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THE EFFECT OF THE LOUISIANA SCHOLARSHIP PROGRAM ON COLLEGE ENTRANCE

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Abstract

The Louisiana Scholarship Program (LSP) is a private school voucher program available to families who have incomes no greater than 250 percent of the federal poverty line and whose children attend a low performing public school. It began as a pilot program in New Orleans in 2008 and was expanded statewide in 2012. Previous evaluations of the LSP generally found negative impacts of the program on math and English language arts test scores. In this study, we evaluate the effects of the program on college enrollment for the first cohort of students eligible to enter college by 2017-18. Using lottery assignment for a student's first choice private school, we are able to identify the causal effect of being awarded a scholarship on student attainment for just over 1,000 randomized students who were in the seventh through twelfth grades during the first year of the program. We find that 60% of treatment students who won a lottery and enrolled in their first choice private schools enter college, compared to 59.5% of control students. This difference is not statistically significant. We find no differential treatment effects when considering student enrollment in two- or four-year post-secondary institutions.

Keywords: school choice, school vouchers, student attainment, college entrance, randomized control trial

THE EFFECT OF THE LOUISIANA SCHOLARSHIP PROGRAM ON COLLEGE ENTRANCE

Introduction

Private school choice continues to be a highly controversial education reform. Choice remains popular, however, as the number of private school choice programs and participating students have both increased rapidly in the last decade (EdChoice, 2019). School choice broadly gives parents the opportunity to select a school for their children other than their residentially assigned public school. Private school choice, in the form of vouchers, tax-credit scholarships, or Education Savings Accounts (ESAs), provides families the opportunity to select a private school for their child and to receive financial support to pay for tuition. Milton Friedman (1962) argued that a robust market of schools supported by government resources but managed privately would lead to a more efficient and successful education system. Choice critics contend that education is a public good best delivered by government-run schools (Gutmann, 1987).

Most research evaluating private choice programs has focused on their effects on student academic achievement. A majority of experimental evaluations find modest, neutral-to-positive effects of private school choice on the student achievement of participants (Bettinger & Slonim, 2006; Cowen, 2008; Cowen et al., 2013; Greene, Peterson, & Du, 1999; Greene, 2001; Howell et al., 2002; Howell & Peterson, 2006; Jin, Barnard, & Rubin, 2010; Krueger & Zhu, 2004; Rouse, 1998; Wolf et al., 2013), with some recent and notable exceptions that find negative effects on student test scores (Abdulkadiroğlu, Pathak, & Walters, 2018; Dynarski et al., 2017; Figlio & Karbownik, 2016; Mills & Wolf, 2019; Waddington & Berends, 2018). Abdulkadiroğlu, Pathak, and Walters (2018) and Mills and Wolf (2019) both evaluate the Louisiana Scholarship Program (LSP) and find large negative effects on both math and English Language Arts (ELA) test scores in the first year of the program. Mills and Wolf (2019) include three additional years of data and

find that the negative test score effects diminish in the second year and become statistically insignificant in the third year only to reemerge in the fourth and final year of the program evaluation. The LSP, demonstrating large negative effects on student test scores, stands out as the most notable exception to the majority of findings in private school choice research.

In this paper we seek to understand how the LSP impacted college enrollment for students who applied to the program in its first year, 2012-13. Using detailed data from the National Student Clearinghouse (NSC) Student Tracker Service, we find that 60% of students who were awarded a scholarship through a lottery and enrolled in their first-choice private school enter college, compared to 59.5% of their control student counterparts. We find that treatment students are two percentage points more likely to enroll in a four-year institutions than a two-year; however, this difference is not statistically distinguishable from zero.

This paper expands our understanding of how the LSP affected students on multiple educationally important outcomes. It also contributes to the emerging body of literature on private school choice programs' effects on student attainment by using an experimental design to estimate the causal effect of the LSP on college entrance. Finally, it adds another case to the growing list of school choice evaluations reporting a disconnect between the short-term test score effects and longer-term attainment effects of school choice programs (Hitt, McShane & Wolf, 2018).

The paper proceeds as follows: first, we define the features and policy context of the LSP; second, we review the previous literature on private school choice including the LSP; third, we discuss our research methodology and data; fourth, we present our results; and last, we discuss the implications of our findings and further research.

Louisiana Scholarship Program Description

The LSP is a school voucher program providing students a scholarship to attend a private school of their choice. The program piloted in New Orleans in 2008 and expanded statewide in 2012. Students are eligible for the LSP if their family incomes are below 250% of the federal poverty line and if they are currently attending a public school rated C, D, or F on the statewide school grading system. Students entering kindergarten or currently enrolled in the Recovery School District, which is the state government takeover mechanism for Louisiana schools, are also eligible to apply for a scholarship.

Scholarship funding comes from the state and is the lesser amount of 90% of state and local funding or the tuition of the private school of the student's choice. In order to participate in the program, private schools are required to administer the state standardized test and cannot have selective admission policies. They also must comply with state financial and safety regulations.

In the first year of the statewide program, 2012-13, over 9,500 students applied for and 5,296 were awarded a scholarship (Mills & Wolf, 2017a). The majority of student applications in the first year were for kindergarten through third grade, with 19% of applications for seventh through twelfth grades.

