application behavior (Dillon & Smith, 2017). One important driver of student application behavior is college information and expectations (Hoxby & Turner, 2015; Dillon & Smith, 2017). Moreover, families must collect college information in a changing education landscape. In our setting, Louisiana began requiring all high schoolers to take the ACT in 2012-2013 (Louisiana Department of Education, 2013). Additionally, college tuition in Louisiana has risen steeply over the past decade, while the state's merit-based scholarship – Taylor Opportunity Program for Students (TOPS) – does not have a dedicated revenue stream and was underfunded one year (Louisiana Board of Regents, 2015; Louisiana Board of Regents, 2017).

College outcomes also appear to be driven partly by the high schools they attend. In some high schools, students go on to attend higher quality colleges year-after-year, and this pattern cannot be fully explained by typically-measured high school resources (Hurwitz, Howell, Smith, & Pender, 2012). High schools might be a source of this information and expectations (Bates & Anderson, 2014; Beal & Crockett, 2010). Also, high school counselors have been found to influence college outcomes (Mulhern, 2020).

There is relatively little research about the effect of school choice writ large on college quality. Two papers examine the impact of attending selective, elite exam high schools on college quality, but neither find a clear pattern of results (Abdulkadiroğlu, Angrist, & Pathak, 2014; Dobbie & Fryer, 2014).[1] In a similar context, Berkowitz and Hoekstra (2011) *do* find attending an elite private high school results in students attending a college where the average SAT score of entering freshman is 20 points higher. Deming, Hastings, Kane, & Staiger (2014) find that winners of an intradistrict high school choice lottery in Charlotte-Mecklenberg became more likely to attend a higher quality college, using Barron's selectivity tiers as measures of quality.

There is also little on the specific reforms of interest here: charter schools. Angrist, Cohodes, Dynarski, Pathak, and Walters (2016) also use Barron's selectivity tiers but find no effect of charter school attendance on college quality. Likewise, Coen, Nichols-Barrer, and Gleason (2019) find no effect of charter attendance on a variety of college attributes (including college admission rate and graduation rate, which could both be indicators of quality). However, both Davis and Heller (2019) and Dobbie and Fryer (2015) find that charters significantly increase the likelihood students will attend selective colleges with average SAT scores of 1000 or more (out of 1600). In short, the effect of school choice, including charter schools, on college quality is inconsistent across studies, even studies on the same type of choice.

This paper aims to extend this literature by examining the effects of the most extensive choice-based reform, in New Orleans, on a wider variety of college quality measures. Given prior evidence that high school graduation and college-going increased (Harris & Larsen, 2018), the effect on college quality is unclear a priori. It could be that the additional (marginal) students are more likely to attend the lowest-quality colleges, pulling down average quality (conditional

[1] Abdulkadiroğlu et al. (2014) finds consistently insignificant effects when examining all Boston exam schools as a group; significant effects are found for only two of the schools when schools are examined independently, and for one of the two schools the significant effect is negative. Dobbie and Fryer (2014) find insignificant effects of attending a college with higher than a 1,300 average SAT for two New York exam schools and a small negative effect for the third.

on college attendance). We might also expect a decline in quality if charter schools just focused on “getting students to college” without regard to college types and quality. On the other hand, if schools increased academic preparation and expectations during high school, as the results from Harris and Larsen (2018) suggest, then initial college quality might increase, especially among students who would have gone to college regardless.

Even if initial college quality increased, the effect on longer-term college outcomes are also ambiguous. An increase in quality could increase persistence to the extent that higher-quality colleges have better resources; or an increase in quality could reduce persistence because higher-quality colleges are more challenging. Also, regardless of the effects on average quality, students might end up in colleges that are a poor match for the students’ interests and abilities. The possible effects on transfer are similarly ambiguous and also depend on the match between students and initial colleges. Understanding this interplay between quality, persistence, and transfer is important given that the long-term benefits of college graduation are much higher than the benefits of college attendance (Jaeger & Page, 1996; Cadena & Keys, 2015; Kane & Rouse, 1995).Our results confirm previous findings and show that New Orleans students became more likely to attend a four-year college and show this effect continued in the more recent years of data. Further, we find New Orleans students were more likely to attend higher quality colleges following the reforms—those with higher SAT scores and faculty salaries. These effects are concentrated in the top quartile and 3$^{rd}$ quartile of the quality distribution, using the PCA index measure of quality. No single explanation emerges for these improvements. We find some evidence that improved academic preparation was a partial cause; however, other evidence points toward increased educator expectations and/or school efforts to ease the transition from high school to college.

We also look at persistence both from freshman year fall-to-spring, our preferred measure of persistence, and year-to-year. We find some indications of increases in freshman fall-to-spring persistence, with increases for persistence at any college, persistence at first college, and transfer (although results are insignificant in the preferred specification). When we break the freshman fall-to-spring persistence rates down by college quality quartile, persistence appears to have *decreased* in the quality quartiles where attendance rates *increased*. This creates mixed prospects for the effect of the reforms on college graduation.

In the next section, we detail the treatment of data used in the analyses. In Section 3, we explore the methodology used. Section 4 presents results for college attendance. Section 5 presents results for transfer and persistence. Section 6 discusses robustness checks. Section 7 concludes.

## 2. Data

To examine the effect of the New Orleans school reforms on college type, we use de-identified Louisiana Department of Education (LDOE) student-level high school records, data from the Louisiana Board of Regents (BOR) and National Student Clearinghouse (NSC) for student-level college enrollment. We use data from the Integrated Postsecondary Education Data System (IPEDS) and the College Scorecard for data on college characteristics, as well as Barron's *Profiles of American Colleges* selectivity rankings (U.S. Department of Education, 2019; Barron's Educational Series, Inc., 2000). We also include social mobility measures from Chetty et al. (2017).

### ***2.1.****Individual-Level High School Records.*

LDOE provided de-identified student-level data for Louisiana public school students. These records include school of attendance, the reason a student exited a school (including high school graduation), entry and exit dates for each high school of attendance, and student demographics (race, gender and free- and reduced-price lunch status each year).

A student is considered having graduated from a given high school if her reason for exit is high school graduation or GED attainment. LDOE only requests college-level data on public Louisiana high school graduates, so those are the only college outcomes we observe. To proxy for academic preparation, we use a student's earliest ACT score (to avoid re-take effects). This sample of students differs from the main analysis because ACT scores are only available for college-going students.

### ***2.2.****Individual-Level College Records.*

We have three different panels of college-level data. The earliest source of college data is from the Louisiana Board of Regents (BOR) and covers the 2000-2001 school year to the 2009-2010 school year. The latest source of college data is from National Student Clearinghouse (NSC) and covers 2005-2006 to 2016-2017 (NSC 1). In our main analyses, we merge these two panels of data to the individual-level high school records, which allow us to use the longest timeframe of data available. In some robustness checks, we use a third panel of data from the National Student Clearinghouse that covers the 2004-2005 school year to the 2013-2014 school year (NSC 2).[2]

[2] Both sources of NSC data (NSC 1 and NSC 2) are used because NSC 1 has later years of data, while NSC 2 has pre-Katrina years of data. We cannot combine the two because they use different student identifiers.

For consistency between the data sets, we use BOR's sample of students and colleges in our main results. This restricted sample includes students who graduate high school and enroll in college in the fall semester immediately following graduation ("on-time" college enrollment) in one of 32 non-profit colleges in Louisiana. While this omits in-state for-profit and out-of-state colleges, it does include the colleges most commonly attended by Louisiana public high school graduates. In 2016, 87.4% of Louisiana (87.7% of New Orleans) public high school graduates who attended college attended a college within this set.

Appendix Table 1 details the differences between our three panels of college data. There are four main takeaways: (1) only BOR and NSC 2 have pre-reform data, (2) only NSC 1 and NSC 2 have data on out-of-state colleges, (3) only NSC 1 and 2 have information on student persistence, and (4) only BOR and NSC 2 can be merged because they use the same student-level identifiers, while NSC 1 uses a unique student-level identifier. We use BOR and NSC 1 for the main results to have the longest possible timeframe. However, we can only use NSC 2 when we examine student persistence (both freshman fall-to-spring and year-to-year), and student attendance at out-of-state colleges, because only NSC 2 covers persistence and out-of-state colleges both pre- and post-reform.

### **2.3.** *Individual-Level Persistence and Transfer.*

We create measures of both college persistence and college transfer using NSC 2. As a result, we examine transfer and persistence for high school graduates from 2003-2004 to 2011-2012. Freshmen college persistence measures whether a student is still enrolled in her first college or any college the second semester after her on-time college enrollment. Freshmen college transfer is measured by looking at whether a student changes institution from the fall semester of her freshmen year to the spring semester her freshmen year. We focus the transfer and persistence analyses on freshmen fall-to-spring enrollment changes because of issues with data when studying year-to-year changes. To account for the high rate of persistence in freshmen year and low number of transfers, we also present results looking at year-to-year persistence, but note that this measure may be biased by the effect of Hurricane Katrina on the pre-reform cohort.

### ***2.4.****College-Level Characteristics.*

College characteristics were gathered from the Integrated Postsecondary Education Data System (IPEDS) and the College Scorecard website. Information on 2-year and 4-year institution status, college location, and student-faculty ratio were collected from IPEDS. Information on college graduation within three years for two-year colleges and six years for four-year colleges (150% of the stated time), instructional spending per full time student, and average SAT score were collected from the College Scorecard. Data on college-level characteristics includes data for all students attending a college, not only our sample of Louisiana public school students.

These college characteristics are generally consistent over time but the data are not available for all institutions for all years. We use data from 2010 (the year with the most available data) where available. If data from 2010 is missing, we interpolate missing values using the two years before and after 2010. We keep the college quality index constant over time in our main analyses to avoid conflating changes in colleges that students attended with changes occurring within the colleges themselves. We also allow college characteristics to vary over time as a robustness check (see Section 6.3).

Table 1 shows the characteristics of the included set of colleges. Given that students tend to choose colleges close to home (Griffith & Rothstein, 2009), Table 1 panel A shows the average college characteristics of colleges located in New Orleans and colleges located elsewhere in Louisiana, as well as the differences between these two sets of colleges. The data indicate that (1) the average college in New Orleans is of higher quality than the average college elsewhere in Louisiana; and (2) the set of colleges in New Orleans is more varied than the set in the rest of the state. However, since colleges do not change locations, these differences in college characteristics across locations should not affect the results, given our DD identification strategy.

## 3. *Methodology*

### ***3.1.****College Quality Index.*

With such a large number of quality measures, it is helpful to use an index that summarizes the results. Principal component analysis (PCA) creates multiple components based on linear combinations of variables, where each component explains as much variation in the data as possible while remaining orthogonal to any other component. Eigenvalues and eigenvectors are created from the covariance matrix. The components are derived by multiplying the eigenvalues (sorted largest to smallest) by the covariance matrix. The first, or principal, component explains the most variation in the data set and has been used as an index of college quality (Black & Smith, 2006; Black, Daniel, & Smith, 2005; Dillon & Smith, 2020).

We model the methodology used here after Dillon and Smith (2018) and include the variables student-faculty ratio, average faculty salary, applicant admission rate, and average SAT score as variables within the PCA.[3] Appendix Table 2 displays the eigenvectors for each variable; the larger an eigenvector is, the more of the variation in the data it explains by itself (an eigenvector of 1 would indicate one variable perfectly explains variation in the data).

[3] In the PCA, we include transformations of two variables (faculty-student ratio rather than student-faculty ratio and rejection rate rather than admission rate) following Dillon & Smith (2020). However, we follow the rest of the literature and focus on student-faculty ratio and admission rate throughout the rest of the paper.

Table 1 Panel B shows the distribution of colleges in each quality quartile in both New Orleans and Louisiana as a whole. While the average four-year college in Louisiana as a whole ranks low on the college quality distribution (15 of 22 colleges are in the 3rd or 4th quartile), New Orleans has two colleges in the top, 2nd, and 3rd quartiles and one college in the 4th quartile.

### ***3.2.****Difference-in-Difference*

To estimate the causal effect of the New Orleans school reforms on college quality and persistence, we follow Harris and Larsen (2018) and rely on a matched difference-in-difference estimator to examine how the school reforms affected students' college-going behaviors. We compare New Orleans students who experienced the reforms (those who graduated high school after the reforms) to students who did not experience the reforms, either because they graduated high school in New Orleans prior to the reforms or because they graduated high school in another parish.

Equation (1) presents the main difference-in-difference model:

$$(1) \qquad Q_{ijt} = \gamma_1(NOLA_j \cdot d_t) + \alpha_j + \varphi d_t + \boldsymbol{\beta V_{ijt}} + u_{ijt}$$

where the school district and year fixed effects are given by $\alpha_j$ and $d_t$, respectively. The coefficient of interest is $\gamma_1$, the effect of a student having been "treated" by attending school in New Orleans once the reforms had taken place. We also include a vector of student characteristics, $V_{ijt}$.[4] We assume the error term, $u_{ijt}$, is orthogonal to treatment. All analyses include robust standard errors, clustered at the district level.

[4] These controls include including student race, free and reduced-price lunch receipt, English language learner status, student grade repetition, and controls for matched bin.

Here, $Q_{ijt}$ is the college outcome for student *i* at public high school *j* in year *t*. For college attendance outcomes, the outcome is binary: a student either attends a specific type of college or she does not. These outcomes include college-level attendance (two-year and four-year), four-year college quality index quartile, and Barron's selectivity tiers (very competitive and above, competitive, less competitive, and noncompetitive). For example, the outcome for top quartile college attendance answers the question: Did this Louisiana public high school graduate attend a four-year college in the top quality quartile ($Q_{ijt}$=1) or not ($Q_{ijt} = 0$)? The null outcome includes students who attended a four-year college in another quality quartile, attended a two-year college, or did not attend any college. For college characteristics (including a college's quality percentile), the outcome is continuous and conditional on a student attending a four-year college, as we only have information on student's college characteristics if they attend a college.

