School Vouchers and College Enrollment: Experimental Evidence From Washington, DC

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Washington, DC's Opportunity Scholarship Program (OSP), the only federally funded school voucher program in the United States, has provided private school scholarships to low-income students in DC since 2004. From its inception, the program has received significant attention in national debates and has been the subject of rigorous evaluations mandated by Congress. We conduct an experimental evaluation of the effect of the OSP on college enrollment by comparing the college enrollment rates of students offered a scholarship in lotteries held in 2004 and 2005 with those of students who applied but did not win a scholarship. Students who won scholarships to attend private schools were not significantly more or less likely to enroll in college than students who did not.

Keywords: *evaluation, policy, private education, program evaluation, experimental design, experimental research, policy analysis*

Introduction

THE number of publicly funded private school scholarships awarded to children in the United States has increased rapidly, from less than 150,000 in 2004 to roughly 600,000 in 2020–2021 (EdChoice, 2020). School voucher programs are almost exclusively enacted by state and local governments. The only federal program is Washington, DC's Opportunity Scholarship Program (OSP), which was authorized by Congress in 2004. Congress specifically cited concerns about the DC public school system, including dismal performance on the National Assessment of Educational Progress (NAEP), when it created the OSP (DC Parental Choice Incentive Act, 2003).

The OSP has been a political football in national debates over private school choice. First

authorized during the Bush administration, the program was closed to new participants under the Obama administration and a Democratic Congress in 2009, and then reauthorized in 2011 and 2017 by Republican-led Congresses as part of appropriations bills. The OSP is currently part of legislation that provides US$45 million to DC schools, with US$15 million going to the voucher program and US$30 million split between the traditional school district and public charter schools. This three-sector arrangement dates to the creation of the program, and the investments made in traditional public and charter schools while giving low-income students immediate alternatives were instrumental in gaining the support of local officials (Hsu, 2004).

The DC program is one of a small number of private school choice programs that have now been

in place long enough that student attainment outcomes can be tracked beyond high school. An earlier evaluation of the OSP found that it increased the rate at which participants graduated from high school, but this analysis was only possible for a subset of participants and relied on information reported by parents (Wolf et al., 2013).

More broadly, existing research on private school choice programs is limited but points toward more positive effects on educational attainment (amount of schooling completed) than achievement (scores on standardized tests). Two quasi-experimental studies examining the long-term effects of private school choice programs have found positive effects on college enrollment and graduation rates among participants in Milwaukee (Cowen et al., 2013; Wolf et al., 2019) and Florida (Chingos , Monarrez, & Kuehn 2019; Chingos & Kuehn, 2017). An additional experimental study found positive attainment effects among subgroups of participants in a privately funded voucher program in New York City (Chingos & Peterson, 2015).

In this study, we examine the college enrollment rates of students who applied for a voucher during the first 2 years of the OSP (2004 and 2005) who are now of college-going age. We take advantage of lotteries to ensure that the results are not biased by selection into the program.

We find that the program had no detectable impact, positive or negative, on the rates at which participating students enrolled in college or the types of colleges they attended. However, the results are not precise enough to rule out modest positive or negative effects. Our results are consistent across student subgroups disaggregated by gender, race/ethnicity, and baseline school characteristics. We find suggestive evidence that students offered vouchers in earlier years, who have had longer time to enroll in college and participated in the voucher program during a time when District of Columbia Public Schools (DCPS) faced more severe challenges, may have experienced more positive impacts than students in more recent cohorts, though in no case do they significantly outperform the control group.

Prior Research on School Choice

School choice proponents argue that families with more options will be able to choose schools that are more compatible for their children's educational needs, with the added feature that competitive market forces may increase institutional responsiveness (Chubb & Moe, 1990; Coons & Sugarman, 1978; Friedman, 1955, 1962). Critics have raised concerns about parents' ability to choose schools effectively, particularly low-income parents who may lack the resources to become informed school choosers (Henig, 1994).

Numerous studies have examined the effects of school choice on student achievement, primarily focusing on charter school and voucher program lotteries. Experimental and quasi-experimental studies of charter schools have largely shown neutral to positive effects on student achievement (Betts & Tang, 2014; Cheng et al., 2017). Voucher studies focusing on student achievement have been more mixed. Early experimental research on privately funded programs in New York, Washington DC, and Dayton, Ohio, revealed small achievement gains, with larger effects for some subgroups (Howell & Peterson, 2002; Krueger & Zhu, 2004). Early experimental studies of publicly funded voucher programs in Charlotte, North Carolina, Milwaukee, Wisconsin, and initial cohorts in Washington, DC's OSP similarly found null to small positive effects (Cowen, 2008; Greene, 2001; Rouse, 1998; Wolf et al., 2009). More recently, however, experimental evaluations of programs in Louisiana and DC, as well as quasi-experimental evaluations of programs in Indiana and Ohio, have found negative achievement effects (Abdulkadiroğlu et al., 2018; Dynarski et al., 2018; Figlio & Karbownik, 2016; Mills & Wolf, 2017; Waddington & Berends, 2018).

Studying the long-term effects of school choice programs using experimental methods is limited by the amount of time it takes for evidence to accumulate and the rarity of programs made available via random lottery (Almond & Currie, 2010). Experimental studies examining the effects of public high school choice on educational attainment have found positive effects on high school graduation rates (Bloom & Unterman, 2014) and college enrollment and completion (Deming et al., 2014). Large quasi-experimental studies of the effects of charter schools on educational attainment have similarly found increases in high school completion and college attendance
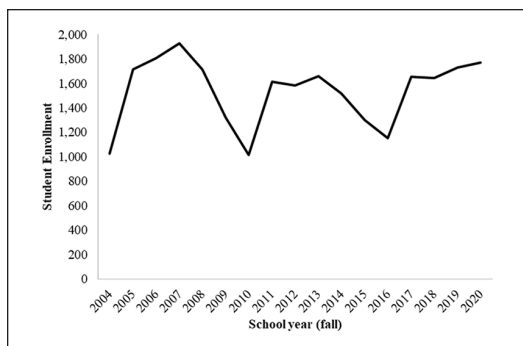
FIGURE 1. *Enrollment in the DC Opportunity Scholarship Program, 2004–2020.*

(Booker et al., 2011; Sass et al., 2016). In addition, a number of lottery-based studies of charters in specific urban areas find increased college-going among students who attend charter schools (Angrist et al., 2016; Coen et al., 2019; Davis & Heller, 2019; Dobbie & Fryer, 2015).