Literature Overview

A large body of research evaluates the effects of various private school choice programs on the student achievement of participants (Abdulkadiroğlu, Pathak, & Walters, 2018; Bettinger & Slonim, 2006; Cowen, 2008; Dynarski et al., 2017; Greene, Peterson, & Du, 1999; Greene, 2001; Jin, Barnard, & Rubin, 2010; Krueger & Zhu, 2004; Mills & Wolf, 2019; Rouse, 1998; Waddington & Berends, 2018; Wolf et al., 2013). A recent meta-analysis by Shakeel, Anderson,

and Wolf (2016) summarizes the effects of private school vouchers around the world and finds statistically significant positive effects on student test scores two or three years after random assignment, with larger results in reading than math. The effects for programs in the United States are smaller and less conclusive than the effects in non-U.S. countries. In many studies there are heterogeneous effects for various subgroups. For example, in the D.C. Opportunity Scholarship Program, test score impacts are larger for girls and students who entered the program from public schools that were not classified as needing improvement (Wolf et al., 2013). A number of studies find greater impacts for African American than for non-African American students (e.g. Howell et al., 2002).

There is a much smaller body of literature on the effects of private school choice on students' educational attainment as measured by high school graduation, college entrance, and degree completion. This research base is less developed than the private school choice achievement impacts literature because attainment evaluations require following students for many years after their initial experience in the program. Educational attainment is, however, arguably, more important than student test scores because it is a more direct proxy for student success and is strongly associated with a host of positive long-term outcomes. Higher levels of educational attainment are predictive of a longer, healthier, and more economically productive life (Belfield & Levin, 2007; Day & Newburger, 2002; Meara, Richards & Cutler, 2008; Muenning, 2005; Muennig, 2008). Moreover, the achievement effects of a school choice program seldom predict that program's later attainment effects. Some choice programs demonstrate large positive test score impacts for students but null or negative post-secondary outcomes; while other programs show no effect on test scores but large positive effects on attainment (Hitt, McShane & Wolf, 2018). Examining both achievement and attainment provides

a more comprehensive understanding of the LSP's effect on students' future success, particularly in light of the large negative test score effects students experienced over most of the first four years of the program.

Literature on private school choice and student attainment

Eight studies assess the impact of private school choice on student attainment in four programs: the Milwaukee Parental Choice Program (MPCP), the District of Columbia Opportunity Scholarship Program (D.C. OSP), the New York School Choice Scholarships Foundation Program, and the Florida Tax Credit Scholarship.¹ Two studies consider high school graduation only (Warren, 2011; Wolf et al., 2013), four studies consider college enrollment only (Chingos, Monarrez, & Kuehn, 2019; Chingos, 2018; Chingos & Kuehn, 2017; Chingos & Peterson, 2015), and two studies examine both (Wolf, Witte & Kisida, 2018; Cowen et al., 2013).

Of the four total studies that consider the effect of private school choice on the likelihood of students graduating from high school, all of them find statistically significant positive effects. The largest impact is in the D.C. OSP experimental evaluation, where the effect of using a voucher is a twenty-one percentage point increase in the likelihood of graduating from high school (Wolf et al., 2013). Using student matching methods, Cowen et al. (2013) find that students participating in the MPCP are two to seven percentage points more likely to graduate from high school in four years compared to similar peers in traditional public schools, an initial finding largely replicated by a follow-up study (Wolf, Witte & Kisida, 2018). Evaluating the same program but with an observational design, Warren (2011) finds that voucher students are

¹ For a systematic review of five of these studies see Foreman, 2017.

twelve percentage points more likely to graduate in six years compared to the state average high school graduation rate.

Regarding impacts on college enrollment and persistence, four of the six total studies find significant positive effects for the overall sample. Students participating in the Florida Tax Credit (FTC) scholarship program are six percentage points more likely to enter college, with most entering community colleges (Chingos & Kuehn, 2017). In a follow up study of the FTC using college enrollment data from the National Student Clearinghouse, Chingos, Monarrez, and Kuehn (2019) find that FTC participants are between six and ten percentage points more likely than similar nonparticipants to enroll in both two-year and four-year institutions. FTC participants are also more likely to earn a bachelor's degree by one to two percentage points. The updated study of the FTC is consistent with the previous findings, but in some cases the effects are larger due to a large portion of FTC participants enrolling in out-of-state colleges. Similarly, students in the Milwaukee program are four to six percentage points more likely to enter four-year colleges and persist in them longer than matched public school students (Wolf, Witte & Kisida, 2018; Cowen et al, 2013). Students in neither the New York City program (Chingos & Peterson, 2015) nor the DC program (Chingos, 2018) realized any significant college enrollment benefits of those private school choice initiatives, although African American and non-immigrant subgroups of students demonstrated attainment impacts in New York.

Overall, private school choice programs tend to have a significant positive effect on students' likelihood of graduating from high school and enrolling in postsecondary institutions. However, research remains limited. Only eight studies have considered the attainment effects of only four private school choice programs in the U.S. Only three of those evaluations employed a gold standard, experimental design. We expand this nascent literature by experimentally

evaluating the impact of the Louisiana Scholarship Program on students' likelihood of entering college.

Previous literature on the Louisiana Scholarship Program

The LSP is one of the most comprehensively studied private school choice programs in the United States. There is evidence of the LSP's impact on students' academic achievement, competitive effects on students who remain in traditional public schools, and school segregation. Researchers also have studied the types of private schools that participate in the LSP, which may help in understanding the various outcomes of the program.