In the main analyses, we compare students who graduated high school in 2016 with those who graduated in 2004, the last pre-reform cohort. This allows us not only to examine the effect of the school reforms on college quality, but also to extend the findings of Harris and Larsen (2018) concerning college level with two additional years of data.

We also present results which use an event study design, presented in Equation (2):

$$(2)\ Q_{ijt} = \sum_{r=-m}^{q} \gamma_t (NOLA_j \cdot d_{t+r}) + \alpha_j + \varphi d_t + \boldsymbol{\beta V_{ijt}} + u_{ijt}$$

Here, coefficient and vector interpretation is identical to that of Equation (1) except for $d_{t+r}$ and $\gamma_t$. In the event study analysis, $d_{t+r}$ is a vector of year indicators from *q* years post-reform to *m* years pre-reform, where the omitted year is the last year of pre-reform data (2003-2004). Correspondingly, $\gamma_t$ is a vector of the effects of attending a New Orleans high school in each individual year.

In addition, we estimate an ordered logit regression to examine the effect of the school reforms on college quality. In this model, the ordered dependent variable denotes college quality, where the value of $C_{ijt}$ ranges from 1 to 5: $C_{ijt} = 1$ indicates that a student attends no four-year college and $C_{ijt} = 5$ indicates that a student attends a top-quartile four year college. All other variable interpretations for Equation (3) are the same as in Equation (1).

Following Harris and Larsen (2018), we present specifications where we compare treated students to students in all of Louisiana, to students in matched schools in all of Louisiana, to students in other hurricane-affected districts, and to students in matched schools in hurricane-affected districts. We consider other hurricane-affected districts[5] as comparison districts to account as much as possible for the trauma, disruption, and effects of interim schools on students in New Orleans. However, analyses of only hurricane-affected districts only have up to eight clusters in analyses, which is generally considered insufficient for valid inference (Angrist & Pischke, 2009). For this reason, we report results based on the full statewide sample as well.

An additional concern is that there is only one treatment observation (New Orleans), which creates additional issues for inference. We present results using alternative standard errors derived by Ferman-Pinto (2019), which yield valid results even with only one treatment group and heteroskedastic errors.

### ***3.3.****Matching.*

In order to further control for observable pre-treatment differences in students' education trajectory, we combine the difference-in-difference estimator with matching. Ideally, we would

[5] These eight parishes – Orleans, Jefferson, Calcasieu, St. Tammany, St. Bernard, Plaquemines, Vermilion, and Cameron Parish –account for over 97.5% of students who entered or exited a Louisiana public school as a result of Hurricane Katrina (Pane, McCaffrey, Tharp-Taylor, Asmus, & Stokes, 2006).

match students based on the characteristics of the college they would have attended pre-reform. However, students only choose their first college once and thus matching on the pre-reform outcome of interest at the individual level is not possible. Instead, we match at the high school level based on the pre-treatment school-level outcome of interest. For example, when the dependent variable is attending a college in the 4th quality quartile, we match each high school in New Orleans to a high school in the given comparison district based on the percentage of students in the respective schools that attended a 4th quartile colleges (pre-reform).[6] We carried out this process for each comparison district, so that each New Orleans school is matched to the distribution of schools in each district as closely as possible. We only include schools with a minimum of ten graduates each year, and we only include districts with a minimum of three schools that meet the graduate requirement.

While the restriction of the sample to comparison districts and to matched schools increases the likelihood we are comparing students with similar expected college outcomes, it does decrease the number of school districts (and thus clusters) in the analyses. When we include all school districts within Louisiana, we have sixty-eight clusters; when we restrict to only school districts within hurricane-affected parishes with enough similar schools, we have five clusters.

Table 2 details demographics for the analytic sample of high school graduates pre-reform for New Orleans and for matched schools in comparison districts (other districts affected by Hurricane Katrina). Pre-reform, the average New Orleans high school graduate was Black and three-quarters received free- or reduced-price lunch, which is not true for the comparison districts, whose graduates were mostly White and half of whom received free- or reduced-price

[6] We present main results in Table A7 where matching is done using the average college quality percentile of college attended by a high school's graduates rather than the percent of students attending a specific college quality quartile as a robustness check.

lunch. We present robustness checks for three subsamples (White students, Black students, and students who received free- or reduced-price lunch) in Section 6.2 to address the issue of demographic differences between the treated and matched comparison group. (These also provide evidence about effect heterogeneity.)

The characteristics of colleges attended by students in New Orleans and in the comparison group also differ: New Orleans' students in the pre-reform period attended colleges with lower admission rates and lower student-faculty ratio (both of which would indicate higher-quality institutions) but lower average SAT scores, faculty salaries, and completion rates (all of which would indicate lower-quality institutions). This is likely driven partially by student academic preparation: New Orleans' students in 2004 had an average ACT score 2.5 points lower than comparison students.[7]

While there are considerable demographic differences between New Orleans and the matched schools, matching on outcome of interest results in similar outcomes pre-reform.[8] Figure 1 and Figure 2 display trends for New Orleans and comparison districts. These trends are largely parallel pre-reform.

Figure 1 shows an upward shift in the percent of New Orleans students who attend any four-year college, aligning with the findings of Harris and Larsen (2018). What about the *quality* of colleges students attend? Figure 2 presents trends for each quality quartile for four-year colleges. The figure shows an apparent increase in the percent of New Orleans high school graduates attending a college in the top and 3rd quality quartiles.

[7] Appendix Table A13 compares the demographics and college characteristics for pre- and post-reform New Orleans graduates.
[8] We additionally present a robustness check alternatively matching to the bottom 10% of districts in in Section 6.4.

The figures also provide suggestive evidence of parallel trends between New Orleans and this matched comparison group, but this is insufficient evidence to establish causality. We estimate effects based on equations (1) and (2).

## 4. **Results: Effects on College Attendance**

In this section, we first extend Harris and Larsen (2018) and examine if the increase in four-year college attendance persists when using 2016 rather than 2014 data. Next, we investigate the effect of the reforms on the characteristics of the four-year colleges students are attending. We then look at changes in likelihood a student will attend colleges of different quality levels and what might have caused these effects.

### ***4.1.****Effect on level of college attended.*

When we examine the likelihood a student will attend a two-year institution or a four-year institution, as shown in Table 3, our findings echo that of Harris and Larsen (2018) with negative or null effects on two-year college attendance, but four-year college attendance increasing 12 percentage points, a 46.2 percent increase from baseline.[9] Harris and Larsen (2018) found that students affected by the reforms were 16.1 percentage points more likely to attend a four-year college (using the same preferred specification). Thus, we find that the effects in 2016 are similar, though perhaps smaller, than 2014 effects.[10]

[9] Note that this is consistent with the descriptive figure for four-year attendance in Figure 1, but that the difference-in-difference examines differences *between the schools*. The overall shift in all hurricane-affected school districts to lower rates of four-year college attendance is netted out.
[10] Results may differ slightly because Harris and Larsen (2018) include all 12th graders (regardless of graduation) and we examine high school graduates.

### **4.2.** *Effect of characteristics of colleges students attend.*

In Table 4, we examine the effect of the reforms on variables that indicate quality: the four variables used to create the PCA quality index (student-faculty ratio, admission rate, average faculty salary, and average SAT) and two other variables (per-student instructional spending and graduation rate) for students who attend a four-year college. Prior research suggests that higher instructional spending improves students' outcomes including graduation, persistence, and future wages (Webber & Ehrenberg, 2010; Griffith & Rask, 2016).

We find no effects on the admission rate of the college attended or total instructional spending. However, we find positive effects on average SAT score of 32 points (a 0.08 standard deviation increase from baseline); positive effects on average faculty salary of $181 more per month (a little more than $2,170 per year and three percent above baseline). There is some evidence of students attending colleges with higher completion rates, although this effect is not significant in the preferred specification. We do find that students post-reform attended colleges with one more student per faculty member, an indicator of lower quality.

The above results use measures of college characteristics from a single year (2010), to avoid conflating changes in student decisions about the colleges attended with changes in the colleges themselves.

### **4.3.** *Effect of the reforms on college quality index.*

In Table 5, we examine effects on the PCA-based quality index (see details in Section 3.1). These effects include changes in quality percentile along the index, and attendance at a specific quality quartile. We also look at changes in quality quartile using an ordered regression model. When examining attendance at a specific quality quartile or using an ordered regression, all high school graduates are included in the analyses, including those who did not attend any college and those who attended a two-year college, since students who do not attend college do have attendance information (although this information is that they did not attend college). When examining quality percentiles, we include only four-year college-goers, since only students who attend a four-year college have percentile information.

Conditional on attending a four-year college, a student who experienced the reforms attends a college that is nine percentile points higher on the quality index than a similar student who did not.[11] The results from the ordered logit (displayed in odds ratios) yield the same general finding.

Next, we place colleges into quartiles of the PCA index distribution. Students are four percentage points more likely to attend a college in the top-quartile (an 80 percent increase from baseline) and four percentage points more likely to attend a college in the 3rd quartile (a 44 percent increase from baseline). Results using statewide data (rather than only hurricane-affected districts like the preferred specifications) indicate an increase in 4th quartile attendance and a decrease in 2nd quartile attendance. (The sum of the coefficients across all the quartiles is roughly equal to the increase in four-year college-going, with an 11 percentage point increase across all quartiles.)

The combined effects indicate that not only are *more* students attending college post-reform but students are also attending higher quality colleges on average. The event study in Figure 3 shows that these results are generally consistent across years. Estimates for four-year colleges overall, along with top-quartile and 3rd quartile four-year colleges particularly, are always positive and statistically significant post-reform.

[11] Percentiles of course are not on an interval scale, but we analyze them this way to simplify reporting.

### ***4.4.****Effect of the reforms on Barron's selectivity tier.*

*Barron's Profiles of American Colleges* is a widely used resource that sorts colleges into different tiers based solely on measures of selectivity.[12] Barron's sorts colleges into six different tiers: most competitive, highly competitive, very competitive, competitive, less competitive, and noncompetitive. We collapse the top three tiers (most, highly, and very competitive) into one tier ("Very Competitive and Above") because within the universe of colleges in Louisiana, only three colleges are in any of these top tier categories.

The Barron's tiers and PCA quality quartiles are not perfectly aligned. For example, the top college quartile in the PCA quality index includes four colleges; the top tier in Barron's ("Very Selective and Above") includes only three of those four. This discrepancy does not invalidate either measure but instead emphasizes the different goals of both: Barron's selectivity tiers solely look at how difficult it is to be admitted into a specific college, whereas the college quality index incorporates data for college-level inputs in addition to selectivity.

As shown in Table 6, the results indicate that treated students became four percentage points (80%) more likely to attend Barron's "Very Competitive and Above Colleges" (the top tier here). This coefficient is close in magnitude to that found by Deming et al. (2014), who examine the impact of students winning a seat at their first-choice high school through an intradistrict lottery in Charlotte-Mecklenberg. Using lottery assignment as an instrumental variable, Deming et al. (2014) finds that students assigned to their first-choice high school were

[12] These selectivity measures consist of median freshman SAT and average SAT scores, percent of freshman scoring above high thresholds on the SAT and ACT, rejection rate, and minimum GPA and class rank required for admission (Barron's Educational Series, Inc., 2000).

4.2 percentage points (40%) more likely to attend a selective college (defined as attending a college ranked "Very Competitive and Above").[13]

### ***4.5.*** *Effect of the reforms on college match.*

The results presented above indicate students treated with the reforms became more likely to attend higher quality colleges. But did these students attend colleges well-matched to their abilities? We examine this question by classifying student-college matches using student ACT scores and college 25th and 75th ACT score percentiles. Following Goodman, Hurwitz, Smith, & Fox (2015),[14] we classify a student-college pair as an *undermatch* if the student's ACT score is above a college's 75th percentile ACT score. A student-college pair is a *match* if the student's ACT score is between the college's 75th and 25th percentile ACT scores. Finally, a student-college pair is an *overmatch* if a student's ACT score is below the college's 25th percentile ACT score. These match classifications are meant as a rough measure of student-college academic fit.

The results are displayed in Table 7. Students who experienced the reforms were no more likely to undermatch or overmatch but were 16 percentage points more likely to attend an academically well-matched college. This suggests that the increase in college attendance described earlier is not due to students over-reaching for colleges that they might not be prepared for.

### **4.6.** *Effect of the reforms on college's social mobility.*

The final measure of college quality we examine is a measure of how well a college fosters social mobility from Chetty, Friedman, Saez, Turner, and Yagan (2017). We use their measure of a college's social mobility "success": the percent of students who attended a college who grew

[13] Note that Deming et al. (2014) examine intent-to-treat (student assignment at first choice high school, rather than student attendance at first choice high school), rather than treatment-on-the-treated as we do here.
[14] Most studies on match, including Goodman et al. (2015), use SAT rather than ACT, which is the test used here.

up in the bottom quintile of the income distribution who end up in the top quintile or top one percent of the income distribution. This measure captures what percent of low-income students end up climbing to the top of the income distribution.

These results, displayed in Table 8, provide some evidence that students may have attended colleges with higher rates of social mobility, although this is not significant in the two specifications limited to hurricane-affected districts. In short, of the multiple measures of college quality we examine, almost all provide evidence of at least marginal improvement.