The set of studies that have looked at the effects of publicly funded vouchers on educational attainment have thus far largely relied on quasi-experimental approaches. A recent examination of the Florida Tax Credit scholarship program found participants were 6% to 10% more likely to enroll in college and 1 to 2 percentage points more likely to earn a bachelor's degree (Chingos, Kuehn, et al., 2019; Chingos, Monarrez, & Kuehn, 2019). Similarly, longitudinal studies of the Milwaukee Parental Choice Program have found increases of 4 to 5 percentage points in high school graduation rates, increases of 5 to 6 percentage points on college enrollment rates, and increased college graduation rates of 3 percentage points (Cowen et al., 2013; Wolf et al., 2019). An experimental evaluation of a privately sponsored voucher initiative in New York City found no overall significant effects on college enrollment or degree attainment, but did find positive effects for minority students and children of women born in the United States (Chingos & Peterson, 2015). Finally, a study that leveraged admission lotteries in oversubscribed private schools in Louisiana's voucher program found no significant effect on college enrollment as a result of using a private school scholarship (Erickson et al., 2021).

Background on the Opportunity Scholarship Program

The DC Opportunity Scholarship Program, created by an act of Congress in January 2004, provides scholarships to low-income families (defined as those making no more than 185% of the federal poverty level) to attend private schools. Scholarships are only available to DC residents and must be used at participating DC private schools. Participating schools must agree to requirements, including nondiscrimination in admissions, fiscal accountability, and the provision of data and information for evaluation purposes (Wolf et al., 2005). Once a family is admitted into the program, scholarships are renewable so long as students remain in DC and income-eligible. Scholarship use need not be continuous to maintain eligibility.

Figure 1 shows that the program has enrolled between 1,000 and 2,000 students each year since its inception in 2004–2005, with a peak of 1,930 in 2007–2008, and 1,724 enrolled in the most recent year for which data are available (2019–2020). Scholarship amounts were initially capped at US$7,500 (about US$10,600 in 2020 dollars); the 2020–2021 maximum is now US$9,161 for elementary and middle school and US$13,742 for high school (Serving Our Children, 2020; Wolf et al., 2005).

Though roughly two-thirds of students in DC public or public charter schools are income-eligible for the OSP (Wolf et al., 2010), enrollment in the program is small relative to public school enrollment in DC. OSP enrollment has never exceeded 3% of total enrollment (district, public charter, and OSP). This largely reflects the fact that program funding can only accommodate a limited number of students.

For the 2020–2021 school year, 3,687 students applied and 1,770 scholarships were awarded, 1,418 of which went to returning students. The program continues to serve predominantly Black (83%) and Hispanic (12%) students (Serving Our Children, 2020).

The law that created the OSP mandated that scholarships be allocated by lottery if there were more applicant families than funding could accommodate or school spaces available. Reports comparing the first cohort of program applicants to the universe of non-applicant students in DCPS in 2004 found that while applicants were

424

similar on some educational measures, they were more likely to come from historically underserved groups. Applicants were comparable to non-applicants in terms of baseline math and reading scores and gender, but were significantly more likely to be Black (92% vs. 85%), less likely to be Hispanic (6% vs. 9%), slightly more likely to receive special education services (16% vs. 14%), and more likely to participate in the federal free or reduced price lunch program (85% vs. 68%), which would be expected given the means-tested component of eligibility (Wolf et al., 2005).

Compared with income-eligible non-applicants, applicants had higher average reading scores (40% vs. 36% national percentile rank), higher math scores (47% vs. 43% national percentile rank), and were more likely to be Black (93% vs. 88%) and less likely to be Hispanic (6% vs. 10%). They were similar in terms of gender, the proportion receiving special education services, and similar in the proportion that participated in the federal free or reduced priced lunch program. Applicants were also less likely to be entering high school (Wolf et al., 2005).

In summary, compared with all students in DCPS, applicants tended to face more educational obstacles. When that comparison is limited to income-eligible non-applicants, applicants were somewhat more educationally advantaged.

Two congressionally mandated evaluation efforts have used the scholarship lotteries to compare the outcomes of students awarded scholarships to those who applied but did not win the lottery. The first evaluation tracked 2,308 students who applied for a scholarship beginning in 2004 or 2005 through 2008–2009 (Wolf et al., 2010). Three years after application, students who were offered a scholarship scored significantly higher on reading tests than those who were not (Wolf et al., 2009). This difference persisted for at least 4 years after application but was only statistically significant at the 90% level (Wolf et al., 2013). Pooled estimates combining yearly samples across all 5 years of the study confirmed a significant positive reading effect (Kisida & Wolf, 2015).

Estimated positive impacts on reading scores were not statistically significant for the subgroup of students who initially attended schools designated as in need of improvement (SINI), whom Congress gave priority in the lottery. But the difference in impacts (for students who attended SINI versus not SINI schools at baseline) was not statistically significant. Positive reading impacts were significantly higher for students from non-SINI schools, female students, and students who were higher performing at baseline. There was no significant impact on math scores for the full sample or subgroups.

Parents reported higher levels of satisfaction and perceptions of school safety if their children won the scholarship lottery, but there were no significant differences in how students perceived the quality or safety of their school (Kisida & Wolf, 2015; Wolf et al., 2013).

Among the subsample of about 500 applicants who were expected to graduate from high school by 2008–2009, the first evaluation found that the offer of a scholarship increased high school graduation rates (as reported by parents) by 12 percentage points relative to the control group. The estimated impact of using a scholarship was 21 percentage points. Significant positive subgroup impacts were observed for SINI students, students who were higher performing at baseline, and female students (Wolf et al., 2010).