First, the LSP had large negative effects on achievement for participating students in the first year. Those negative test score effects ranged from a 0.40 standard deviation (Abdulkadiroğlu, Pathak, & Walters, 2018) to a 0.65 standard deviation decrease in math test scores (Mills, 2015).² The effect was smaller in English Language Arts, but also negative and statistically significant. These initial negative achievement effects of the LSP decreased in the second year and became statistically insignificant by the third year, only to reemerge in the fourth and final year of the evaluation (Mills & Wolf, 2019). The LSP is one of only two voucher programs, along with the D.C. OSP (Dynarski et al. 2017), to show negative test score effects based on an experimental design.³

The reasons for the negative achievement effects of the LSP are unknown. Potential explanations include disruption due to switching schools (especially during the chaotic first year

² Abdulkadiroğlu, Pathak, & Walters (2018) and Mills, 2015 have slightly different point estimates for two main reasons. One, the studies use slightly different samples of students. Two, Mills (2015) and Mills & Wolf (2017a) standardized student test scores to the control group testing distribution, and Abdulkadiroğlu, Pathak, & Walters (2018) standardize student test scores to New Orleans student test scores.

³ Figlio and Karbowink (2016) and Waddington and Berends (2018) find negative achievement effects in the first years of the Ohio and Indiana voucher programs, respectively. Both studies use non-experimental designs.

of the initiative), differences in testing culture and familiarity, and the quality of participating private schools.

The LSP was enacted less than three months before the start of the 2012-13 school year. Program implementers and private school personnel had to rush the roll-out of the new initiative. Participating private schools had little time to prepare for an influx of new students, many of whom arrived with challenging backgrounds and low achievement levels (Sude & Wolf, 2019). At least some of the initial achievement loss of the LSP students compared to the control group students can be attributed to the extreme conditions in which students had to adjust to new schools and the schools to new students.

Private schools participating in the program are required to administer the state accountability test to their LSP students. In the first two years of the LSP, the test came in two versions, LEAP and iLEAP. The LEAP was fully aligned to the content of the curriculum taught in Louisiana public schools, while the iLEAP was only partly aligned to the state's curriculum standards. The students in the evaluation who took the more aligned LEAP exam demonstrated negative test score effects of the LSP that were twice as large as the students who took the less aligned iLEAP exam through the first two years of the study (Mills & Wolf, 2017a, pp. 15-16). While public schools are accustomed to taking the LEAP/iLEAP, both tests were new for private schools, which also might have contributed to the negative LSP effects using both tests. The difference between treatment and control group students' test scores could in part reflect differences in familiarity between private and public schools with the state test and the practice of accountability-based testing. In the third year, when there were no statistical differences between treatment and control students' test scores, the state switched assessments from LEAP/iLEAP to the PARCC. The PARCC test was new to both public and private schools, and

no accountability penalties were attached to school-level performance on that test that year. The effects of the LSP on student achievement were null in outcome year 3, the one year the PARCC was used. In outcome year 4, the state used a third accountability test, modeled after the PARCC that was fully aligned to the state curriculum. The test was high-stakes that year, with accountability rewards and penalties attached to school-level performance. The LSP effects on test scores returned to statistically significant negative in that fourth year. In sum, the test score impacts of the LSP varied across time and across tests, from null in year 3 to negative in years 1, 2 & 4, in part probably because of differences in test alignment and test familiarity between the private and public schools.

Some evidence suggests that the quality of private schools participating in the program is a factor in the generally negative test score effects of the LSP. Sude, DeAngelis, and Wolf (2018) find that only 33 percent of Louisiana private schools participated in the program. When surveyed, private school leaders listed “concerns about future regulations” as their main reason for not participating in the LSP (Kisida, Wolf & Rhinesmith, 2015). While there is no simple measure of private school quality at the start of the program, since private schools were not required to administer or report test scores until they joined the LSP, indicators suggest that lower quality private schools disproportionately participated in the program. Participating schools charge lower tuitions, enroll fewer students per grade, and have smaller school staffs than nonparticipating private schools in the state. In a separate report by our team, Lee, Mills and Wolf (2019) find that most of the negative test score effects of the LSP were concentrated among students attending private schools in the lower two-thirds of the distribution on various quality indicators.

Louisiana has a robust private school market with approximately 20 percent of students attending a private school. The state provides a state tax deduction for parents who self-fund their child's private education, providing a resource benefit to private schools that comes with no restrictions (EdChoice, 2019). As such, high quality private schools in Louisiana have little incentive to participate in the LSP because demand already exists for private schools and other government programs provide financial support that does not come with the same regulations as the LSP.

In sum, the negative test score effects observed throughout most of the longitudinal evaluation of the LSP have several plausible causes. The especially large negative effects in the first year of the program likely were magnified due to the challenge of student-school adjustments amidst a rushed implementation schedule. The smaller, but still substantial, negative effects observed in the second and fourth outcome years of the evaluation probably are due to some combination of test alignment favoring students taught in public schools and the average quality of the private schools participating in the LSP. Conceptually, the supply of private schools from which parents can choose is largely the school choice program intervention. The fact that only one-third of the private schools in Louisiana, apparently disproportionately coming from the lower part of the quality distribution, participated in the LSP is not an excuse for the generally negative test score effects of the program after four years, but it is a partial explanation for those results.