### *4.7.Exploratory analysis on causes of college quality shift.*

What about the school reforms led to these overall increases in college attendance and quality, without decreases in college persistence? One possible hypothesis is increased academic preparation, as measured by high stakes test scores from high school. Harris and Larsen (2018) find that the New Orleans school reforms increased test scores markedly and this improved academic preparation may have led students to gain admittance to, and be more likely to succeed in, four-year colleges.[15]

Table 9 presents the main results in column 1, results for the subsample where ACT scores are available in column 2, and results with the ACT control in column 3. The results are qualitatively similar when restricting to the sub-sample with non-missing ACT information (see middle column). However, when also controlling for the ACT score, the coefficient and significance level drop considerably. The same is true when focusing on the top two quartiles of the PCA index. These results suggest that improved academic preparation explains some of the improvement in college attendance and attendance at higher quality colleges.

[15] Harris and Larsen (2018) focus on elementary and middle school scores due to some limitations in the data available then on high school. Harris (2020) provides descriptive evidence reinforcing that these gains extended to high school.

However, additional suggestive evidence from the trend in effects over time give a different impression. The event study results show a sharp upward spike (intercept shift) followed by a slight upward slope. The intercept shift is likely partially caused by a temporary change in the population just after Katrina. Low-income residents, whose children have higher probabilities of going to college, returned more slowly. Eventually, by around 2010, the demographics mirrored the pre-Katrina population, so this cannot explain the longer-term effects, but it may explain the initial pattern (Harris & Larsen, 2018).

It is also possible that the reforms induced high schools to make sudden changes in college expectations and/or began doing more to aid students in the transition from high school to college (e.g., providing assistance with FAFSA completion, college visits, and college applications). Unfortunately, we cannot easily disentangle these explanations with the available data.

## 5. Results: Effects of the reforms on college persistence & transfer.

Section 4 explored the effect of the school reforms on the type of colleges students attend, and the cause of the shift toward higher quality colleges. If students are moving to higher quality colleges, are they succeeding at those colleges? Many students who attend college do not persist; only 85 percent of New Orleans college freshmen in 2003-2004 continued from fall to spring semester at any college. (Year-to-year persistence from freshman to sophomore year is even lower, with 70 percent of New Orleans college freshmen in 2015-2016 continuing from first to third semester.) For this analysis, we use the NSC 2 data as it allows us to examine persistence both before and after the reforms (as discussed in Section 2.2).[16] In Table 10, we examine changes in persistence and transfer behavior.

[16] Using NSC 2 means 2012 is the post-Katrina year of interest, rather than 2016, as NSC 2 has a shorter timeframe than NSC 1, the data set used for post-Katrina years in the main results.

We first examine the effect of the reforms on fall-to-spring freshman year college persistence at a four-year college; we look both at the first college attended and at any college. We find some positive effects of the reforms on the likelihood a student will persist at the first college or any college during their freshman year, although effects are insignificant in specifications using matched districts. We also examine transfer behavior during fall-to-spring freshman year and find that students treated with the reforms were slightly more likely to transfer institutions from their first semester to second semester freshman year, although these results are also insignificant in the preferred specification using hurricane districts and matching. These results suggest that overall students were not only attending better colleges but were also at least as successful in them as before.

Additionally, we examined freshman fall-to-spring persistence and transfer by the quality quartile of the initial college attended. Because persistence and transfer are conditional on a student beginning college at a university in a certain quality quartile, the power to detect changes in likelihood is much more limited than in the main analyses. Moreover, the results are less robust to alterations in the college sample than other analyses.

Table 11 shows that, for a student whose first college was in the top quartile, the reforms resulted in a six percentage point lower likelihood of first-college freshman fall-to-spring persistence and a five percentage point lower likelihood of any-college freshman fall-to-spring persistence, in the preferred specification (estimates in other specifications are inconsistent). If that first college was in the 3$^{rd}$ quartile, there was a seven percentage point lower likelihood of a student persisting at their first college and a 12 percentage point lower likelihood of a student persisting at any college. The reforms resulted in no change in the likelihood of persisting in the 2$^{nd}$ quartile. For a student whose first college was in the 4$^{th}$ quartile, freshman persistence (at any and first college) increased in statewide analyses but not in those restricted to students attending hurricane-affected districts.

Table 11 also shows that there are few effects on the likelihood of transfer during freshman year. There is a decrease in the likelihood of transfer for students at a top quartile college of six percentage points in the preferred specification (the estimates are in the same direction but insignificant in two of the other three specifications). There is an increase in transfer in the 3rd quartile in three specifications, although not in the specification with matched hurricane-affected districts.

Because of the high rates of persistence and low rates of transfer during freshman year, we look at persistence year-to-year. These analyses do include the semester during and immediately after Hurricane Katrina's landfall in pre-reform observations, however estimates would only be biased upwards if students who graduated from New Orleans high schools were more likely to attend a hurricane-affected college *and* the effects on colleges were very short-lived (Harris & Larsen, 2018). Table 12 presents these estimates of year-to-year persistence for four-year colleges overall. We see increases in both types of year-to-year persistence, and decreases in year-to-year transfer, when looking at the specifications including statewide data but not in analyses using only hurricane-affected districts. The decrease in year-to-year transfer could be partially driven by a large number of pre-treatment New Orleans students transferring college following Hurricane Katrina.

Examining the results for each quartile, Table 13 shows that year-to-year persistence increased for students attending colleges in the second highest quartile in seven out of eight specifications. We also see increased year-to-year persistence for students at a college in the fourth quartile, but these are only significant in the statewide data. Year-to-year persistence at any college also increased for students who began at a top-quartile college, but only in the preferred specification. The one group where we see consistent evidence of a drop in year-to-year persistence is students in the 3rd quality quartile.

Changes in likelihood of year-to-year transfer are seen only in specifications using statewide data. Not only do the magnitude and precision change when we switch to the hurricane-affected districts, but so too does the direction of effects. For this reason, we conclude that the effects on transfer by tier are indeterminate.

## 6. Robustness Checks

### ***6.1.****Returnees.*

One concern about the main results is that the population of New Orleans may have changed after Katrina in ways that the population of other hurricane-affected districts did not. To address this concern, we limit the sample to (1) students who graduated high school pre-reform from hurricane-affected districts and (2) students who attended high school in 2004 in a hurricane-affected district and graduated in a post-reform year (2010 to 2016) from that same district (that is, returnees). Thus, we do not include any students who moved to a hurricane district who did not live in that district in the year immediately before Katrina.

Figure 3 shows the coefficients of the effects of the New Orleans school reforms on these returnees for each year from 2002 to 2016 using an event study analysis. The direction of results for college level hold (i.e., increasing likelihood of attending a four-year college and decreases in the likelihood of attending a two-year college), as do the direction of results for college quality (i.e., increasing likelihood of attending a top quartile or 3rd quartile and insignificant results for other college quartiles).

### **6.2.** *Subsamples by Race and Free- and Reduced-Lunch Status*

Tables A3 through A5 show DD results by subsamples: only Black students, only White students, and only students who qualified for free-or-reduced lunch. For each subsample analysis, we rematch using the specified subgroup. Consistent with Harris and Larsen (2018), the significant effect of the reforms on the likelihood of attending any four-year college is evident for Black students and free- and reduced-lunch students but not for White students.

All subsamples show similar increases in college quality percentiles as in the main results, although for Black students this is not significant in the preferred specification. For the quality quartiles, the general pattern is the same as the main results (positive effects on the likelihood of attending a college in the top, 3rd, or 4th quartile and a negative effect on attending a college in the 2nd quartile), although effects are mostly insignificant in the preferred specification. The results are less precise in part because of the smaller sample sizes involved in subgroup analyses.

### ***6.3.*** *Data Concerns.*

There are three main data concerns with this analysis: (1) possible effects of switching college reporting source (NSC vs. BOR) pre- and post-treatment, (2) the restriction to the set of in-state, non-profit colleges in the data available prior to 2004 , and (3) the creation of the college quality index using a single year's data.

First, it is possible the results are an artifact of differences in reporting and matching practices by the NSC and BOR college data sets, rather than reflecting reform effects. This measurement error might not be orthogonal to treatment. We speak to the concern that measurement error is endogenous by comparing the gap between the number of in-state freshmen at each university from an official aggregated source (the public version of the BOR) and the number of in-state freshmen at each university in the student-level data (BOR from 2001 to 2010 and NSC from 2011 to 2016). This allows us to compare both student-level data sources in how much in-state enrollments for each college vary from a more official source of information, creating an approximation of possible “measurement error.” Additionally, we construct weights for the percent of students at each high school that attended each college pre-reform. This allows us to estimate “effects” of the reforms on measurement error using model (1). The results, shown in Appendix Table A7, indicate that measurement error is orthogonal to treatment; in other words, measurement error is no different in New Orleans than in other districts.

A second related concern is that the 32 colleges contained within the BOR perhaps changed in quality at the same time as the New Orleans school reforms took place (that is, immediately following Hurricane Katrina). We address this concern by using NSC 2 (a previous pull of NSC data, discussed in section 2.2) to examine the main results including all colleges (both within Louisiana and the rest of the United Sates), not only the restricted set used in the main results. These results are presented in Table A6; coefficients are similar, and in general are more significant.

Additionally, the characteristics of colleges may change over time, but we have only used quality measures for 2010 college characteristic data. While keeping the characteristics fixed allows us to avoid conflating changes in the colleges themselves with changes in student college choices, this is not completely possible if students make decisions based on quality at the time of application. To attempt to mitigate this concern, we ran analyses for the college quality characteristics where the college characteristics vary over time for characteristics available for all years. Results are shown in Table A8 in the Appendix and in fact suggest *larger* changes in quality characteristics: students attend institutions with higher average faculty salary (an increase of $901) and higher average SAT score (an increase of 142). An additional check that we run to address the static nature of our PCA index is to present an analysis where we use the college quality quartiles from the year a student begins attending college (i.e., college freshmen in 2004 are assigned their college's quality quartile calculated using 2004 data). The college attendance results by quartile differ slightly, but show positive effects on the likelihood of attending a top quartile college and 4th quartile college (rather than a 3rd quartile college, as in the main results). The ordinal logit estimation shows an increase in college quality comparable to the main results. An additional check that we run to address the static nature of our PCA index is to use other years' data to create the college quality index (2011 to 2016). All results show a significant increase in college quality, confirming the main results.

### ***6.4.****Additional Robustness Checks*

We address two other concerns: valid inference with a single treatment group and common support. Ferman and Pinto (2019) show that the cluster-robust standard errors commonly used in difference-in-difference analyses may not perform well with few treatment groups. Table A12 presents *p*-values using these alternative standard errors along with estimates and *p*-values from the main results. As expected, the results are less precise and many coefficients become insignificant. However, we still find precise estimates reinforcing that New Orleans students started attending college at higher rates, that these changes are concentrated in four-year colleges, and that the students shifted to higher quality four-year colleges, which are the main findings of the paper.

In addition to this specification concern, a lack of common support between New Orleans and other districts is evident in baseline characteristics in Table 2. We present results where we limit the comparison district to the bottom 10% of districts in the state for each outcome in Figure 5. The pattern of these results is similar to the main results, although the estimates are smaller in magnitude.

## 7. Conclusion

High schools have been found to affect college choice, and college choice in turn affects life outcomes. As charter schools are becoming a bigger part of the public education market, much research has been devoted to charter schools' impact on college *attendance*. This research generally shows that charter attendance increases the likelihood a student will attend a four-year college. Importantly, Harris and Larsen (2018) find this result holds in the current paper's setting – New Orleans.

However, college attendance is only one aspect of college choice. Less research exists on the impact of charter schools on *quality* of college attended, and what research does exist uses narrow quality measures. College quality is associated with higher later-in-life income and thus warrants consideration. We seek to address the gap in the literature by examining the effect of the New Orleans school reforms using a wide variety of college quality measures.

Overall, our results indicate that the New Orleans school reforms increased the quality of colleges that students attend. Students who experienced the reforms attended institutions with higher average SAT score and faculty salaries (but also higher student-faculty ratios). Students became more likely to attend colleges in the top quartile and the 3rd quartile of college quality, and more likely to attend colleges that were academic fits. Student freshman fall-to-spring persistence and transfer remained the same overall, although evidence is inconsistent in specific quartiles. In addition, we confirm previous work and find that the New Orleans school reforms resulted in a higher likelihood of students attending four-year colleges.

These findings indicate that charter schools, at least when implemented at scale in a city like New Orleans, improve the extent of college attendance and the quality of college attended. Given the benefits of attending these types of colleges, this suggests we can expect long-term life benefits for students as a result of the city's reforms.

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Table 1.

1.A. Comparison of College Characteristics for Colleges Located in New Orleans and Located Elsewhere in Louisiana.

| | New Orleans Universities | Universities Located Elsewhere in Louisiana | Difference between New Orleans and Non-New Orleans Universities |
|---|---|---|---|
| *Admission Rate* | 0.55 | 0.63 | -0.08 |
| | (0.11) | (0.15) | |
| *Avg. SAT Score of Entering Freshmen* | 1010.9 | 1011.4 | -0.5 |
| | (207.2) | (78.37) | |
| *Avg. Faculty Salary* | 6766.4 | 5634.5 | 1131.9 |
| | (1590.4) | (1122.8) | |
| *Instructional Expenditure per Full-Time Student* | 8050.9 | 5436.0 | 2614.9 |
| | (5060.1) | (2108.6) | |
| *Student-Faculty Ratio* | 15.2 | 20.8 | -5.6 |
| | (3.96) | (2.41) | |
| *Completion Rate (Within 150% of Time)* | 0.32 | 0.30 | 0.02 |
| | (0.236) | (0.167) | |

Notes: Averages are presented above using data from a publicly available data source, the Integrated Post-Secondary Education Data System. All data is from 2010 and interpolated where necessary. Averages are for the set of 32 colleges within the Board of Regents data, which was received from LDOE.