Congress mandated a second evaluation of the OSP under the Scholarships for Opportunity and Results (SOAR) Act of 2011, tracking the outcomes of 1,771 participants from the 2012, 2013, and 2014 lotteries. Data from these students' first and second school years following the lottery indicate that receiving a scholarship reduced test scores in math but these differences were no longer significant after the third year. Impacts on parent satisfaction have been statistically insignificant, with the exception of a positive impact on student satisfaction in the third year. Impacts on parents' perceptions of school safety were positive and significant across the first 2 years, but not the third. Student perceptions of safety were significantly more positive in the second and third years. Finally, the third-year evaluation found that the program significantly reduced chronic absenteeism (Dynarski et al., 2017, 2018; Webber et al., 2019).

A potentially important limitation of existing research on the OSP is that it has relied on voluntary participation by students and families in data collection efforts, including standardized testing and surveys. The initial evaluation tested 70% of

eligible students at least 4 years after application and Dynarski et al. (2017) tested about 75% of students in their study of students' first post-lottery year. The parent survey used to measure high school graduation in the first evaluation had a response rate of 63% (Wolf et al., 2010).

These are high response rates for original data collection efforts from a historically underserved population, but they still require the investigators to assume that nonrespondents do not differ in unmeasured ways between the treatment and control groups. This assumption cannot be tested directly, and research indicates that nonresponse can bias estimates of treatment effects in randomized evaluations of school vouchers, and that commonly used reweighting techniques may not mitigate this bias (Chingos & Peterson, 2015).

Data and Method

Data

The present study builds on existing work on the OSP using administrative records to measure the college enrollment patterns of participants in the first two lotteries. We track the college enrollment outcomes of a subset of 1,776 students who applied for a scholarship in 2004 or 2005 and are now old enough to have potentially graduated from high school and enrolled in college.

Working with the current OSP administrator, Serving Our Children (SOC), we reconstructed baseline files from the original lottery applications that the Washington Scholarship Fund (the original OSP administrator) used in 2004 and 2005. These applications did not include the rich baseline surveys (or measures of student achievement) that the first congressionally mandated evaluation used. They do include ample demographic information, including student race and ethnicity, gender, age, whether the parents or guardians were married, whether parents or guardians owned their home, and family income. We put in place strict procedures to ensure that applicants' personally identifiable information was never released to anyone outside SOC.

We use these data to identify students who met the same criteria used to construct the study sample for the original evaluation. These were students who were attending a public school at baseline (or were entering kindergarten) and who were subject to the lottery because they applied

for a grade that was oversubscribed and were not part of a priority group guaranteed to win a scholarship.

We reconstructed baseline records for 2,282 students who met these requirements, which is 99% of the total evaluation sample size of 2,308 reported in the first evaluation (Wolf et al., 2010). We group students based on the year of application, grade they were entering (as reported on the application), and whether they were attending a SINI school at baseline. These groupings affected the likelihood that the student won the lottery, which we adjust for throughout the analysis using base weights analogous to those used in the first evaluation (Wolf et al., 2010).[1]

For this study, we limit the sample of students to those who can be observed for at least 2 years following their expected graduation from high school (assuming on-time progression from the grade they were entering at the time of their OSP application). This 2-year window permits the observation of college enrollment outcomes of students who repeated a grade before high school graduation or who did not enroll in college immediately afterward.

A total of 1,780 students met this criterion, and the complete data on name and date of birth needed to match to administrative records on college enrollment were available for 1,776 (99.8%) of these students. The students included in this study were entering grades 2 to 12 at the time of application; the 502 students who were entering grades K–1 in 2004 and 2005 were not yet old enough to be observed for at least 2 years after expected high school graduation.

These records were matched to administrative data on college enrollment maintained by the National Student Clearinghouse (NSC), a nonprofit organization that collects student-level enrollment, and degree data from colleges and universities making up 97% of enrollment in the United States. Coverage rates exceed 95% in all sectors of higher education (as of fall 2016), except the for-profit sector, where the coverage rate is 71%. These coverage rates have increased over time; in fall 2006, the national coverage rate was 89%, with higher rates in the DC (95%), Maryland (97%), and Virginia (95%) (National Student Clearinghouse, 2012).

NSC data have been used extensively in education research (see, e.g., Chingos & Peterson,

2015; Dynarski et al., 2015). These data are nearly universal and do not require contacting students to obtain information. Administrative data from NSC are thus more complete and accurate that can typically be obtained by survey.

We use the NSC data to measure whether students in the OSP lotteries enrolled in college within a given number of years after expected high school graduation. We measure college enrollment overall as well as by sector (2- vs. 4-year and public vs. private) and whether the student ever enrolled full time. The NSC data also include information on degree receipt, but too few students are old enough to have potentially received a college degree, so we do not use this information in the present study.

Methodology

We report the effect of winning the OSP lottery as the difference between the average outcome of the treatment group (won the lottery) and the control group (lost the lottery). All differences are weighted as described above and are estimated using linear probability models. Marginal effects generated from probit models are qualitatively similar. Because the average family had roughly 1.5 children in the study sample, standard errors are clustered by family to account for autocorrelation between siblings, which is consistent with previous OSP evaluations. Specifically, we estimate the following linear regression:

$$Y_i = \alpha + \beta \text{Treat}_i + \delta X_i + \theta_{if}$$

where Y_i is the college enrollment of student i, Treat_i is a dummy variable indicating students assignment to the treatment group (i.e., offered a scholarship), X_i is a vector of student-level characteristics derived from the scholarship applications, including race/ethnicity (Black, Hispanic, with neither/missing as omitted category), gender, whether parents/guardians were married, whether parents/guardians owned home, age, natural log of family income (with missing coded as zero), and whether income was missing; θ_{if} is the error term, clustered by family. Our primary interest is β, which represents the causal effect of being offered a scholarship to attend a private school. We report results with and

without control variables, and all models use baseline weights.