Second, Egalite and Mills (2019) evaluated the impact the LSP had on student test scores in traditional public schools. They use multiple measures of private school competition: distance, density, diversity, and concentration. Using school fixed effects and regression discontinuity

models, they find that students in traditional public schools experienced small gains in math test scores due to competitive pressures from the LSP.

Third, the LSP has reduced racial segregation in public schools, especially those under federal desegregation orders (Egalite, Mills, & Wolf, 2016). The effect of school choice on racial stratification in both private and public schools is an increasingly discussed outcome that can have significant consequences for students (Swanson, 2017). Egalite and her colleagues find that students who use an LSP voucher to attend a private school tend to leave schools in which their own race is dramatically overrepresented relative to the surrounding community. Students entering private schools are more likely to enter private schools that have a larger proportion of students of their similar race. However, the racial demographics of the private school is more closely representative of the larger community than the public school. On balance, the authors conclude the LSP has decreased racial stratification in Louisiana.

In sum, there is a large amount of research on the LSP to consider when evaluating the value of the scholarship program. There are clear negative effects on student academic achievement in the first years of the program that reemerge in the fourth year of the evaluation. The estimates of the test score effects of the LSP are limited to approximately 15% of all LSP applicants with baseline and outcome test scores and who faced a placement lottery in their first-choice private school. As a result of the LSP, public schools also seem to have moderately benefited both in terms of small test score increases and improved racial integration. We add to the existing literature by evaluating the impact of the LSP on yet another important dimension, college entrance.

Research Methodology

Experimental designs are considered the gold standard for evaluation because they hold the greatest potential to identify causal effects (Mosteller & Boruch, 2002; Pirog et al., 2009; Rossi, Lipsey, & Freeman, 2004). In this paper, we exploit lotteries in oversubscribed private schools to estimate the causal effect of the LSP on students' likelihood of entering college. To participate in the LSP, students apply through a centralized enrollment process administered by the Louisiana Department of Education (LDOE). Families are able to rank in order their top five preferred private schools. This enrollment system is similar to the New York City Department of Education's public high school choice system (Abdulkadiroglu, Pathak, & Roth, 2005). The LSP enrollment system awards scholarships based on available seats in students' preferred private schools and their priority status. Students with disabilities as well as multiple birth siblings (twins, triplets, etc.) are automatically awarded a scholarship if space is available in their desired private schools. Remaining students are awarded a scholarship based on six priority factors.

- **Priority 1** – Students who receive LSP scholarships in the prior school year who are applying to the same school
- **Priority 2**– Non-multiple birth siblings of Priority 1 awardees in the current round
- **Priority 3** – Students who received LSP scholarships in the prior school year who are applying to a different school
- **Priority 4** – New applicants who attend public schools that received a “D” or “F” grade in Louisiana's school accountability system
- **Priority 5** – New applicants who attended public schools that received a “C” grade

- **Priority 6** – New applicants who are applying to kindergarten

Figure 1 summarizes the process of awarding scholarships. The process begins by trying to place all students in Priority 1 into their first-choice private school. If there are more seats than there are students applying for the specific school, then all students are awarded a scholarship to that given school. If there are no seats available for students in the specific school, no students are awarded a scholarship for that school. If there are more applicants for a school than seats available, scholarships are awarded by lottery. Priority 1 students who were not awarded a scholarship for their first-choice school repeat the same process for their second, third, fourth, and fifth-choice schools. After all Priority 1 students are placed, the process repeats for students in priority categories 2 through 6. The process continues until all students are awarded or not awarded a direct placement in a preferred private school supported by a scholarship.