1.B. Number of Types of Colleges in Louisiana and Percent of Each Type in New Orleans.

| | *Number in All of Louisiana* | *Number in New Orleans* |
|---|---|---|
| *Level: 2-Year or Less* | 10 | 1 |
| *Level: 4-Year* | 22 | 7 |
| *Quality: Top Quartile ("High Quality")* | 4 | 2 |
| *Quality: 2nd Quartile ("Mid-High Quality")* | 3 | 2 |
| *Quality: 3rd Quartile ("Mid-Low Quality")* | 9 | 2 |
| *Quality: 4th Quartile ("Low Quaity")* | 6 | 1 |
| *Sector: Public* | 24 | 3 |
| *Sector: Private* | 8 | 5 |
| *Total Number of Colleges* | 32 | 8 |
| *Total Number of High School Graduates* | 33,485 | 2,066 |

Notes: We use publicly available data from the Integrated Post-Secondary Education Data System on average SAT freshman score, acceptance rate, faculty-student ratio, and average faculty salary to determine college quality quartiles. Quality quartiles for the 32 non-profit, in-state colleges present in the Louisiana Board of Regents data provided by LDOE are presented above. Total number of high school graduates gives a count of the entire analytic sample of high school graduates both in Louisiana and in New Orleans in 2016 using high school enrollment data provided by LDOE.

Table 2. Matched Student Demographics & Characteristics, Pre-Reform (2003-2004)

| | New Orleans | Other Hurricane Districts (Matched) | Non-Hurricane Districts (Matched) |
|---|---|---|---|
| *Demographics: Average for All High School Graduates* | | | |
| *Student Race: Black* | 0.90 | 0.31 | 0.37 |
| | (0.30) | (0.46) | (0.48) |
| *Student Race: White* | 0.05 | 0.59 | 0.60 |
| | (0.21) | (0.49) | (0.49) |
| *Student Race: Other* | 0.05 | 0.10 | 0.03 |
| | (0.22) | (0.30) | (0.18) |
| *Free- and Reduced-Price Lunch* | 0.75 | 0.55 | 0.54 |
| | (0.43) | (0.50) | (0.50) |
| *Special Education* | 0.04 | 0.06 | 0.05 |
| | (0.20) | (0.25) | (0.23) |
| *Ever Repeat* | 0.16 | 0.10 | 0.09 |
| | (0.37) | (0.30) | (0.29) |
| *Ever English Language Learner* | 0.07 | 0.03 | 0.03 |
| | (0.26) | (0.18) | (0.16) |
| *College Level: Average for All High School Graduates* | | | |
| *College Level: 4-Year* | 0.26 | 0.35 | 0.38 |
| | (0.44) | (0.48) | (0.49) |
| *College Level: 2-Year* | 0.09 | 0.06 | 0.06 |
| | (0.28) | (0.23) | (0.23) |
| *College Characteristics: Average for 4-Year College-Going Students* | | | |
| *Admission Rate* | 0.47 | 0.61 | 0.65 |
| | (0.25) | (0.13) | (0.15) |
| *Avg. SAT Score of Entering Freshmen* | 850.50 | 1027.1 | 1019.20 |
| | (389.40) | (140.90) | (120.10) |
| *Avg. Faculty Salary (Monthly)* | 5805.20 | 6824.70 | 6573.40 |
| | (2746.00) | (1236.60) | (995.80) |
| *Instructional Expenditure per Full-Time Student* | 6640.10 | 6647.10 | 6184.70 |
| | (3872.10) | (2310.70) | (1782.60) |
| *Student-Faculty Ratio* | 14.75 | 20.37 | 20.37 |
| | (7.53) | (3.61) | (2.74) |
| *Completion Rate (Within 150% of Time)* | 0.29 | 0.37 | 0.37 |
| | (0.18) | (0.13) | (0.12) |

*Note:* Table continues onto following page; table notes and data sources underneath table end.

| | New Orleans | Other Hurricane Districts (Matched) | Non-Hurricane Districts (Matched) |
|---|---|---|---|
| *PCA College Quality Quartiles: Average for All High School Graduates* | | | |
| *PCA: Top Quartile ("High Quality")* | 0.05 | 0.06 | 0.04 |
| | (0.21) | (0.24) | (0.21) |
| *PCA: 2nd Quartile ("Mid-High Quality")* | 0.10 | 0.07 | 0.04 |
| | (0.30) | (0.26) | (0.20) |
| *PCA: 3rd Quartile ("Mid-Low Quality")* | 0.09 | 0.13 | 0.17 |
| | (0.28) | (0.34) | (0.37) |
| *PCA: 4th Quartile ("Low Quality")* | 0.03 | 0.09 | 0.12 |
| | (0.17) | (0.29) | (0.32) |
| *PCA: Percentile* | 0.40 | 0.42 | 0.34 |
| | (0.27) | (0.24) | (0.23) |
| *Barron's College Quality Tiers: Average for All High School Graduates* | | | |
| *Barron's: Very Competitive and Above* | 0.05 | 0.06 | 0.04 |
| | (0.21) | (0.24) | (0.20) |
| *Barron's: Competitive* | 0.09 | 0.06 | 0.02 |
| | (0.29) | (0.24) | (0.12) |
| *Barron's: Less Competitive* | 0.07 | 0.14 | 0.15 |
| | (0.25) | (0.34) | (0.36) |
| *Barron's: Noncompetitive* | 0.02 | 0.08 | 0.12 |
| | (0.15) | (0.27) | (0.32) |
| *College Match* | | | |
| *Undermatch* | 0.13 | 0.13 | 0.15 |
| | (0.34) | (0.34) | (0.35) |
| *Match* | 0.45 | 0.54 | 0.50 |
| | (0.45) | (0.50) | (0.50) |
| *Overmatch* | 0.42 | 0.33 | 0.35 |
| | (0.49) | (0.47) | (0.48) |
| *Persistence & Transfer, First to Second Semester Freshman Year: Average for all Four-Year College Students* | | | |
| *Transfer* | 0.00 | 0.00 | 0.01 |
| | (0.00) | (0.05) | (0.12) |
| *Persistence at First College* | 0.85 | 0.87 | 0.86 |
| | (0.36) | (0.33) | (0.34) |
| *Persistence at Any College* | 0.85 | 0.87 | 0.85 |
| | (0.36) | (0.34) | (0.36) |

*Note:* Weighted averages presented for the analytic sample of 2004 high school graduates in New Orleans and high school graduates attending matched schools in comparison districts. Other hurricane-affected districts are listed in Footnote 10. Non-hurricane districts include all other districts in Louisiana.

*Source:* We use data from the Louisiana Department of Education (LDOE) for 2000-01 through 2015-16 records on high school students, including student demographics, high school graduation dates, and ACT score. Our records on students' college of attendance and college persistence were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the college records above for the 2004 high school graduates. We use publicly available data from the Integrated Post-Secondary Education Data System (IPEDS) for the following college-level variables: college level (2- or 4-year) and college characteristics (admission rate, average SAT score of entering freshmen, average faculty salary, instructional expenditure per full-time student, student-faculty ratio, and completion rate). Using the IPEDS data on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles and PCA percentile. Using publicly available IPEDS data on college's 25th and 75th ACT percentile combined with student ACT scores provided by LDOE, we determine student-college match. We use Barron's Profile of American Colleges (2001) for information on each college's Barron's selectivity tier.

Table 3: Average Treatment Effect of the Reforms on Two-Year or Four-Year College Attendance

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| 2-Year Attendance | -0.02* | -0.01 | 0.01 | -0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| 4-Year Attendance | 0.08*** | 0.13*** | 0.05* | 0.12*** |
| | (0.01) | (0.01) | (0.02) | (0.01) |
| *N* | 75543 | 45005 | 20953 | 11609 |
| Clusters | 68 | 40 | 8 | 5 |

*Note:* Sample includes Louisiana public high school graduates. Each cell represents a separate difference-in-difference regression with estimation at the student-level. An outcome is one if the student attended the specific institution type (here, four-year or two-year) and zero if the student attended another type of postsecondary institution or did not attend any postsecondary institution. Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System on college level (2- or 4-year).

Table 4: Average Treatment Effects of Reforms on College Quality Characteristics

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *College Outcome: Characteristics in PCA Quality Index* | | | | |
| Average SAT | 11.55*** | 23.94*** | 11.62** | 32.52*** |
| | (1.79) | (3.66) | (2.86) | (3.47) |
| *N* | 27880 | 13863 | 7454 | 3722 |
| Admission Rate | 0.00 | -0.01 | 0.01 | -0.00 |
| | (0.00) | (0.01) | (0.01) | (0.01) |
| *N* | 27880 | 10599 | 7454 | 3792 |
| Avg. Faculty Salary | 1.83 | 105.26** | 2.87 | 181.45* |
| (monthly) | (19.22) | (30.83) | (41.65) | (50.62) |
| *N* | 27880 | 15857 | 7454 | 4217 |
| Student-Faculty Ratio | 0.35*** | 0.90*** | 0.35*** | 1.23*** |
| | (0.06) | (0.19) | (0.06) | (0.19) |
| *N* | 27880 | 4569 | 7454 | 1678 |
| *College Outcome: Other Characteristics Indicative of Quality* | | | | |
| Per capita instructional spending | -91.66* | 24.48 | -45.02 | 3.20 |
| | (34.92) | (42.30) | (50.76) | (58.32) |
| *N* | 27880 | 18238 | 7454 | 4595 |
| Graduation Rate | 0.01** | 0.03*** | 0.01 | 0.02 |
| | (0.00) | (0.00) | (0.01) | (0.02) |
| *N* | 27880 | 14142 | 7454 | 3852 |
| Clusters | 68 | 40 | 8 | 5 |

*Note:* Sample includes Louisiana public high school graduates who attend a four-year college immediately following high school graduation. Outcome for each characteristic is a continuous variable containing institution-level data from 2010. Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare characteristics for the cohorts that graduated high school in 2004 and 2016, conditional on college attendance. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for the college characteristics shown above: average SAT, admission rate, average faculty salary, student-faculty ratio, per capita instructional spending, and graduation rate.

Table 5: Average Treatment Effects of Reforms on Likelihood of Attendance at each College Quality Quartile

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *College Outcome: Overall Quality Percentile* | | | | |
| | 0.08*** | 0.10*** | 0.07* | 0.09* |
| | (0.01) | (0.01) | (0.03) | (0.03) |
| *N* | 26864 | 16688 | 7717 | 4616 |
| *College Outcome: Ordinal Logit Estimation* | | | | |
| College Quality Quartile | 1.39*** | 1.97*** | 1.20* | 1.76*** |
| | (0.06) | (0.09) | (0.09) | (0.09) |
| *N* | 75543 | 45766 | 20953 | 12300 |
| *College Outcome: Quality Quartile* | | | | |
| Top Quartile (“High Quality”) | 0.02*** | 0.05*** | 0.01 | 0.04* |
| | (0.00) | (0.00) | (0.01) | (0.01) |
| $2^{nd}$ Quartile (“Mid-High Quality”) | -0.02*** | -0.01** | -0.02 | -0.01 |
| | (0.00) | (0.00) | (0.01) | (0.01) |
| $3^{rd}$ Quartile (“Mid-Low Quality”) | 0.06*** | 0.06*** | 0.03 | 0.04* |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| $4^{th}$ Quartile (“Low Quality”) | 0.03*** | 0.02* | 0.03 | 0.04 |
| | (0.01) | (0.01) | (0.02) | (0.03) |
| *N* | 75543 | 39639 | 20953 | 11287 |
| Clusters | 68 | 40 | 8 | 5 |

*Note:* Sample for quality quartiles includes Louisiana public high school graduates; sample for quality percentiles includes Louisiana public high school graduates who attend college. Each cell represents a separate difference-in-difference regression with estimation at the student-level. For the quality quartiles, an outcome is one if the student attended a specific quartile (here, a specific quality quartile) and zero if the student attended another quality quartile, a two-year institution, or did not attend any postsecondary institution. For overall quality percentile, outcome is where on the index a student’s college of attendance is, conditional on college attendance. For the ordinal logit estimation, the outcome is a student’s college quality quartile of attendance, ranging from 0 (attends no four-year college) to 5 (attends high quality four-year college). Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students’ college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality quartiles and percentiles.

Table 6. Average Treatment Effects of Reforms on Attendance at Each Barron's Selectivity Tier

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *College Outcome: Attendance at Barron's Tiers* | | | | |
| Barron's: Very Competitive and Above | 0.02*** | 0.05*** | 0.01 | 0.04* |
| | (0.00) | (0.00) | (0.01) | (0.01) |
| Barron's: Competitive | -0.02*** | -0.00 | -0.01 | -0.00 |
| | (0.00) | (0.00) | (0.01) | (0.01) |
| Barron's: Less Competitive | 0.05*** | 0.07*** | 0.03* | 0.04 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Barron's: Noncompetitive | 0.03*** | 0.02 | 0.02 | 0.01 |
| | (0.01) | (0.01) | (0.02) | (0.02) |
| *N* | 75543 | 39612 | 20953 | 11983 |
| Clusters | 68 | 40 | 8 | 5 |

*Note:* Sample includes Louisiana public high school graduates. Each cell represents a separate difference-in-difference regression with estimation at the student-level. An outcome is one if the student attended the specific institution type (here, a specific Barron's selectivity tier) and zero if the student attended another Barron's selectivity tier, a two year institution, or did not attend any postsecondary institution. Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is $\delta$ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use Barron's Profile of American Colleges (2001) for information on each college's Barron's selectivity tier.