These estimates are "intent to treat" (ITT) in that they capture the effect of being offered a scholarship to use at a participating private school, when in fact many students who were offered a scholarship did not use one. Among all students who won the lottery, 71% used a scholarship for at least 1 year (this statistic is weighted using the base weights; the unweighted share of lottery winners who ever used a scholarship is 74%). We only report ITT estimates throughout this study, but because treatment group non-compliers would have experienced zero impact from the treatment, the effect for students who actually used a scholarship for at least 1 year can be roughly rescaled by dividing the ITT estimates by 0.71 (Bloom, 1984). Moreover, if we account for the program-induced crossover of control group students who attended private schools as a result of having a sibling who used a scholarship in the treatment group (roughly 3% of control group students), ITT estimates can be rescaled by dividing by 0.68 to obtain treatment-on-treated (TOT) estimates.[2]

It is also worth noting that assignment to the control group did not prevent students from finding other ways to exercise school choice, by enrolling in private schools without the aid of a voucher or by attending public charter schools. For example, parental surveys administered during the previous evaluation found that roughly 12% of control group students were enrolled in private schools and an additional 35% were enrolled in public charter schools in 2009 (Wolf et al., 2013).

Student Characteristics and Program Participation

Given random assignment to treatment, we would expect the treatment and control groups to be similar on observed characteristics. This is generally the case for the set of student characteristics captured on the scholarship application (Table 1). Students in the treatment group are significantly less likely to be white, Asian, or other race/ethnicity (or missing data on race/ethnicity), and have slightly lower family income at baseline, but the magnitude of these differences is small and not practically significant. A joint sig-

TABLE 1

Descriptive Statistics and Baseline Equivalence

Characteristic	Control	Treatment	Difference	*p* value
Race/ethnicity				
Black	0.87	0.87	0.00	.85
Hispanic	0.08	0.11	0.02	.12
White, Asian, or other/missing	0.05	0.03	−0.02*	.02
Female	0.51	0.48	−0.03	.21
Parents/guardians married	0.19	0.19	−0.01	.77
Parent/guardian owns home	0.13	0.14	0.01	.62
Age	11.79	11.89	0.09	.48
Income missing	0.19	0.19	0.00	.79
Charter at baseline	0.25	0.25	0.00	.86
Family income	US$18,904	US$17,691	−US$1,213*	.04
Observations (unweighted)	717	1,059		

Note. Summary statistics are weighted by baseline weights. A joint significance test of all of the listed variables fails to reject the null of no difference with $p = .21$.
*Statistically significant at $p < .05$.

nificant test fails to reject the null of no difference with $p = .21$.

The descriptive statistics also show that OSP applicants in 2004 and 2005 came from historically underserved groups, with an average family income of about US$18,000 and less than 20% from married two-parent families. Almost all are Black or Hispanic, and about one quarter were attending a public charter school at the time of application.

SOC also provided data on which school years each treatment-group student used their scholarship through 2016–2017. As noted, 26% of students who were offered a scholarship never used it. In all, 12%, 14%, and 15% of students used their scholarship for 1, 2, and 3 years, respectively. About 30% of students used a scholarship for 4 or more years. Students who entered the OSP in later grades had fewer remaining years in school in which they could have participated in the program. The average lottery winner used the scholarship for 39% of their remaining years in K–12 schools. The corresponding percentage for students who used a scholarship for at least 1 year is 55%.

An earlier report after the first 3 years of the program found certain baseline characteristics were significantly associated with scholarship use. Students who ever used a scholarship were less likely to require services for students with special needs, less likely to be male, less likely to be Hispanic, more likely to be Black, and more likely to be entering elementary school. Similarly, among students who ever used their scholarships, students who used them consistently were less likely to have special needs, less likely to be male, and had higher test scores if entering high school (Wolf et al., 2009). Comparisons of baseline characteristics covering usage patterns through 2016–2017 show that scholarship users were less likely to be male, less likely to have parents who owned a home, and tended to be younger (see Appendix Table A1).

Parents cited several reasons students did not use their scholarship or stopped participating, including a lack of space at a desired private school, a lack of services for students with special needs, admission to a preferred charter school, a child's private school being converted into a public charter school, or losing eligibility through a rise in family income or moving out of DC (Wolf et al., 2010).

Results

The main findings are provided in Table 2. Overall, students offered a scholarship were somewhat less likely to enroll in college within 3

TABLE 2

Effect of Scholarship Offer on College Enrollment Within 2 Years of Expected High School Graduation

Model	Any college	4-year college	2-year college	Full-time	4-year public	4-year private
Without controls	−0.030	−0.017	−0.024	−0.018	−0.013	−0.016
	(0.026)	(0.025)	(0.018)	(0.025)	(0.022)	(0.018)
With controls	−0.025	−0.014	−0.021	−0.011	−0.010	−0.015
	(0.026)	(0.025)	(0.018)	(0.024)	(0.022)	(0.018)
Control mean	0.455	0.346	0.151	0.343	0.239	0.136
Observations	1,776	1,776	1,776	1,776	1,776	1,776

Note. Robust standard errors adjusted for clustering on family appear in parentheses. Controls include race/ethnicity (Black, Hispanic, with neither/missing as omitted category), gender, whether parents/guardians were married, whether parents/guardians owned home, age, natural log of family income (with missing coded as zero), and whether income was missing. All models are weighted using baseline weights.

TABLE 3

Effect of Scholarship Offer on College Enrollment Within 1 to 5 Years of Expected High School Graduation

Graduation cohorts	Enrollment at any colleges within:				
	1 year	2 years	3 years	4 years	5 years
Expected HS graduation 2005–2016 (N = 1,776)	−0.025	−0.025			
Control group mean	(0.025)	(0.026)			
	0.385	0.455			
Expected HS graduation 2005–2015 (N = 1,597)	−0.029	−0.019	0.002		
Control group mean	(0.027)	(0.028)	(0.028)		
	0.390	0.454	0.477		
Expected HS graduation 2005–2014 (N = 1,425)	−0.012	−0.007	0.015	0.021	
Control group mean	(0.028)	(0.029)	(0.030)	(0.030)	
	0.369	0.435	0.459	0.473	
Expected HS graduation 2005–2013 (N = 1,247)	−0.014	−0.005	0.014	0.020	0.020
Control group mean	(0.030)	(0.031)	(0.032)	(0.032)	(0.032)
	0.379	0.440	0.467	0.482	0.496

Note. Robust standard errors adjusted for clustering on family appear in parentheses. All models include controls listed in notes to Table 2 and are weighted using baseline weights. HS = high school.

years of expected graduation from high school: 42% compared with 46% of applicants who lost the lottery, although the differences are not statistically distinguishable from zero at conventional levels.