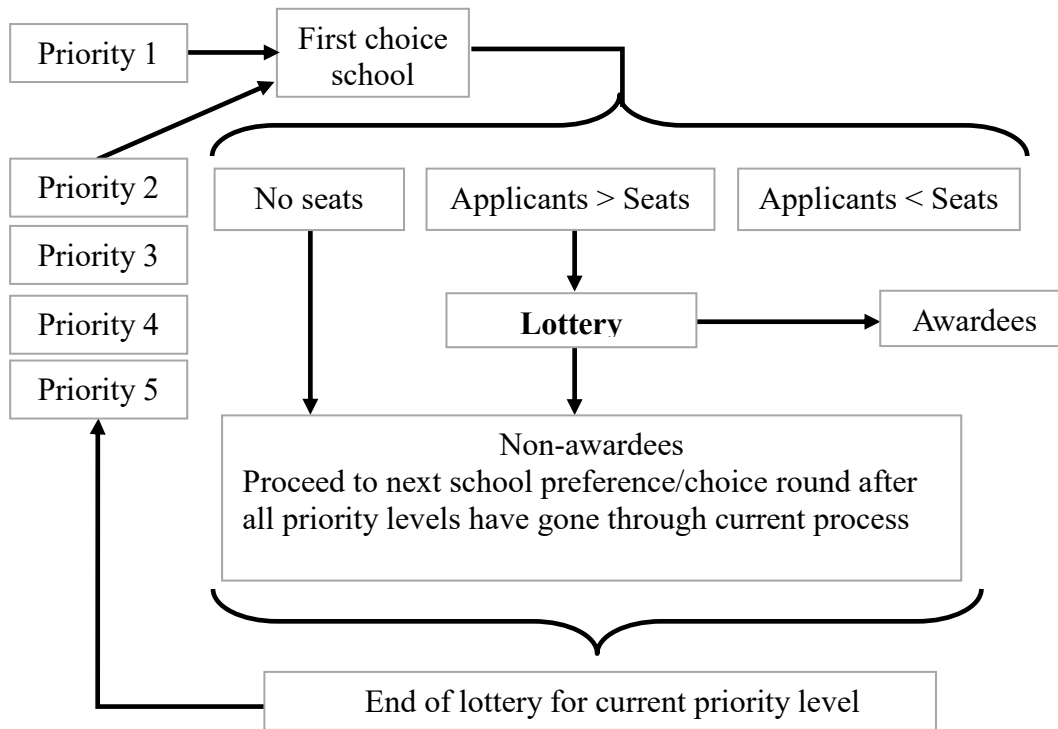


Figure 1: First Stage of the Louisiana Scholarship Program award allocation process for the 2012-2013 school year

Source: Mills and Wolf, 2017a

Given the allocation process, only a subset of students faced a lottery. Using data on student school preferences, we identify if a student faced a lottery when the percentage of students awarded a scholarship fell between 0%-100% for a given priority category, school, and grade combination. We limit our sample to students who faced a lottery for their first-choice school to ensure that each awarded scholarship is independent of any other student being awarded a scholarship, within the same priority category. This same strategy was used in test scores evaluations of the LSP (Abdulkadiroğlu, Pathak, & Walters, 2018; Mills & Wolf, 2019; 2017a; 2017b) as well as other evaluations of choice programs with similar lottery designs (Deming et al., 2014; Bloom & Unterman, 2014).

Data

We use two data sources in our analysis. First, we use student application data for the LSP in the first year of program implementation provided by the LDOE. Second, we use data from the National Student Clearinghouse (NSC) Student Tracker Service for college entrance. The NSC collects data on college entrance, persistence, and degree attainment from 98 percent of all public and private post-secondary institutions (National Student Clearinghouse). The comprehensiveness of the NSC database allows us to capture records for students in our sample who attend college outside of Louisiana. While the NSC collects information on post-secondary completion, this paper focuses exclusively on college enrollment, in both two and four-year institutions, because there are not enough students in our sample who have been enrolled long enough to complete a degree for our analysis to be able to detect a treatment effect on college graduation.

Sample

Using these data, our analytic sample consists of LSP applicants who faced a lottery for their first-choice private school and those who were eligible to have enrolled in college by the fall of 2018. Table 1 shows how many students applied for the LSP in its first year and how many students faced a lottery for their first-choice private school. A total of 9,809 students applied for a scholarship through the LSP for school year 2012-13 (Table 1, Column 1) of which 6,599 students faced a lottery for their first-choice school (Table 1, Column 2). A total of 1,927 students are eligible to have entered college by fall 2018 (Table 1, Column 1), of which 1,113 faced a lottery to gain admission to their first-choice private school (Table 1, Column 2). The students in our analytic sample are not evenly distributed across grades, with more students applying for earlier grades (Table 1, Column 2). Students who applied for twelfth grade in 2012-13 could have enrolled in up to five and a half years of college by fall 2018, while students

applying for seventh grade in 2012-13 could have enrolled in one semester of college, assuming students graduated from high school within four years. Students in our analytic sample are also concentrated in priority categories four and five (Table 1, Column 2) which are students applying for a scholarship who were attending public schools that received a C, D, or F grade from the state accountability system.

Table 1 also contains baseline comparisons between our treatment and control groups on observable characteristics. Experimental designs rely on randomization to create similar treatment and control groups. Our treatment and control groups appear similar at baseline on observable characteristics (Table 1, columns 3-6). Overall, the information on observable characteristics of treatment and control students suggests that randomization worked properly. Our treatment and control groups do not greatly differ from each other, at least on observable characteristics, in any systematic way that would bias our estimates.

Table 1:
Descriptive data on Experimental Sample and Baseline Equivalence

	(1) Applicant Sample	(2) Experimental Sample	Baseline Equivalence			
			(3) Treatment Mean	(4) Control Mean	(5) Adjusted Diff.	(6) P-Value
Students applied for scholarship in baseline year	9,809	6,599				
Eligible for college by 2017-18	1,927	1,113				
Enroll in college for at least one semester	52%	55%				
Enroll in 4yr. institution (of those who enroll in 1+ semesters)	48%	46%				
Enroll in 2yr. institution (of those who enroll in 1+ semesters)	52%	54%				
7th Grade	38%	37%				
8th Grade	24%	22%				
9th Grade	22%	23%				
10th Grade	9%	11%				
11th Grade	5%	6%				
12th Grade	2%	1%				
LSP Priority 1	7%	3%				
LSP Priority 2	1%	0%				
LSP Priority 3	1%	1%				
LSP Priority 4	49%	56%				
LSP Priority 5	43%	39%				
LSP Priority 6	0%	0%				
Female	50%	52%	50%	53%	-3	0.360
Black	89%	91%	88%	92%	-3	0.148
White	7%	5%	6%	4%	2	0.319
Hispanic	3%	3%	3%	3%	0	0.918
Other	2%	1%	2%	1%	1	0.133
Number of School Preferences listed	1.9	2.1	2.0	2.1	-0.1	0.171

Notes: Applicant sample includes all students who applied for the LSP for the 2012-13 school year. Experimental sample refers to students who applied for a scholarship who faced a lottery for their first-choice private schools. The descriptive statistics for each sample are based on the number of college eligible students; 1,927 students in the applicant sample (column 1) and 1,113 students in the experimental sample (column 2). Adjusted differences (column 5) is the difference between treatment and control group students controlling for first-choice school lottery specific fixed effects. The p-values for the adjusted differences are in column 6.