Table 7. Average Treatment Effects on College Match

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *Outcome: Persistence At First College* | | | | |
| Undermatch | 0.02* | 0.02 | 0.00 | -0.00 |
| | (0.01) | (0.01) | (0.01) | (0.04) |
| Match | 0.09*** | 0.12*** | 0.13*** | 0.16* |
| | (0.01) | (0.02) | (0.02) | (0.04) |
| Overmatch | 0.00 | 0.03 | -0.04 | 0.03 |
| | (0.01) | (0.01) | (0.02) | (0.02) |
| *N* | 30836 | 17114 | 8712 | 4767 |

*Note:* Sample includes Louisiana public high school graduates who attend a four-year college immediately following high school graduation. A college-student pair is considered an "undermatch" if a student's ACT score falls above the college's 75th percentile of ACT. A college-student pair is considered a "match" if a student's ACT score falls within a college's 25th and 75th ACT percentiles. A college-student pair is considered an "overmatch" if a student's ACT score falls below a college's 25th percentile ACT score. Each outcome is binary and exclusive. Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare characteristics for the cohorts that graduated high school in 2004 and 2016, conditional on college attendance. The first number in each cell is $\delta$ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics, high school graduation dates, and ACT score. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). Using publicly available data from the Integrated Post-Secondary Education Data System on college's 25th and 75th percentile ACT scores combined with student ACT scores provided by LDOE, we determine student-college match.

Table 8. Average Treatment Effects of Reforms on Social Mobility Measure.

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *College Outcome: College's Social Mobility* | | | | |
| High Mobility College: Percent of Students Moving from Bottom 20% to Top 20% of Income Distribution | 0.0032*** | 0.0025*** | 0.0036 | 0.0025 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Highest Mobility College: Percent of Students Moving from Bottom 20% to Top 1% of Income Distribution | 0.0001*** | 0.0001*** | 0.0001 | 0.0001 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| *N* | 28263 | 15897 | 8672 | 4823 |
| Clusters | 68 | 40 | 8 | 5 |

*Note:* Sample includes Louisiana public high school graduates who attend a four-year college immediately following high school graduation. Outcome for each characteristic is a continuous variable containing institution-level data from 2010. Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare characteristics for the cohorts that graduated high school in 2004 and 2016, conditional on college attendance. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics, high school graduation dates, and ACT score. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use data from Chetty et al. (2017) to determine each college's social mobility.

Table 9. Average Treatment Effects of Reforms on Attendance, Controlling for High Stakes Test Scores

| | Main Results | ACT Subsample | ACT Subsample with Control for Student ACT Score |
|---|---|---|---|
| *College Outcome: College Level* | | | |
| 2-Year Attendance | -0.00 | -0.06 | -0.01 |
| | (0.01) | (0.02) | (0.03) |
| 4-Year Attendance | 0.12*** | 0.23*** | 0.14* |
| | (0.01) | (0.03) | (0.04) |
| *N* | 11609 | 5400 | 5400 |
| *College Outcome: Quality Quartile* | | | |
| Top Quartile (“High Quality”) | 0.04* | 0.07 | 0.03 |
| | (0.01) | (0.03) | (0.03) |
| 2nd Quartile | -0.01 | -0.08 | -0.10* |
| | (0.01) | (0.03) | (0.03) |
| 3rd Quartile | 0.04* | 0.08 | 0.09 |
| | (0.01) | (0.03) | (0.05) |
| 4th Quartile (“Low Quality”) | 0.04 | 0.08 | 0.07 |
| | (0.03) | (0.08) | (0.08) |
| *N* | 11287 | 5043 | 5043 |
| Clusters | 5 | 5 | 5 |

*Note:* Sample for quality quartiles includes Louisiana public high school graduates; sample for quality percentiles includes Louisiana public high school graduates who attend college. Each cell represents a separate difference-in-difference regression with estimation at the student-level. For the quality quartiles and college level, an outcome is one if the student attended a specific college type and zero if the student attended another college type or did not attend any postsecondary institution. For overall quality percentile, outcome is where on the index a student’s college of attendance is, conditional on college attendance. Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. All estimations use students in matched schools in hurricane-affected districts as the comparison group. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Lower number of observations for ACT subsample in four-year and two-year estimation than for quality quartiles due to matching process. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education (LDOE) for 2000-01 through 2015-16 records on high school students, including student demographics, high school graduation dates, and ACT score. Our records on students’ college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the college records above for the 2004 high school graduates. We use publicly available data from IPEDS on college level (2- or 4-year). Using publicly available data from the Integrated Post-Secondary Education Data System on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles.

Table 10. Average Treatment Effect of the Reforms on Freshman Fall-to-Spring Persistence & Transfer Behavior or all 4-Year Colleges

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *Outcome: Freshman Fall-to-Spring Persistence at First College* | | | | |
| 4-Year College | 0.03*** | 0.01 | 0.03** | -0.02 |
| | (0.01) | (0.02) | (0.01) | (0.02) |
| *N* | 16148 | 6315 | 4246 | 1270 |
| *Outcome: Freshman Fall-to-Spring Persistence at Any* | | | | |
| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
| 4-Year College | 0.04*** | -0.01 | 0.04** | -0.04 |
| | (0.01) | (0.02) | (0.01) | (0.03) |
| *N* | 16148 | 4086 | 4246 | 1059 |
| *Outcome: Freshman Fall-to-Spring Transfer* | | | | |
| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
| 4-Year College | 0.01*** | 0.01*** | 0.01*** | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.01) |
| *N* | 16148 | 6933 | 4246 | 2128 |

Notes: Sample includes Louisiana public high school graduates who attend a four-year college immediately following high school graduation. The outcome for persistence is one if a student attended a college both the fall and spring of their freshman year. The outcome for transfer is one if a student changed institutions between the fall and spring of their freshman year. Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare characteristics for the cohorts that graduated high school in 2004 and 2012, conditional on college attendance. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance and persistence were also provided by LDOE, and come from the National Student Clearinghouse (NSC) for the both pre- and post-reform cohorts used above (2004 and 2012). We use publicly available data from the Integrated Post-Secondary Education Data System on college level (2- or 4-year).

Table 11. Average Treatment Effects of Reforms on Freshman Fall-to-Spring Persistence & Transfer Behavior for Each Quality Quartile

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *Outcome: Freshman Fall-to-Spring Persistence At First College* | | | | |
| Top Quartile ("High Quality") | -0.01 | -0.03 | -0.00 | -0.06** |
| | (0.01) | (0.03) | (0.01) | (0.01) |
| 2nd Quartile | 0.00 | 0.03 | -0.00 | 0.00 |
| | (0.02) | (0.06) | (0.01) | (0.04) |
| 3rd Quartile | -0.07*** | -0.09*** | -0.06** | -0.07*** |
| | (0.01) | (0.02) | (0.01) | (0.01) |
| 4th Quartile ("Low Quality") | 0.07*** | 0.11*** | 0.06 | 0.03 |
| | (0.01) | (0.03) | (0.03) | (0.05) |
| *N* | 3083 | 557 | 1015 | 234 |
| *Outcome: Freshman Fall-to-Spring Persistence At Any College* | | | | |
| Top Quartile ("High Quality") | -0.03** | -0.05 | -0.02 | -0.05* |
| | (0.01) | (0.04) | (0.01) | (0.02) |
| 2nd Quartile | 0.01 | 0.04 | 0.00 | 0.01 |
| | (0.02) | (0.05) | (0.01) | (0.04) |
| 3rd Quartile | -0.05*** | -0.07* | -0.04* | -0.12* |
| | (0.01) | (0.03) | (0.01) | (0.03) |
| 4th Quartile ("Low Quality") | 0.07*** | 0.07* | 0.06 | -0.01 |
| | (0.01) | (0.03) | (0.03) | (0.04) |
| *N* | 3083 | 1250 | 1015 | 332 |
| *Outcome: Freshman Fall-to-Spring Transfer* | | | | |
| Top Quartile ("High Quality") | -0.01 | -0.03 | -0.00 | -0.06** |
| | (0.01) | (0.03) | (0.01) | (0.01) |
| 2nd Quartile | 0.01 | -0.01 | 0.00 | [17] |
| | (0.01) | (0.02) | (0.00) | |
| 3rd Quartile | 0.01*** | 0.02*** | 0.02*** | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.02) |
| 4th Quartile ("Low Quality") | 0.01 | 0.01 | 0.00 | 0.00 |
| | (0.00) | (0.01) | (0.01) | (0.00) |
| *N* | 3083 | 557 | 1015 | 234 |
| *Clusters* | 65 | 36 | 8 | 5 |

*Note*: Sample includes Louisiana public high school graduates who attend a four-year college in the specified quality quartile immediately following high school graduation. The outcome for persistence is one if a student attended college both the fall and spring of their freshman year. The outcome for transfer is one if a student changed institutions between the fall and spring of their freshman year. Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare characteristics for the cohorts that graduated high school in 2004 and 2012, conditional on beginning college attendance in the specified quartile. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance and persistence were also provided by LDOE, and come from the National Student Clearinghouse (NSC) for the both pre- and post-reform cohorts used above (2004 and 2012). Using publicly available data from the Integrated Post-Secondary Education Data System on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles.

[17] No transfers took place in this analytical sample.

Table 12. Average Treatment Effect of the Reforms on Year-to-Year Persistence & Transfer Behavior for all 4-Year Colleges

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *Outcome: Year-to-Year Persistence at First College* | | | | |
| 4-Year College | 0.11*** | 0.08*** | 0.08 | 0.05 |
| | (0.02) | (0.02) | (0.07) | (0.05) |
| *N* | 19936 | 9364 | 4481 | 1840 |
| *Outcome: Year-to-Year Persistence at Any College* | | | | |
| 4-Year College | 0.09*** | 0.07*** | 0.09 | 0.08 |
| | (0.01) | (0.02) | (0.05) | (0.05) |
| *N* | 19936 | 10238 | 4481 | 1835 |
| *Outcome: Year-to-Year Transfer* | | | | |
| 4-Year College | -0.03*** | -0.03*** | -0.00 | -0.03 |
| | (0.01) | (0.00) | (0.02) | (0.02) |
| *N* | 19936 | 13306 | 4481 | 2977 |

*Note:* Sample includes Louisiana public high school graduates who attend a four-year college immediately following high school graduation. The outcome for persistence is one if a student attended a college for two consecutive years. The outcome for transfer is one if a student changed institutions during these two years. Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare characteristics for the cohorts that graduated high school in 2004 and 2012, conditional on college attendance. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source*: We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance and persistence were also provided by LDOE, and come from the National Student Clearinghouse (NSC) for the both pre- and post-reform cohorts used above (2004 and 2012). We use publicly available data from the Integrated Post-Secondary Education Data System on college level (2- or 4-year).

Table 13. Average Treatment Effects of Reforms on Year-to-Year Persistence & Transfer Behavior for Each Quality Quartile

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *Outcome: Year-to-Year Persistence at First College* | | | | |
| Top Quartile ("High Quality") | -0.02 | -0.03 | 0.02 | 0.02 |
| | (0.02) | (0.04) | (0.04) | (0.09) |
| 2nd Quartile | 0.27*** | 0.36*** | 0.11* | 0.34* |
| | (0.05) | (0.05) | (0.04) | (0.08) |
| 3rd Quartile | -0.19*** | -0.28*** | -0.16*** | -0.19* |
| | (0.01) | (0.03) | (0.01) | (0.06) |
| 4th Quartile ("Low Quality") | 0.14*** | 0.16*** | 0.08 | 0.16 |
| | (0.03) | (0.03) | (0.06) | (0.10) |
| *N* | 4461 | 2066 | 1454 | 558 |
| *Outcome: Year-to-Year Persistence at Any College* | | | | |
| Top Quartile ("High Quality") | 0.01 | 0.00 | 0.03 | 0.15* |
| | (0.02) | (0.05) | (0.02) | (0.04) |
| 2nd Quartile | 0.22*** | 0.30*** | 0.12 | 0.25* |
| | (0.04) | (0.05) | (0.06) | (0.06) |
| 3rd Quartile | -0.18*** | -0.25*** | -0.13*** | -0.12 |
| | (0.01) | (0.04) | (0.02) | (0.08) |
| 4th Quartile ("Low Quality") | 0.16*** | 0.21*** | 0.14 | 0.05 |
| | (0.03) | (0.04) | (0.07) | (0.15) |
| *N* | 4461 | 2137 | 1454 | 600 |
| *Outcome: Year-to-Year Transfer* | | | | |
| Top Quartile ("High Quality") | 0.03** | 0.02 | 0.01 | -0.02 |
| | (0.01) | (0.02) | (0.02) | (0.04) |
| 2nd Quartile | -0.04* | -0.09*** | 0.01 | -0.03 |
| | (0.02) | (0.02) | (0.03) | (0.06) |
| 3rd Quartile | 0.02*** | 0.03*** | 0.03 | 0.02 |
| | (0.00) | (0.01) | (0.01) | (0.02) |
| 4th Quartile ("Low Quality") | -0.02* | 0.01 | 0.02 | 0.03 |
| | (0.01) | (0.01) | (0.03) | (0.03) |
| *N* | 4461 | 3072 | 1454 | 995 |
| *Clusters* | 65 | 36 | 8 | 5 |

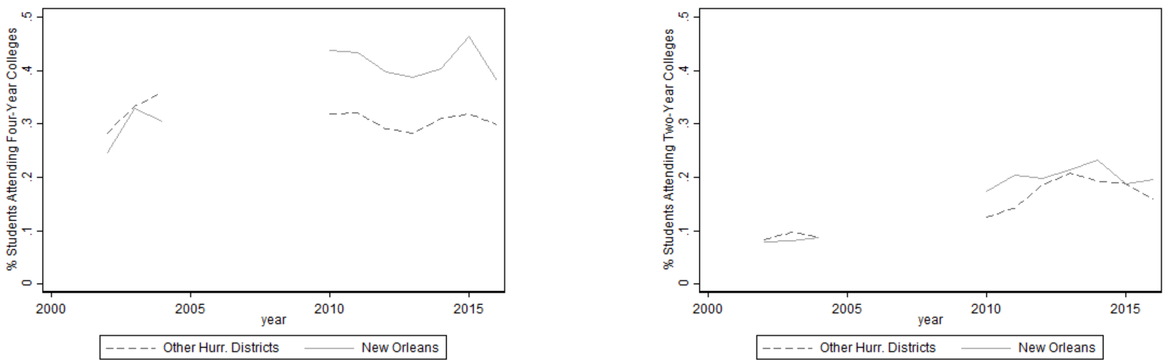
*Note:* Sample includes Louisiana public high school graduates who attend a four-year college in the specified quality quartile immediately following high school graduation. The outcome for persistence is one if a student attended a college for two consecutive years. The outcome for transfer is one if a student changed institutions during these two years.. Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare characteristics for the cohorts that graduated high school in 2004 and 2012, conditional on beginning college attendance in the specified quartile. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance and persistence were also provided by LDOE, and come from the National Student Clearinghouse (NSC) for the both pre- and post-reform cohorts used above (2004 and 2012). Using publicly available data from the Integrated Post-Secondary Education Data System on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles.