This pattern holds for both 2- and 4-year colleges and for 4-year public and 4-year private colleges. Adding control variables has little impact on the results, as would be expected given random assignment.

We observe a subset of students for more than 2 years after expected high school graduation, with fewer students observed for longer periods

of time. Table 3 reports the effect of winning the OSP lottery on college enrollment within 2, 3, 4, and 5 years of expected high school graduation. None of the estimates are statistically distinguishable from zero, but the modest negative estimate for the full sample becomes a small positive estimate for those observed for at least 3 years.

This result suggests that the negative estimate in the short run merely reflects a delay in when some students enter college, perhaps because private schools are more likely to hold them back for multiple grades or their entrance into

TABLE 4

Subgroup Effects of Scholarship Offer on College Enrollment Within 2 Years of Expected High School Graduation

Subgroup	Without controls		With controls		C mean	Obs.
	Estimate	SE	Estimate	SE		
Black	−0.039	(0.028)	−0.033	(0.028)	0.457	1,552
Hispanic	−0.063	(0.085)	−0.058	(0.086)	0.479	175
Female	−0.027	(0.037)	−0.028	(0.037)	0.495	878
Male	−0.028	(0.036)	−0.027	(0.036)	0.412	898
School ever SINI	−0.052	(0.037)	−0.039	(0.037)	0.476	925
School never SINI	−0.008	(0.036)	−0.010	(0.036)	0.434	851
Entering grades 3–5	−0.064	(0.049)	−0.056	(0.048)	0.505	489
Entering grades 6–8	0.022	(0.043)	0.026	(0.043)	0.417	703
Entering grades 9–12	−0.060	(0.053)	−0.052	(0.051)	0.459	405
Charter at baseline	−0.037	(0.054)	−0.055	(0.054)	0.538	442
Not charter at baseline	−0.027	(0.030)	−0.022	(0.030)	0.426	1,334

Note. Robust standard errors adjusted for clustering by family appear in parentheses. Controls include those listed in Table 2. All models are weighted using baseline weights.

college is more likely to be delayed for other reasons.

The change in results may also be in part because of the change in the sample of students examined. There are less negative 2-year impacts for the sample of students observed for 3 through 5 years than for students observed for 2 years, mostly because of differences in the control group's enrollment rate. At the same time, there is steady improvement in the control group rate over time, which reflects the general improvement in educational outcomes in DC as measured by standardized test scores, a point which we return to in our discussion section.

These results reflect the outcomes of everyone in the treatment group, regardless of how long they used a scholarship to attend private school or if they used it at all. This is necessary in the context of a randomized experiment with limited baseline data, as it is not possible to randomize whether a student uses a scholarship that is offered to them and how long they use it.

Finally, we estimate the effect of winning a scholarship for subgroups of students, defined based on demographic characteristics and the types of schools they attended at the time of application. There is no compelling evidence of effect heterogeneity, although the effects are often imprecisely estimated given the reduced sample size (Table 4). We find no evidence of positive or negative effects among students from SINI or non-SINI public schools, or whether they attended a charter school at baseline or not. We also find no evidence of impacts when disaggregating by race/ethnicity, gender, or grade level.

Discussion and Conclusion

This study provides experimental evidence on the effect of a publicly funded private school choice program on college enrollment. We find that students who won a scholarship to attend a private school in Washington, DC, enrolled in similar types of colleges at similar rates as students who were not offered a private school voucher.

No significant difference between scholarship winners and losers still suggests a possible productivity benefit of the private sector, as the maximum voucher amount (roughly US$10,600 in 2021 dollars) was less than half of average per-pupil spending in DC's public schools (roughly US$21,400 in 2021 dollars in 2004–2005, and more in later years; National Center for Education Statistics, 2016). Such an interpretation merits caution, however, as our results are imprecisely estimated, the program allows

parents to supplement voucher amounts with their own funds, and private schools can use additional revenue sources to offset tuition costs.[3] Previous investigations of the OSP found that 14% of treatment-group students attended a private school that charged more for tuition than the scholarship amount (Wolf et al., 2010).[4]

The lack of a positive impact on college enrollment may be surprising in light of prior evidence indicating a large positive effect of the program on high school graduation rates (Wolf et al., 2010). One possible explanation is that the earlier study only included students who would have graduated by 2008–2009; however, when we limit the sample to approximately the same cohorts of students, we find similarly insignificant effects on college enrollment.

Two other issues may explain this discrepancy. First, there may be differential graduation standards in public and private high schools which led to a net positive effect on high school graduation for the students who used a voucher to enroll in private schools. For example, roughly 42% of the high school graduation sample would have had to have graduated on time to be counted as graduates (Wolf et al., 2013). If students in the control group took extra time but still eventually graduated, this could explain the discrepancy between the high school graduation and college enrollment results. Second, the previous study relied on parental self-reports to determine high school graduation with a survey response rate of 63%, resulting in a total analytic sample of 316 of the 500 students forecasted to have completed 12th grade by June 2009. It may be the case that the reported gains in high school graduation suffered from some degree of attrition bias. Although follow-up weights were used to re-balance the sample on observable characteristics, these may not correct for differential patterns in unobservable characteristics. As others have noted, treatment-group students in this scenario may be positively selected, as they perceive the main benefit for contributing to data collection as maintaining their voucher, whereas control group members may be negatively selected, as their main benefit for participating in the study is maintaining voucher eligibility (Neal, 2002). In a previous voucher study, Chingos and Peterson (2015) demonstrate empirically that weighting on observables can increase the bias in estimates

with significant sample attrition, enough to shift null effects to statistically significant.