Analytical strategy

Due to the demand for the LSP and the nature of the allocation process, we are able to leverage lotteries and estimate the causal effect of students enrolling in their first-choice private school on their likelihood of entering college. The lotteries allow us to compare students who applied for the LSP but received or did not receive a scholarship by random chance.

Randomization is key in determining the causal effect of the scholarship because it removes selection bias created by students choosing to apply to the program (Bækgaard et al., 2015). In order to identify the casual effect, we limit our sample to only students who faced a lottery for their first-choice private schools because the first lottery is the only lottery that is independent of all other lotteries. For example, a student could have lost a lottery to his or her first-choice school but won a lottery for a less preferred school; however, the student faced the possibility of a second lottery because he or she lost a first-choice lottery.

We calculate the Local Average Treatment Effect (LATE) to estimate the causal effect of students winning a scholarship and enrolling in their first-choice private school. The LATE provides an unbiased estimate of the effect of the scholarship for students who actually use it. We argue that the LATE is a more appropriate estimate of the impact of the LSP than the simpler intent-to-treat estimate because winning a first-choice lottery simultaneously entails the offer of a scholarship and placement in a particular private school. The LATE is interpreted as the effect of receiving a scholarship and enrolling in that first-choice private school.

We calculate the LATE using a two-step process via two stage least squares (TSLS). In the first step, we use students' lottery assignments to predict the probability of students enrolling in their first-choice private schools. In the second step, we replace the lottery assignment with the predicted probability of enrolling in a student's first-choice school to predict the probability

of that student entering college. We use the following linear probability models⁴ to estimate the LATE where i denotes student and k denotes lottery.

$$Enroll_i = \vartheta_0 + \vartheta_1 W_i + \gamma_k + X_i \vartheta_2 + u_{ik} \quad (1)$$

$$CollegeEntrance_i = \beta_0 + \beta_1 \widehat{Enroll}_i + \gamma_k + \beta_2 X_i + \epsilon_{ik} \quad (2)$$

Where, in equation 1, $Enroll_i$ is a dichotomous variable indicating if student i actually enrolled in his or her first-choice school. W_i indicates whether or not student i was awarded a scholarship through the lottery. γ_k is a fixed effect for the specific lottery a student was in, which is a combination of his or her priority category, school, and grade. The lottery fixed effects account for where randomization took place and effectively compare students in the same lottery to each other. X_i is a vector of student characteristics including gender, race, and the number of school preferences listed on students' applications. While student characteristics are not required to identify the causal effect of the LSP on college entrance due to randomization by the lotteries, student characteristics can help to more precisely estimate the effect. In the second step (equation 2) of the LATE estimation process, we replace the lottery assignment with the predicted probability of enrolling in student i 's first-choice school to estimate the probability of entering college. $CollegeEntrance_i$ equals 1 if a student enrolled in any college for at least one semester and 0 if a student had never started college. To account for clustering of students within lotteries, we use bootstrapped standard errors (Angrist & Pischke, 2009).

⁴ We estimate all the models as linear probability models due to the difficulty of a probit or logit achieving convergence given the large number of lottery fixed effects in our model. For each of our models the linear predictions all fall within the appropriate range of zero to one.

Results

The results of our LATE estimates are presented in Tables 2 and 3 as well as Figure 1. Table 2 presents the results of the first stage model where we predict the likelihood of students enrolling in their first-choice private schools by their lottery status. We find that 77% of students who win a lottery for their first-choice private school use the awarded scholarship to actually enroll in their given schools. Table 3 contains the results of our second stage and represents the causal effect of winning a lottery and enrolling in a student's first-choice private school. We find that the LSP has no statistically significant effect on college entrance for students who enroll in their first-choice private school. Column 1 in Table 3 presents the results of the two-step model without any student level covariates. Column 2 presents the results with student covariates. Students who receive a scholarship and enroll in their first-choice private school are more likely to enter college by 0.5 percentage points compared to students who did not win a lottery to attend their first-choice school. The estimated effect is small and statistically insignificant. The estimates are also imprecise as the standard errors are relatively large. The lack of precision is likely due to the demands placed on the data by estimating a two-stage analytic model with fixed effects.

The majority of students in the analysis enroll in college, with 59.5% of control students and 60% of treatment students entering college (Table 3, Column 2, and Figure 1). The percentage of students entering college is particularly higher given that students who applied for the program came from economically disadvantaged backgrounds. These higher than average college enrollment rates could be a result of other efforts Louisiana has made to expand access to college. We also estimate the likelihood of participating students entering two-year or four-year institutions. We find that the LSP had no significant effect on the rate at which treatment and control students choose a four-year over a two-year post-secondary institution. Treatment

students enroll at a slightly higher rate, by two percentage points, in four-year institutions than do their control counterparts, but the difference is not statistically significant (Table 3, Columns 3 and 4).