Figure 1. Percent of New Orleans High School Graduates and Comparison Hurricane-Affected District Graduates Attending Four- and Two-Year Colleges

**A. Percent of High School Graduates Attending 4-Year Institutions**

**B. Percent of High School Graduates Attending 2-Year Institutions**

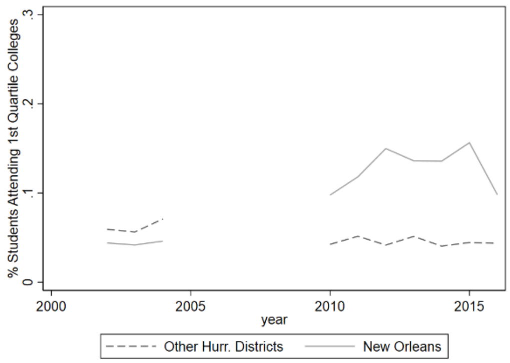



*Note:* The break in the figures from 2005 to 2007 reflects Hurricane Katrina's landfall and the beginning of the school reforms. Years indicate the year a cohort graduated high school. "New Orleans" indicates weighted averages for New Orleans high school graduates; "Other Hurr. Districts" indicates weighted averages for non-New Orleans hurricane-affected districts high school graduates in matched high schools.

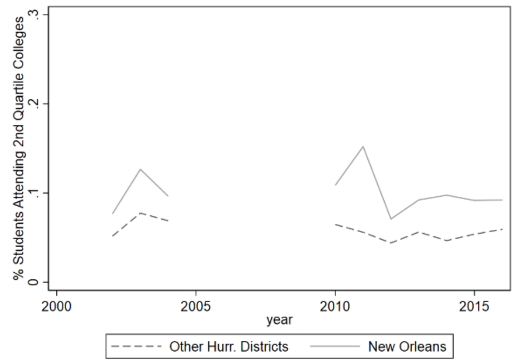
*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohorts and the National Student Clearinghouse (NSC) for the post-reform cohorts. We use publicly available data from the Integrated Post-Secondary Education Data System on college level (2- or 4-year).

Figure 2. Percent of New Orleans High School Graduates and Comparison Hurricane-Affected District Graduates Attending Each Four-Year College Quartile

**A. Percent of High School Graduates Attending 4-Year Colleges in Top Quartile**

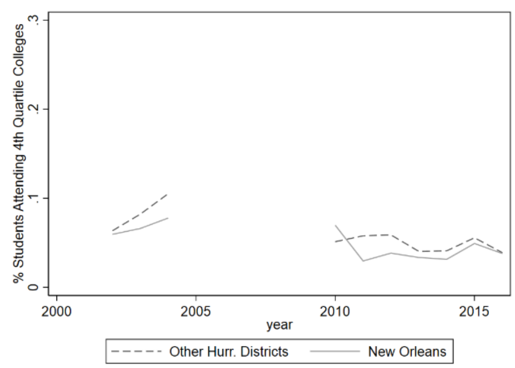



**B. Percent of High School Graduates Attending 4-Year Colleges in 2nd Quartile**




**C. Percent of High School Graduates Attending 4-Year Colleges in 3rd Quartile**

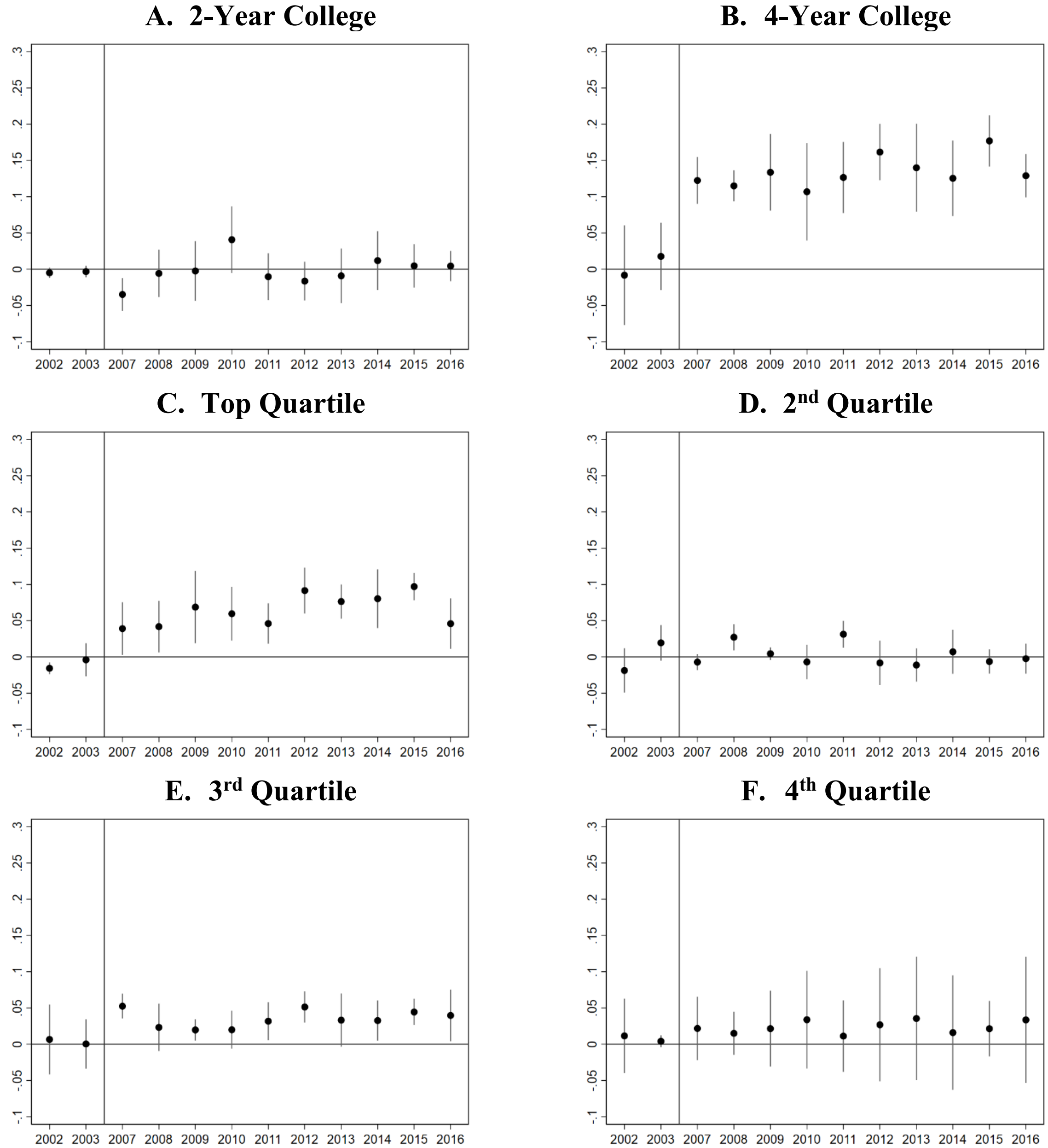

**D. Percent of High School Graduates Attending 4-Year Colleges in 4th Quartile**




*Note:* The break in the figures from 2005 to 2007 reflects Hurricane Katrina's landfall and the beginning of the school reforms. Years indicate the year a cohort graduated high school. "New Orleans" indicates weighted averages for New Orleans high school graduates; "Other Hurr. Districts" indicates weighted averages for non-New Orleans hurricane-affected districts high school graduates in matched high schools.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohorts and the National Student Clearinghouse (NSC) for the post-reform cohorts. Using publicly available data from the Integrated Post-Secondary Education Data System on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles.

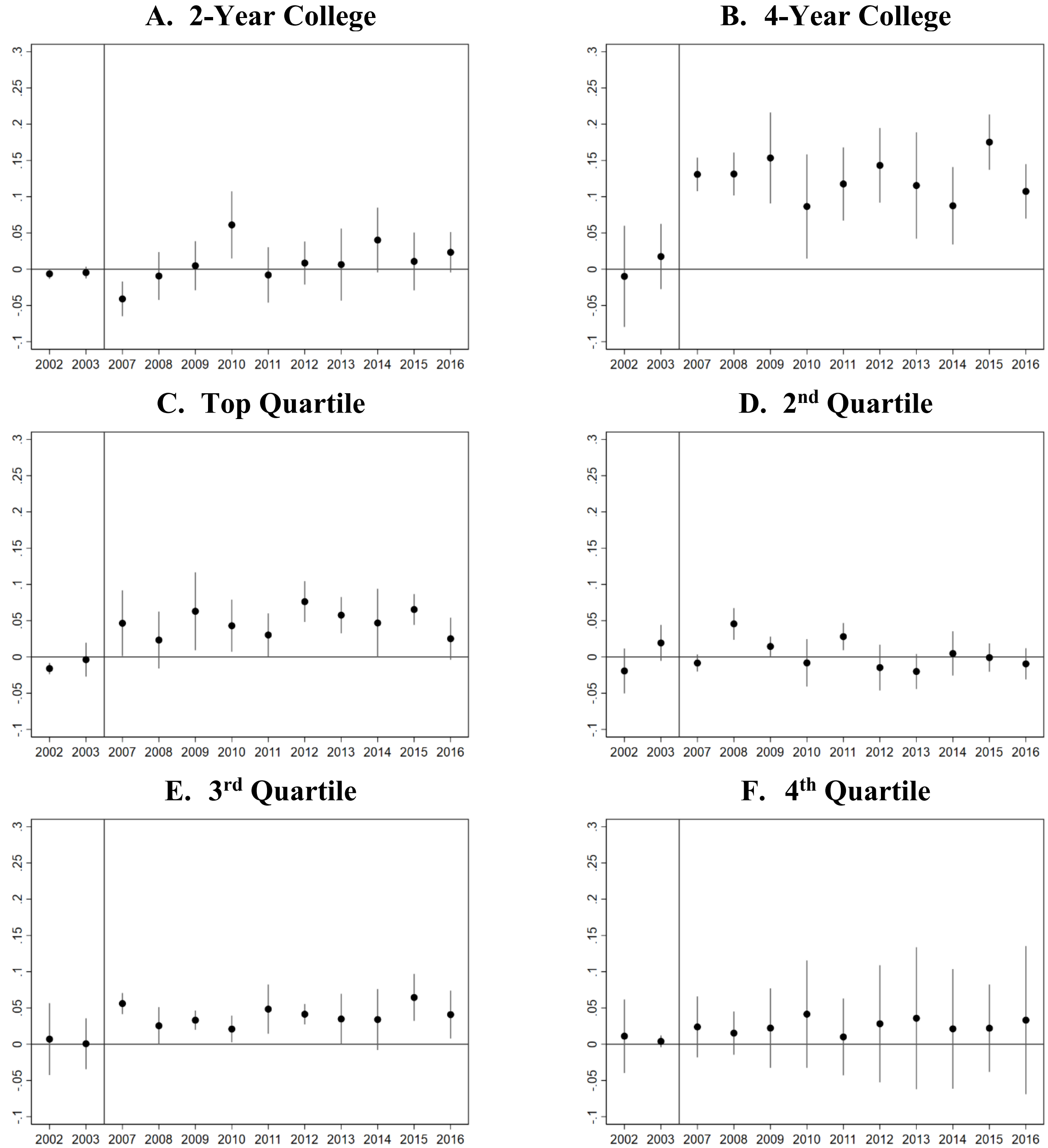
Figure 3. Average Treatment Effects of Reforms on Likelihood of Attendance Using Event Study Design.




*Note*: Estimates are based on equation (2) with the matched hurricane sample. Tables 3 and 4 provide the equivalent estimates based on equation (1). 95% confidence intervals are represented as spikes based on robust standard errors, clustered by district.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohorts and the National Student Clearinghouse (NSC) for the post-reform cohorts. Using publicly available data from the Integrated Post-Secondary Education Data System on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles.