Unfortunately, we are unable to precisely isolate the 63% of students whose parents reported graduation outcomes in the earlier study to determine whether this sample also experienced higher college enrollment. A notable benefit of our study, however, is that we experience virtually no attrition from the original sample, the data from the NSC are from administrative reports instead of parental surveys, and our outcomes of interest are measured the same across the treatment and control groups.

This study has a number of limitations. First, the results are not precise enough to rule out modest (and in some cases large) positive or negative effects. The 95% confidence interval for the 2-year result on enrollment in any college (Tables 2 and 3) ranges from negative 7.6 to positive 2.6 percentage points. Estimates of college enrollment over a longer time horizon are centered closer to zero. For example, the 3-year result reported in Table 3 cannot rule out (at the 95% confidence interval) negative effects smaller than 5.3 percentage points or positive effects smaller than 5.7 percentage points.

Second, a necessary drawback of examining longer-term outcomes is that they reflect the experiences of earlier cohorts of students. Results for more recent participants (which will not be measurable for many years) may differ because of changes in the voucher program or changes in the public school system. For example, even when controlling for demographic changes, the performance of DC's public school system on the NAEP has increased markedly in recent years (Blagg & Chingos, 2016). At the time of the OSP's founding, DC ranked near the bottom nationally on the NAEP, with students averaging mid-30 national percentile ranks on norm-referenced standardized tests (Wolf et al., 2009). This may be why earlier evaluations of the OSP found positive impacts on test scores (Wolf et al., 2013), but a more recent evaluation found negative effects after 1 and 2 years (Dynarski et al., 2017, 2018). Program impacts are necessarily measured against a counterfactual, and the relative performance of the counterfactual in DC, as well as in the numerous other voucher studies, varies across time and place.

The large and growing charter sector also complicates the interpretation of the results, as there are many students in both the treatment and

control groups who attended public schools of choice. The share of DC public school students enrolled in charters has grown from less than 20% when the OSP was launched to more than 40% today. In the most recent OSP evaluation, 42% of the control group was enrolled in a charter school compared with 15% of the treatment group (Dynarski et al., 2017).

Finally, this study does not capture any competitive effects of the voucher program, which have been positive in other contexts (e.g., Egalite & Wolf, 2016; Figlio & Hart, 2014), even when the average share of students exiting is small (Figlio et al., 2021). Though the legislation that established the OSP ensured DCPS would gain rather than lose funds, these funds were not earmarked for individual schools that experienced enrollment losses to the program. Despite the program never amounting to more than 3% of school-aged children in DC, the top 25% of schools had an average application rate of 15.5% and a voucher usage rate of 9.4% (Wolf et al., 2010). However, because the program has not grown over the last 15 years, the initial competitive threat has likely not intensified over time, unlike other areas where private school choice has grown concurrently with improvements in the public sector (Figlio et al., 2021).

These limitations aside, this study shows that students who won private school scholarships from the nation's only federally funded school voucher program were not significantly more or less likely to enroll in college than students who did not win a scholarship. But given the significant changes to the DC education system over the period since the students in this study applied for scholarships in 2004 and 2005, it will be important to continue to track the outcomes of more recent program participants.

More broadly, experimental studies of the effects of school vouchers have trended from more positive to more negative findings on student achievement outcomes, which may reflect differences in program design, populations served, or changes in the relative efficacy of the public sector. Differences over eligibility requirements and accountability mechanisms in voucher programs have generated much debate among school choice stakeholders and may explain differences in outcomes, making it all the more difficult to generalize from any single program (Kisida et al., 2015). Time will tell if these same patterns hold when examining long-term impacts, as future studies will be able to track students in other existing programs over longer periods of time. Given continued efforts to expand private school choice options in the United States through state, and more recently, federal policy, vouchers remain a highly salient policy issue, and it is imperative that rigorous research shed additional light on the efficacy of private school choice.

Appendix

TABLE A1

Characteristics of Scholarship Users and Non-Users

Characteristic	Ever-users	Never-users	Difference	*p* value
Race/ethnicity				
Black	0.88	0.85	0.03	.18
Hispanic	0.10	0.13	−0.04	.09
White, Asian, or other/missing	0.03	0.04	−0.02	.15
Female	0.51	0.40	0.11**	.00
Parents/guardians married	0.17	0.21	−0.04	.17
Parent/guardian owns home	0.12	0.18	−0.06*	.02
Age	11.47	12.91	−1.44**	.00
Income missing	0.17	0.23	−0.05*	.05
Charter at baseline	0.25	0.25	−0.00	.94
Family income	17,246	18,863	−1,616	.06
Observations (unweighted)	780	279		

Note. All models are weighted using baseline weights.
*Statistically significant at *p* < .05. **Statistically significant at *p* < .00.

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Notes

1. The base weights account for the fact that applicants were placed into randomization stratum with different probabilities of being awarded a scholarship, based on legislative prioritization of students from schools designated as in need of improvement (SINI) status at time of application, the grade band they were entering (K–5, 6–8, and 9–12), and their application year cohort. Within each randomization stratum, the base weight for participants is the inverse probability of being assigned to the treatment or control group.

2. A small number of control group students likely attended private schools as a direct result of the Opportunity Scholarship Program (OSP). While we do not have these data for our study sample, survey data from an earlier evaluation of the OSP found that roughly 3% of the control group attended a private school because they had a sibling in the treatment group who used a voucher (including cases where the schools accepted a single voucher for both siblings). This 3% were accounted for when calculating treatment-on-treated (TOT) impacts for that study (Wolf et al., 2013). An additional 20% of control group students in that sample who ever-attended a private school without the aid of a voucher were not accounted for in TOT estimates because that evaluation focused on the causal effects of the OSP, not the effect of private school attendance.

3. Private schools may spend more than they receive in tuition because of other revenue sources (e.g., the Catholic church), and public schools face costs (e.g., special education and district administration) that private schools do not. Previous attempts to adjust for these differences find that they narrow the estimated cost differences between sectors but do not eliminate them (Howell & Peterson, 2002).