Table 2:

First Stage Results of TSLS: Probability of Enrolling in First Choice Private School

	Scholarship Usage
Win Lottery	0.770*** (0.025)
Female	0.029* (0.017)
Black	0.057 (0.093)
White	0.046 (0.099)
Hispanic	0.032 (0.106)
# of schools listed	0.013 (0.008)
Constant	-0.042 (0.096)
Observations	1,113
Number of Lotteries	106
R-squared	0.728

Notes: Bootstrap standard errors in parentheses to account for clustering of students within lotteries. All models are linear probability models. Linear predictions fall within zero and one.

*** p<0.01, ** p<0.05, * p<0.1

Table 3:

The Effect of Enrolling in a Student's First Choice School on College Entrance

	(1) College Entrance	(2) College Entrance	(3) 2yr. Institution	(4) 4yr. Institution
LSP Enroll	-0.001 (0.043)	0.005 (0.042)	-0.020 (0.059)	0.020 (0.059)
Female		0.153*** (0.034)	0.085* (0.045)	-0.089** (0.045)
Black		-0.079 (0.122)	-0.048 (0.157)	0.030 (0.152)
White		-0.247** (0.115)	-0.029 (0.215)	0.019 (0.212)
Hispanic		-0.161 (0.147)	-0.092 (0.164)	0.083 (0.161)
# of schools listed		-0.017 (0.017)	0.014 (0.022)	-0.012 (0.022)
Constant	0.551*** (0.021)	0.595*** (0.135)	0.514*** (0.173)	0.502*** (0.168)
Observations	1,113	1,113	613	613
Number of Lotteries	106	106	99	99

Notes: Bootstrap standard errors in parentheses to account for clustering of students within lotteries. All models are linear probability models. Linear predictions fall within zero and one. Columns 3 and 4 are conditional on having entered any college. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

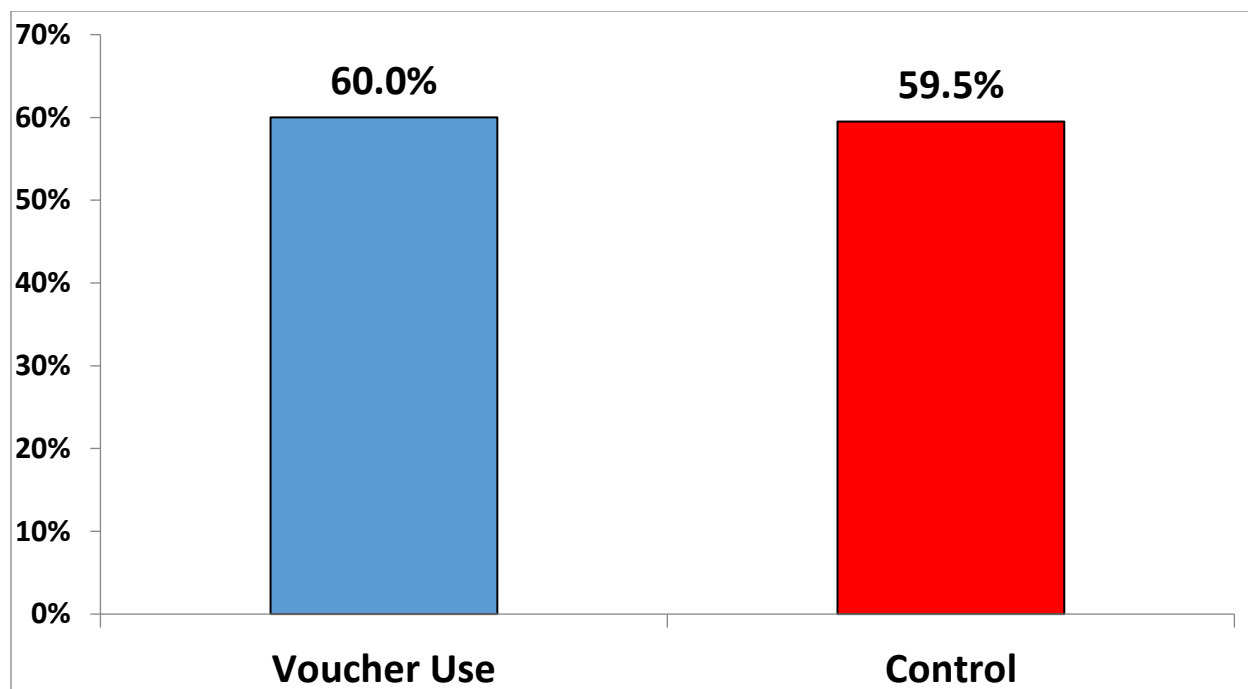


Figure 1. Regression-adjusted college enrollment rates for students who ever used an LSP voucher and students in the control group.

Enrollment rate is for enrolling in any two-year or four-year institution of higher education at any time between 2013 and 2018. Regression adjusted for student and family demographic characteristics.