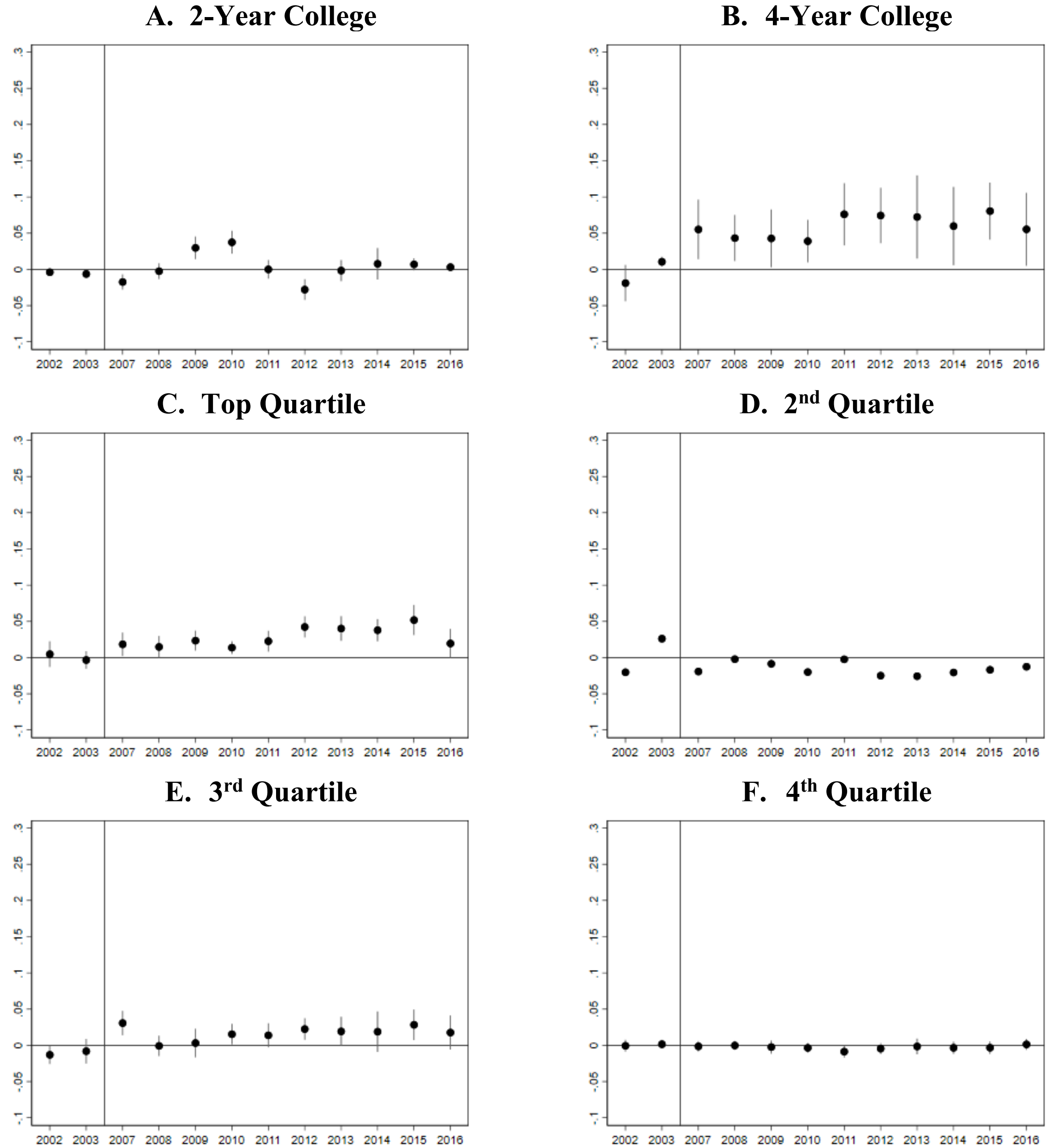
Figure 4. Robustness Check: Average Treatment Effects of Reforms on Likelihood of Attendance For Multiple Years, Returnees to Hurricane-Affected Districts Only.




*Note:* Estimates are based on equation (2) with the matched hurricane sample, using only returnees. Tables 3 and 4 provide the equivalent estimates based on equation (1) when using the full sample. 95% confidence intervals are represented as spikes based on robust standard errors, clustered by district.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohorts and the National Student Clearinghouse (NSC) for the post-reform cohorts. Using publicly available from the Integrated Post-Secondary Education Data System data on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles.

Figure 5. Robustness Check: Average Treatment Effects of Reforms on Likelihood of Attendance For Multiple Years, Compared to Bottom 10% of Districts




*Note:* Estimates are based on equation (2) with the bottom 10% of districts for each outcome. 95% confidence intervals are represented as spikes based on robust standard errors, clustered by district.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohorts and the National Student Clearinghouse (NSC) for the post-reform cohorts. Using publicly available data from the Integrated Post-Secondary Education Data System on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles.

**Appendix Tables.**

Table A1. Data panels and their characteristics.

| | *BOR* | *NSC 1* | *NSC 2* |
|---|---|---|---|
| *Data Source* | Louisiana Board of Regents | National Student Clearinghouse | National Student Clearinghouse |
| *Years of Data (College Entry)* | 2001-2010 | 2005-2018 | 2004-2014 |
| *Pre-Reform Data Available?* | Yes | No | Yes |
| *Student ID Link* | Same as NSC 2; Different than NSC 1 | Different than BOR and NSC 2 | Same as BOR; different than NSC 1 |
| *Students Matched to College Records* | Louisiana public high school graduates | Louisiana public high school graduates | Louisiana public high school graduates |
| *Colleges Included* | 32 Non-Profit Colleges in Louisiana | All colleges reporting to NSC in a year | All colleges reporting to NSC in a year |
| *Student College Information* | College Entry Immediately After HS Graduation | College Attendance in any semester | College Attendance in any semester |
| Used in which analyses papers (table of specified given in parentheses) | Pre-reforms: college level (3), college quality characteristics (4), college quality quartile (5), Barron's tiers (6), college match (7), Chetty social mobility measure (8), main results controlling for ACT score (9), main results for subsamples (A3, A4, A5), measurement error (A7), dynamic characteristics (A8), dynamic quality (A9), using other years' percentiles (A10), main results using college quality percentiles to match (A11), using Ferman-Pinto standard errors (A12), | Same as Panel A but Post-reforms. | Pre- and Post-reforms: College persistence (10, 11, 12, and 13); Out-of-State Results (A6) |

*Source:* All three sets of records on college students were provided by LDOE.

Table A2. Principal Component of the College Quality Proxies

| | |
|---|---|
| Eigenvalue | 2.06 |
| Variance Explained | 52% |
| Eigenvectors | |
| Faculty-Student Ratio | 0.38 |
| Average Freshmen SAT Score | 0.60 |
| Rejection Rate | 0.45 |
| Average Faculty Salary | 0.55 |

*Note:* Averages are presented above using data from a publicly available data source, the Integrated Post-Secondary Education Data System. All data is from 2010 and interpolated where necessary. Institutions with all college quality characteristics available used to calculate the above principal component (1,370 four-year institutions).

Table A3. Black Students Only

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| | | *Outcome: College Level* | | |
| 2-Year Attendance | -0.03** | -0.02 | -0.00 | -0.00 |
| | (0.01) | (0.01) | (0.01) | (0.02) |
| 4-Year Attendance | 0.11*** | 0.14*** | 0.10* | 0.10** |
| | (0.01) | (0.01) | (0.03) | (0.02) |
| | 30458.00 | 16623.00 | 9149.00 | 6011.00 |
| | | *Outcome: Overall Quality Percentile* | | |
| | 0.06*** | 0.07*** | 0.06 | 0.09 |
| | (0.01) | (0.02) | (0.05) | (0.08) |
| | 8955.00 | 5344.00 | 2629.00 | 1811.00 |
| | | *Outcome: Quality Quartile* | | |
| Top Quartile ("High | 0.01** | 0.02** | 0.00 | -0.00 |
| Quality") | (0.00) | (0.01) | (0.01) | (0.02) |
| 2nd Quartile | -0.01** | -0.01 | -0.00 | 0.00 |
| | (0.00) | (0.00) | (0.01) | (0.01) |
| 3rd Quartile | 0.08*** | 0.10*** | 0.03 | 0.07* |
| | (0.01) | (0.01) | (0.02) | (0.02) |
| 4th Quartile ("Low | 0.04*** | 0.03 | 0.06* | 0.09 |
| Quality") | (0.01) | (0.02) | (0.03) | (0.07) |
| N | 30458 | 15431 | 9149 | 6362 |

*Note*: Sample includes Louisiana public high school graduates who identify as Black. Each cell represents a separate difference-in-difference regression with estimation at the student-level. An outcome is one if the student attended the specific institution type (here, a college quality quartile) and zero if the student attended another quality quartile, a two year institution, or did not attend any postsecondary institution. Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality quartiles and percentiles.

Table A4. White Students Only

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *Outcome: College Level* | | | | |
| 2-Year Attendance | -0.01 | -0.03* | 0.00 | -0.02 |
| | (0.01) | (0.01) | (0.01) | (0.03) |
| 4-Year Attendance | 0.00 | -0.02 | -0.02 | -0.03 |
| | (0.01) | (0.01) | (0.03) | (0.03) |
| | 40679 | 15438 | 9926 | 2903 |
| *Outcome: Overall Quality Percentile* | | | | |
| | -0.01 | 0.09*** | -0.01 | 0.09** |
| | (0.01) | (0.01) | (0.02) | (0.02) |
| | 16358 | 4884 | 4410 | 1516 |
| *Outcome: Quality Quartile* | | | | |
| Top Quartile ("High | -0.04*** | 0.02* | -0.04 | 0.03 |
| Quality") | (0.01) | (0.01) | (0.02) | (0.01) |
| 2nd Quartile | -0.05*** | -0.08*** | -0.06*** | -0.09*** |
| | (0.00) | (0.01) | (0.01) | (0.01) |
| 3rd Quartile | 0.06*** | -0.00 | 0.04** | -0.00 |
| | (0.01) | (0.01) | (0.01) | (0.02) |
| 4th Quartile ("Low | 0.03*** | 0.01 | 0.04 | 0.02 |
| Quality") | (0.01) | (0.01) | (0.02) | (0.04) |
| N | 40679 | 13553 | 9926 | 3873 |

*Note:* Sample includes Louisiana public high school graduates who identified as White. Each cell represents a separate difference-in-difference regression with estimation at the student-level. An outcome is one if the student attended the specific institution type (here, a college quality quartile) and zero if the student attended another quality quartile, a two year institution, or did not attend any postsecondary institution. Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality quartiles and percentiles.

Table A5. FRPL Students Only

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| | *Outcome: College Level* | | | |
| 2-Year Attendance | -0.03*** | -0.04*** | -0.01 | -0.02 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| 4-Year Attendance | 0.03*** | 0.08*** | 0.00 | 0.06** |
| | (0.01) | (0.01) | (0.02) | (0.02) |
| | 50306 | 33398 | 14260 | 10474 |
| | *Outcome: Overall Quality Percentile* | | | |
| | 0.10*** | 0.12*** | 0.09* | 0.10** |
| | (0.01) | (0.01) | (0.04) | (0.02) |
| | 16434 | 10026 | 4849 | 3500 |
| | *Outcome: Quality Quartile* | | | |
| Top Quartile ("High | 0.02*** | 0.05*** | -0.00 | 0.04 |
| Quality") | (0.00) | (0.01) | (0.01) | (0.02) |
| 2nd Quartile | -0.03*** | -0.02*** | -0.02 | -0.02 |
| | (0.00) | (0.00) | (0.01) | (0.02) |
| 3rd Quartile | 0.04*** | 0.06*** | 0.02 | 0.04* |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| 4th Quartile ("Low | 0.01 | -0.01 | 0.01* | -0.01 |
| Quality") | (0.00) | (0.01) | (0.00) | (0.02) |
| N | 50306 | 28562 | 14260 | 10206 |

*Note:* Sample includes Louisiana public high school graduates who received free- or reduced-price lunch in the past four years prior to graduation. Each cell represents a separate difference-in-difference regression with estimation at the student-level. An outcome is one if the student attended the specific institution type (here, a college quality quartile) and zero if the student attended another quality quartile, a two year institution, or did not attend any postsecondary institution. Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality quartiles and percentiles.

Table A6. Main Results, Including All Colleges (Not Only the 32 in Board of Regents), Using NSC 2

| | Main Results: BOR & NSC 1 | BOR Colleges: NSC 2 | All Colleges: NSC 2 |
|---|---|---|---|
| | *Outcome: College Level* | | |
| 4-Year Attendance | 0.12*** | 0.16** | 0.13** |
| | (0.01) | (0.03) | (0.02) |
| *N* | 11609 | 6974 | 6974 |
| | *Outcome: Overall Quality Percentile* | | |
| | 0.09* | 0.14* | 0.12* |
| | (0.03) | (0.03) | (0.03) |
| *N* | 4616 | 2567 | 3147 |
| | *Outcome: Quality Quartile* | | |
| Top Quartile ("High | 0.04* | 0.08** | 0.08** |
| Quality") | (0.01) | (0.01) | (0.02) |
| 2nd Quartile | -0.01 | 0.00 | 0.02* |
| | (0.01) | (0.01) | (0.01) |
| 3rd Quartile | 0.04* | 0.08 | 0.04** |
| | (0.01) | (0.03) | (0.01) |
| 4th Quartile ("Low | 0.04 | 0.00 | -0.01 |
| Quality") | (0.03) | (0.02) | (0.01) |
| *N* | 11287 | 8853 | 7766 |

*Note:* Sample for quality quartiles includes Louisiana public high school graduates. This analysis relies on NSC 2. Each cell represents a separate difference-in-difference regression with estimation at the student-level. An outcome is one if the student attended a specific quartile (here, a specific quality quartile) and zero if the student attended another quality quartile, a two-year institution, or did not attend any postsecondary institution. Analyses using NSC 2 compare rates for the cohorts that graduated high school in 2004 and 2012. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the National Student Clearinghouse (NSC) for the both pre- and post-reform cohorts used above (2004 and 2012). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality quartiles and percentiles.

Table A7. Robustness Check: Average Treatment Effect of Reforms on Measurement Error

| | Entire State | Entire State (Only Schools Matched in 4-Year Attendance Specification) | Hurricane Districts | Hurricane Districts (Only Schools Matched in 4-Year Attendance Specification) |
|---|---|---|---|---|
| Measurement Error | -0.03 | -0.02 | -0.08 | -0.07 |
| | (0.02) | (0.02) | (0.05) | (0.05) |

Notes: Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error. Here, districts included in the specifications with school matching are schools matched to New Orleans in the specification for likelihood of attending a four-year college. Every specification is weighted by the percent of students at a school who attended the specific college in 2003. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) the National Student Clearinghouse (NSC). We use publicly available data on the number of freshmen at each public Louisiana college from the Louisiana Board of Regents to determine measurement error.