4. It is also the case that students tended to cluster in participating schools with lower tuition amounts. Although 14% of OSP students attended a private school that charged tuition greater than the voucher amount, 50% of participating charter schools charged more than the voucher amount. At the top end of the range, the most expensive participating school's tuition was roughly four times the voucher amount. Related, 21% of students who did not use their scholarship reported there was a lack of space in their preferred private school, 19% reported that the scholarship amount was not adequate to cover tuition, and 11% reported that their preferred private school was not participating (Wolf et al., 2010). This may raise concerns about negative selection regarding which schools students were effectively able to choose among participating schools, and which schools chose to participate at all. Although private school participation in the OSP was relatively high, with a peak of roughly two thirds of area private schools participating at some point during the years from 2004–2005 to 2008–2009, there is some evidence of nonrandom attrition. From 2004–2005 to 2008–2009, only 36.8 of schools that consistently participated charged more than the voucher amount, whereas 57.1% of private schools that only partially participated charged more than the voucher amount (this calculation excludes lower tuition Catholic schools that converted to public charter schools after 4 years of consistent participation).

References

Abdulkadiroğlu, A., Pathak, P. A., & Walters, C. R. (2018). Free to choose: Can school choice reduce student achievement? *American Economic Journal: Applied Economics*, *10*(1), 175–206.

Almond, D., Jr., & Currie, J. (2010, March). *Human capital development before age five* (NBER Working Paper No. 15827). https://www.nber.org/system/files/working_papers/w15827/revisions/w15827.rev0.pdf

Angrist, J. D., Cohodes, S. R., Dynarski, S. M., Pathak, P. A., & Walters, C. R. (2016). Stand and deliver: Effects of Boston's charter high schools on college preparation, entry, and choice. *Journal of Labor Economics*, *34*(2), 275–318.

Betts, J. R., & Tang, E. T. (2014). *A meta-analysis of the literature on the effect of charter schools on student achievement*. Center on Reinventing Public Education. https://www.crpe.org/sites/default/files/

CRPE_meta-analysis_charter-schools-effect-student-achievement_workingpaper.pdf

Blagg, K., & Chingos, M. M. (2016). *Does gentrification explain rising student scores in Washington, DC?* Urban Institute. https://www.urban.org/urban-wire/does-gentrification-explain-rising-student-scores-washington-dc

Bloom, H. S. (1984). Accounting for no-shows in experimental evaluation designs. *Evaluation Review*, *8*(2), 225–246.

Bloom, H. S., & Unterman, R. (2014). Can small high schools of choice improve educational prospects for disadvantaged students? *Journal of Policy Analysis and Management*, *33*, 290–319.

Booker, K., Sass, T. R., Gill, B., & Zimmer, R. (2011). The effects of charter high schools on educational attainment. *Journal of Labor Economics*, *29*(2), 377–415.

Cheng, A., Hitt, C., Kisida, B., & Mills, J. N. (2017). "No excuses" charter schools: A meta-analysis of the experimental evidence on student achievement, *Journal of School Choice*, *11*(2), 209–238.

Chingos, M. M., & Kuehn, D. (2017). *The effects of statewide private school choice on college enrollment and graduation*. Urban Institute. https://www.urban.org/research/publication/effects-statewide-private-school-choice-college-enrollment-and-graduation

Chingos, M. M., Kuehn, D., Monarrez, T., Wolf, P. J., Witte, J. F., & Kisida, B. (2019). *The effects of means-tested private school choice programs on college enrollment and graduation*. Urban Institute. https://www.urban.org/sites/default/files/publication/100665/the_effects_of_means-tested_private_school_choice_programs_on_college_enrollment_and_graduation_2.pdf

Chingos, M. M., Monarrez, T., & Kuehn, D. (2019). *The effects of the Florida Tax Credit scholarship on college enrollment and graduation: An update*. Urban Institute. https://www.urban.org/sites/default/files/publication/99728/the_effects_of_the_florida_tax_credit_scholarship_program_on_college_enrollment_and_graduation_2.pdf

Chingos, M. M., & Peterson, P. E. (2015). Experimentally estimated impacts of school vouchers on college enrollment and degree attainment. *Journal of Public Economics*, *122*, 1–12.

Chubb, J. E., & Moe, T. M. (1990). *Politics, markets and American schools*. Brookings Institution Press.

Coen, T., Nichols-Barrer, I., & Gleason, P. (2019). *Long-term impacts of KIPP middle schools on college enrollment and early college persistence*. Mathematica. https://mathematica.org/publications/long-term-impacts-of-kipp-middle-schools-on-college-enrollment-and-early-college-persistence

Coons, J. E., & Sugarman, S. D. (1978). *Education by choice: The case for family control*. University of California Press.

Cowen, J. (2008). School choice as a latent variable: Estimating the complier average causal effect of vouchers in Charlotte. *Policy Studies Journal*, *36*, 301–315.

Cowen, J. M., Fleming, D. J., Witte, J. F., Wolf, P. J., & Kisida, B. (2013). School vouchers and student attainment: Evidence from a state-mandated study of Milwaukee's Parental Choice Program. *Policy Studies Journal*, *41*(1), 147–168.

Davis, M., & Heller, B. (2019). No excuses charter schools and college enrollment: New evidence from a high school network in Chicago. *Education Finance and Policy*, *14*(3), 414–440.

DC Parental Choice Incentive Act of 2003, H.R. 2556, 108th Cong. (2003).

Deming, D. J., Hastings, J. S., Kane, T. J., & Staiger, D. O. (2014). School choice, school quality, and postsecondary attainment. *American Economic Review*, *104*, 991–1013.

Dobbie, W., & Fryer, R. (2015). The medium-term impacts of high-achieving charter schools. *Journal of Political Economy*, *123*(5), 985–1037.