Discussion

Overall, the LSP did not affect students' likelihood of enrolling in post-secondary schooling. There is no statically significant observable difference in the rate at which treatment and control students enroll in college. Our estimates are imprecise which could be due to the demands put on the data given the two-step estimation process. With 95 percent confidence, the true effect of the LSP on the likelihood of college enrollment could be as high as an increase of 9 percentage points or as low as a decrease of 8 percentage points. A larger sample of college-age students would provide greater statistical power to estimate an attainment effect of the LSP. In the next few years, the college-aged sample of students who participated in the LSP in 2012-13 will continue to grow. With a larger sample, we also will be able to estimate the effect of the

LSP on college persistence and degree completion. In coming years, we will hopefully understand much more regarding the effects of the LSP on multiple post-secondary outcomes.

Our research team's estimate of the LSP's effect on college entrance differs from our estimate of the program's effect on achievement. Students who enrolled in their first-choice private schools experienced large math and substantial reading test score declines compared to their control counterparts, even as late as the fourth year after random assignment (Mills & Wolf, 2019). However, we find that treatment students entered college at approximately the same rate as their control counterparts. One might expect that a program with such negative test score effects might also negatively affect the likelihood of students entering college.

There are a few probable explanations for the potential disconnect between the LSP's effects on student test scores and post-secondary enrollment. First, students in the achievement analysis are not the same group of students in the attainment analysis. The achievement analysis included students in the baseline year, 2012-13, who applied for grades four through eight, while our sample in this paper includes students who applied for seventh through twelfth grades. The differences between the test score findings and the college enrollment findings could be due to the difference between elementary and high schools. We estimate the effect of college entrance for seventh and eighth grade students and find no differential effect for these students; the treatment coefficient remains small and statistically insignificant.⁵ This result gives some evidence that the difference between the achievement and college entrance results is not driven by school grades, but there will be more conclusive evidence as more students in the achievement analysis enter college.

⁵ The LATE point estimate for seventh and eighth graders is -0.034 with a standard error of 0.079 and an associated p-value of 0.666.

Second, the disconnect could be due to the differences in how private and public schools treat standardized tests. As discussed above, the achievement effects of the LSP over the four years of the evaluation have been sensitive to the specific state test used as a measure of student learning. It is possible that a more general measure of learning than the state criterion-referenced accountability exam would have revealed LSP achievement effects that were more favorable, or at least less unfavorable, to the program than those reported in our team's test score analysis (Mills & Wolf, 2019).

Third, the disconnect between achievement and college enrollment effects of this private school choice program could be a result of public and private schools having different goals. While public schools are under great accountability pressures regarding student academic growth, specifically on math and reading test scores, private schools can focus more broadly on whole student education where they may focus on academic, social, emotional, and character development. An initial analysis of the impact of the LSP on student non-cognitive and civic outcomes reported null effects similar to those found here for student attainment (Mills et al., 2016).

The disconnect between student outcomes observed in the LSP is consistent with the tendency for a disconnect between attainment and achievement effects in school choice programs generally (Hitt, McShane, & Wolf, 2018). For example, evaluations of the Washington, D.C. Opportunity Scholarship Program (Wolf et al., 2013) and the Milwaukee Parental Choice Program (Wolf, Witte & Kisida, 2018; Witte et al., 2014; Cowen et al, 2013) both found marginal to null test score effects but large statistically significant increases in high school graduation rates. Evaluations of the Boston charter schools (Angrist, et al. 2016), the Harlem Promise Academy (Dobbie and Fryer, 2015), the KIPP charter schools (Tuttle, et al., 2015), and

the SEED Boarding Charter school (Unterman, et al., 2016) reported significant increases in student test scores but no increase in high school graduation or college entrance rates. The pattern in the literature suggests that schools affect students in ways not always detected on standardized tests. It could be that various school sectors, whether they are private, traditional public, or charter, have diverse goals and a comparative advantage at improving certain, distinct student outcomes. For example, private schools of choice could have more of a comparative advantage over public schools in developing the non-cognitive skills of students, including grit, persistence and conscientiousness. These character traits likely affect the probability that students continue with higher education independent of their performance on the state standardized test scores, compared to their public school peers. The LSP is the first private school choice program to show negative test score effects and null attainment effects. While the actual reason for the achievement-attainment disconnect in school choice evaluations is unknown, it seems to be a prevalent pattern that deserves further consideration particularly in light of the unique findings from the LSP.

Conclusion

We use a rigorous experimental design to estimate the causal effects of the LSP on the likelihood of students entering post-secondary schooling. We compare students who won a lottery and enrolled in their first-choice private school to those who lost a lottery. Our findings indicate that the LSP had no statistically significant impact on students' likelihood of entering college if they initially applied for the program entering grades seven through twelve in the 2012-13 school year. While we find no statistically significant effect on college entrance, our estimates are relatively imprecise.

This paper is part of a larger evaluation of the LSP that has considered many aspects of the scholarship program including the effects on student academic performance. The null findings in this paper are particularly interesting given the large negative test score effects students experienced in the first year of the program. The academic and college entrance effects from the LSP seem to conflict with each other as treatment students experienced a significant negative effect on test scores but appear to be just as likely as their control counterparts to enter college. A disconnect between the effects of school choice programs on student achievement and attainment is a consistent pattern in other school choice literature generally (Hitt, McShane, & Wolf, 2018). Fortunately, as time passes, our sample will increase as more students graduate from high school and enter college. A larger sample will increase our analytic power, as well as allow us to estimate the effect of the LSP on college persistence and degree completion. There is still a great deal yet to be discovered regarding the effects of the LSP on post-secondary outcomes and the apparent disconnect between the student achievement and college entrance findings.

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