Table A8. Robustness Check: Average Treatment Effect of Reform on Dynamic College Quality Characteristics.

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| Average SAT | 157.79*** | 158.25*** | 112.63** | 142.44** |
| | (9.69) | (9.82) | (26.73) | (24.67) |
| *N* | 25082 | 8430 | 7128 | 3224 |
| Admission Rate | -0.28*** | -0.26*** | -0.21*** | -0.20* |
| | (0.02) | (0.03) | (0.03) | (0.06) |
| *N* | 25170 | 3925 | 7147 | 2008 |
| Avg. Faculty Salary | 969.97*** | 1045.37*** | 640.40*** | 901.01** |
| (monthly) | (80.78) | (60.86) | (116.83) | (124.65) |
| *N* | 30565 | 11057 | 8568 | 4703 |

*Note:* Sample includes Louisiana public high school graduates who attend a four-year college immediately following high school graduation. Outcome for each characteristic is a continuous variable containing institution-level data from the year prior to a students' college enrollment. Each cell represents a separate difference-in-difference regression with estimation at the student-level. Analyses compare characteristics for the cohorts that graduated high school in 2004 and 2016, conditional on college attendance. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, and average faculty salary.

Table A9. Robustness Check: Average Treatment Effect of Reform on Dynamic College Quality Quartiles.

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| *College Outcome: Ordinal Logit Estimation* | | | | |
| College Quality Quartile | 1.39*** | 1.78*** | 1.18* | 1.80*** |
| | (0.06) | (0.15) | (0.08) | (0.20) |
| *N* | 75543 | 28814 | 20953 | 10999 |
| *College Outcome: Quality Quartile* | | | | |
| Top Quartile (“High Quality”) | 0.01*** | 0.02*** | 0.00 | 0.01* |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| 2nd Quartile (“Mid-High Quality”) | -0.02 | -0.04 | -0.01 | 0.01 |
| | (0.02) | (0.03) | (0.03) | (0.05) |
| 3rd Quartile (“Mid-Low Quality”) | 0.04*** | 0.04*** | 0.00 | 0.01 |
| | (0.01) | (0.01) | (0.02) | (0.01) |
| 4th Quartile (“Low Quality”) | 0.05** | 0.08*** | 0.06 | 0.11* |
| | (0.02) | (0.02) | (0.03) | (0.03) |
| *N* | 70155 | 23912 | 19607 | 10271 |
| Clusters | 68 | 40 | 8 | 5 |

*Note:* Sample for quality quartiles includes Louisiana public high school graduates; sample for quality percentiles includes Louisiana public high school graduates who attend college. Each cell represents a separate difference-in-difference regression with estimation at the student-level. For the quality quartiles, an outcome is one if the student attended a specific quartile (here, a specific quality quartile) and zero if the student attended another quality quartile, a two-year institution, or did not attend any postsecondary institution. For overall quality percentile, outcome is where on the index a student’s college of attendance is, conditional on college attendance. For the ordinal logit estimation, the outcome is a student’s college quality quartile of attendance, ranging from 0 (attends no four-year college) to 5 (attends high quality four-year college). Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students’ college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality quartiles.

Table A10. Quality Percentile Index using Other Years' Data.

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| Quality Percentile: 2011 | 6.82*** | 7.82*** | 7.05* | 8.23* |
| | (0.83) | (0.94) | (2.76) | (2.83) |
| Quality Percentile: 2012 | 6.41*** | 7.28*** | 6.86* | 9.07* |
| | (0.82) | (0.85) | (2.62) | (2.03) |
| Quality Percentile: 2013 | 6.72*** | 8.06*** | 7.05* | 9.47** |
| | (0.74) | (0.76) | (2.55) | (1.88) |
| Quality Percentile: 2014 | 3.56*** | 5.18*** | 4.58* | 6.69** |
| | (0.73) | (0.76) | (1.74) | (1.40) |
| Quality Percentile: 2015 | 2.97*** | 4.44*** | 3.89 | 7.87** |
| | (0.77) | (0.97) | (1.80) | (1.11) |
| Quality Percentile: 2016 | 4.62*** | 5.44*** | 5.33 | 8.61* |
| | (0.85) | (0.99) | (2.63) | (2.01) |

*Note:* Sample includes Louisiana public high school graduates who attend a four-year college immediately following high school graduation. Outcome for each characteristic is a continuous variable containing the college quality percentile for specified year, as indicated. Each cell represents a separate difference-in-difference regression with estimation at the student-level. College attendance analyses compare characteristics for the cohorts that graduated high school in 2004 and 2016, conditional on college attendance. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics for average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality percentiles.

Table A11. Matching using college quality percentile

| | Entire State | Entire State w/ School Matching | Hurricane Districts | Hurricane Districts w/ School Matching |
|---|---|---|---|---|
| Top Quartile ("High Quality") | 0.02*** | 0.05*** | 0.01 | 0.04** |
| | (0.00) | (0.00) | (0.01) | (0.01) |
| 2nd Quartile | -0.02*** | -0.01 | -0.02 | -0.01 |
| | (0.00) | (0.01) | (0.01) | (0.01) |
| 3rd Quartile | 0.06*** | 0.07*** | 0.03 | 0.05* |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| 4th Quartile ("Low Quality") | 0.03*** | 0.03*** | 0.03 | 0.03 |
| | (0.01) | (0.01) | (0.02) | (0.01) |
| N | 75543 | 45766 | 20953 | 12300 |

*Note:* Sample includes Louisiana public high school graduates. Each cell represents a separate difference-in-difference regression with estimation at the student-level. An outcome is one if the student attended the specific institution type (here, a specific college quality quartile) and zero if the student attended another type of postsecondary institution or did not attend any postsecondary institution. Analyses compare rates for the cohorts that graduated high school in 2004 and 2016. The first number in each cell is δ in equation 1. The second number in parentheses is the GEE clustered standard error, clustered at the district level. Column titles represent the sample in each estimation; estimations for school matching include weights. Significance levels: *** p<.001, ** p <.01, *p <.05.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality quartiles and percentiles.

Table A12. Ferman-Pinto (2019) Adjusted P-Value Calculations

| | | | | |
|---|---|---|---|---|
| *College Outcome: Level of Attendance* | | | | |
| | 2-Year College | | 4-Year College | |
| | Entire State | Matched State | Entire State | Matched State |
| Estimate | -0.01 | -0.01 | 0.10 | 0.10 |
| P-value | (0.05) | (0.34) | (0.00) | (0.00) |
| F-P P-value | (0.72) | (0.36) | (0.01) | (0.18) |
| *College Outcome: Quality Percentile* | | | | |
| | Entire State | Matched State | | |
| Estimate | 0.10 | 0.09 | | |
| P-value | (0.00) | (0.00) | | |
| F-P P-value | (0.03) | (0.08) | | |
| *College Outcome: Quality Quartile* | | | | |
| | Top Quartile | | 2nd Quartile | |
| | Entire State | Matched State | Entire State | Matched State |
| Estimate | 0.04 | 0.03 | -0.01 | -0.01 |
| P-value | (0.00) | (0.00) | (0.00) | (0.00) |
| F-P P-value | (0.18) | (0.09) | (0.48) | (0.47) |
| | 3rd Quartile | | 4th Quartile | |
| | Entire State | Matched State | Entire State | Matched State |
| Estimate | 0.05 | 0.05 | 0.03 | 0.03 |
| P-value | (0.00) | (0.00) | (0.00) | (0.018) |
| F-P P-value | (0.30) | (0.22) | (0.40) | (0.35) |

*Note:* Reported estimates are based on cell averages rather than student-level observations, as in the main analyses. The *p*-values without using the Ferman and Pinto (2019) methodology are denoted "P-value"; those that use Ferman-Pinto standard errors are denoted "F-P *p*-values." F-P *p*-values were calculated using a bootstrap method with 2,000 iterations.

*Source:* We use data from the Louisiana Department of Education for 2000-01 through 2015-16 records on high school students, including student demographics and high school graduation dates. Our records on students' college of attendance were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the pre-reform cohort used above (2004) and the National Student Clearinghouse (NSC) for the post-reform cohort used above (2016). We use publicly available data from the Integrated Post-Secondary Education Data System for college characteristics on average SAT, admission rate, average faculty salary, and student-faculty ratio to determine college quality quartiles and percentiles.

Table A13. Summary Statistics for New Orleans Students, Pre- and Post-Reform

| | New Orleans Pre-Reform Cohort (2004 Graduates) | New Orleans Post-Reform Cohort (2016 Graduates) |
|---|---|---|
| *Demographics: Average for All High School Graduates* | | |
| *Student Race: Black* | 0.90 | 0.83 |
| | (0.30) | (0.38) |
| *Student Race: White* | 0.05 | 0.09 |
| | (0.21) | (0.28) |
| *Student Race: Other* | 0.05 | 0.08 |
| | (0.22) | (0.27) |
| *Free- and Reduced-Price Lunch* | 0.75 | 0.81 |
| | (0.43) | (0.39) |
| *Special Education* | 0.04 | 0.08 |
| | (0.20) | (0.27) |
| *Ever Repeat* | 0.16 | 0.24 |
| | (0.37) | (0.43) |
| *Ever English Language Learner* | 0.07 | 0.04 |
| | (0.26) | (0.20) |
| *College Level: Average for All High School Graduates* | | |
| *College Level: 4-Year* | 0.26 | 0.32 |
| | (0.44) | (0.47) |
| *College Level: 2-Year* | 0.09 | 0.11 |
| | (0.28) | (0.31) |
| *College Characteristics: Average for 4-Year College-Going Students* | | |
| *Admission Rate* | 0.47 | 0.54 |
| | (0.25) | (0.18) |
| *Avg. SAT Score of Entering Freshmen* | 850.50 | 1012.50 |
| | (389.40) | (218.30) |
| *Avg. Faculty Salary (Monthly)* | 5805.20 | 6897.60 |
| | (2746.00) | (1687.60) |
| *Instructional Expenditure per Full-Time Student* | 6640.10 | 7722.20 |
| | (3872.10) | (3405.70) |
| *Student-Faculty Ratio* | 14.75 | 18.04 |
| | (7.53) | (5.49) |
| *Completion Rate (Within 150% of Time)* | 0.29 | 0.38 |
| | (0.18) | (0.17) |

*Note:* Table continued onto following page; table notes and data sources underneath table end.

| | New Orleans Pre-Reform Cohort (2004 Graduates) | New Orleans Post-Reform Cohort (2016 Graduates) |
|---|---|---|
| *PCA College Quality Quartile: Average for All High School Graduates* | | |
| *PCA: Top Quartile ("High Quality")* | 0.05 | 0.09 |
| | (0.210) | (0.28) |
| *PCA: 2nd Quartile ("Mid-High Quality")* | 0.10 | 0.08 |
| | (0.295) | (0.27) |
| *PCA: 3rd Quartile ("Mid-Low Quality")* | 0.09 | 0.13 |
| | (0.280) | (0.34) |
| *PCA: 4th Quartile ("Low Quality")* | 0.03 | 0.02 |
| | (0.165) | (0.15) |
| *PCA College Quality Percentile* | 0.40 | 0.51 |
| | (0.27) | (0.25) |
| *Barron's College Quality Tiers: Average for All High School Graduates* | | |
| *Barron's: Very Competitive and Above* | 0.05 | 0.09 |
| | (0.21) | (0.28) |
| *Barron's: Competitive* | 0.09 | 0.08 |
| | (0.29) | (0.28) |
| *Barron's: Less Competitive* | 0.07 | 0.11 |
| | (0.25) | (0.31) |
| *Barron's: Noncompetitive* | 0.02 | 0.02 |
| | (0.15) | (0.15) |
| *College Match* | | |
| *Undermatch* | 0.13 | 0.26 |
| | (0.34) | (0.44) |
| *Match* | 0.45 | 0.53 |
| | (0.45) | (0.50) |
| *Overmatch* | 0.42 | 0.21 |
| | (0.49) | (0.41) |
| *Persistence & Transfer, First to Second Semester Freshman Year: Average for all Four-Year College Student* | | |
| *Transfer* | 0.00 | 0.01 |
| | (0.00) | (0.10) |
| *Persistence at First College* | 0.85 | 0.91 |
| | (0.36) | (0.28) |
| *Persistence at Any College* | 0.85 | 0.92 |
| | (0.36) | (0.27) |

*Note:* Descriptive averages presented for the analytic sample of 2004 and 2016 high school graduates in New Orleans, except for persistence and transfer, which present descriptive averages for the analytical sample of 2004 and 2012 high school graduates.

*Source:* We use data from the Louisiana Department of Education (LDOE) for 2000-01 through 2015-16 records on high school students, including student demographics, high school graduation dates, and ACT score. Our records on students' college of attendance and college persistence were also provided by LDOE, and come from the Louisiana Board of Regents (BOR) for the college records above for the 2004 high school graduates. We use publicly available data from the Integrated Post-Secondary Education Data System (IPEDS) for the following college-level variables: college level (2- or 4-year) and college characteristics (admission rate, average SAT score of entering freshmen, average faculty salary, instructional expenditure per full-time student, student-faculty ratio, and completion rate). Using the IPEDS data on admission rate, average SAT score of entering freshmen, average faculty salary, and student-faculty ratio, we constructed an index of college quality used for the PCA college quality quartiles and PCA percentile. Using publicly available IPEDS data on college's 25th and 75th ACT percentile combined with student ACT scores provided by LDOE, we determine student-college match. We use Barron's Profile of American Colleges (2001) for information on each college's Barron's selectivity tier.