Dynarski, M., Rui, N., Webber, A., Gutmann, B., & Bachman, M. (2017). *Evaluation of the DC Opportunity Scholarship Program: Impacts after one year* (NCEE Report 2017–4022). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Dynarski, M., Rui, N., Webber, A., Gutmann, B., & Bachman, M. (2018). *Evaluation of the DC Opportunity Scholarship Program: Impacts after two years after students applied* (NCEE Report 2018–4010). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Dynarski, S. M., Hemelt, S. W., & Hyman, J. M. (2015). The missing manual using National Student Clearinghouse data to track postsecondary outcomes. *Educational Evaluation and Policy Analysis*, *37*(1), 53S–79S.

EdChoice. (2020). *Fast facts on school choice*. https://www.edchoice.org/school-choice/fast-facts/

Egalite, A. J., & Wolf, P. J. (2016). A review of the empirical research on private school choice. *Peabody Journal of Education*, *91*(4), 441–454.

Erickson, H. E., Mills, J. N., & Wolf, P. J. (2021). The effects of the Louisiana Scholarship Program on student achievement and college entrance. *Journal of Research on Educational Effectiveness*, *14*(4), 861–899.

Figlio, D. N., & Hart, C. M. D. (2014). Competitive effects of means-tested school vouchers. *American*

Economic Journal: Applied Economics, *6*(1), 133–156.

Figlio, D. N., Hart, C. M. D., & Karbownik, K. (2021). *Effects of scaling up private school choice programs on public school students* (IZA DP 14342). IZA Institute of Labor Economics. https://docs.iza.org/dp14342.pdf

Figlio, D. N., & Karbownik, K. (2016). *Evaluation of Ohio's EdChoice Scholarship Program*. Fordham Institute. https://fordhaminstitute.org/sites/default/files/publication/pdfs/FORDHAM-Ed-Choice-Evaluation-Report_online-edition.pdf

Friedman, M. (1955). The role of government in education. In R. A. Solo (Ed.), *Economics and the public interest* (pp. 123–144). Rutgers University Press.

Friedman, M. (1962). *Capitalism and freedom*. The University of Chicago Press.

Greene, J. P. (2001). Vouchers in Charlotte: Vouchers and the test-score gap. *Education Next*, *1*, 55–60.

Henig, J. R. (1994). *Rethinking school choice: Limits of the market metaphor*. Princeton University Press.

Howell, W. G., & Peterson, P. E. (2002). *The education gap: Vouchers and urban schools*. Brookings Institution Press.

Hsu, S. S. (2004). How vouchers came to D.C. *Education Next*, *4*(4), 44–50.

Kisida, B., & Wolf, P. J. (2015). Customer satisfaction and educational outcomes: Experimental impacts of the market-based delivery of public education. *International Public Management Journal*, *18*, 265–285.

Kisida, B., Wolf, P. J., & Rhinesmith, E. (2015). *Views from private schools: Attitudes about school choice programs in three states*. American Enterprise Institute. https://www.aei.org/wp-content/uploads/2015/01/Views-from-Private-Schools-7.pdf?x91208

Krueger, A. B., & Zhu, P. (2004). Another look at the New York City school voucher experiment. *American Behavioral Scientist*, *47*, 658–698.

Mills, J. N., & Wolf, P. J. (2017). Vouchers in the Bayou: The effects of the Louisiana Scholarship Program on student achievement after 2 years. *Educational Evaluation and Policy Analysis*, *39*, 464–484.

National Center for Education Statistics. (2016). Digest of Education Statistics, table 236.70. https://nces.ed.gov/programs/digest/d16/tables/dt16_236.70.asp?current=yes

National Student Clearinghouse. (2012). NSC Enrollment Percentages. https://nscresearchcenter.org/wp-content/uploads/NSC_COVERAGE.xlsx

Neal, D. (2002). How vouchers could change the market for education. *Journal of Economic Perspectives*, *16*(4), 25–44.

Rouse, C. E. (1998). Private school vouchers and student achievement: An evaluation of the Milwaukee Parental Choice Program. *Quarterly Journal of Economics*, *113*, 553–602.

Sass, T. R., Zimmer, R. W., Gill, B. P., & Booker, T. K. (2016). Charter high schools' effect on long-term attainment and earnings. *Journal of Policy Analysis and Management*, *35*(3), 683–706.

Serving Our Children. (2020). *Program fact sheet*. https://servingourchildrendc.org/our-program/

Waddington, J., & Berends, M. (2018). Impact of the Indiana Choice Scholarship Program: Achievement effects for students in upper elementary and middle school. *Journal of Policy Analysis and Management*, *37*(4), 783–808.

Webber, A., Rui, N., Garrison-Mogren, R., Olsen, R. B., & Gutmann, B. (2019). *Evaluation of the DC Opportunity Scholarship Program: Impacts three years after students applied* (NCEE 2019-4006). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Wolf, P. J., Gutmann, B., Eissa, N., & Puma, M. (2005). *Evaluation of the DC Opportunity Scholarship Program: First year report on participation*. National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Wolf, P. J., Gutmann, B., Puma, M., Kisida, B., Rizzo, L., Eissa, N., & Carr, M. (2009). *Evaluation of the DC Opportunity Scholarship Program: Impacts after three years* (NCEE Report 2009–4050). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/pubs/20094050/pdf/20094050.pdf

Wolf, P. J., Gutmann, B., Puma, M., Kisida, B., Rizzo, L., Eissa, N., & Carr, M. (2010). *Evaluation of the DC Opportunity Scholarship Program: Final report* (NCEE Report 2010–4018). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/pubs/20104018/pdf/20104018.pdf

Wolf, P. J., Kisida, B., Gutmann, B., Puma, J., Eissa, N., & Rizzo, L. (2013). School vouchers and student outcomes: Experimental evidence from Washington, DC. *Journal of Policy Analysis and Management*, *32*, 246–270.

Wolf, P. J., Witte, J., & Kisida, B. (2019, August). *Do voucher students attain higher levels of education?*

Extended evidence from the Milwaukee Parental Choice Program (EdWorkingPaper: 19-115). Annenberg Institute at Brown University. https://doi.org/10.26300/1tnp-hk76

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