Achievement Effects of The Expansion of Means-Tested Private School Vouchers in North Carolina

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Abstract

We explore how private school choice has affected public school student achievement, employing a student fixed effects approach to examine the first five years of the means-tested private school voucher program known as the North Carolina Opportunity Scholarship program. Using statewide administrative data and a within-student panel design, we estimate the relationship between program expansion and public school student achievement, accounting for pre-program variation in private school competitive pressure. Our primary measure of competition reflects the availability of grade-relevant private school seats within a 30-minute driving radius, alongside four additional measures capturing proximity, density, diversity, and religious options. We find no consistent evidence that the expansion of the OS program affected the standardized test scores of non-participating students. While small, positive effects emerge when using the "slots" measure of competition, these are not robust across specifications and do not remain statistically significant after adjusting for multiple hypothesis testing. Additional analyses explore heterogeneity by student race, gender, and disability status, but yield similarly null findings after correction. Overall, our results suggest that, in the early years of the OS program, increased exposure to private school options had limited academic spillover effects—positive or negative—on students who remained in traditional public schools.

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Public schools across the United States face an evolving educational landscape, with over a million students currently enrolled in private school choice programs by way of Education Savings Account (ESA), voucher, and tax-credit scholarship programs (EdChoice, 2025). As these programs evolve and a growing share of eligible students opt in, it is important to track whether and how the students who remain in traditional public schools are affected. Only by studying the public school response over a multi-year time frame can we understand the ways in which such programs have a systemic impact on the broader educational environment.

North Carolina's Opportunity Scholarship (OS) program is a means-tested private school voucher program that offers state funds for eligible elementary and secondary school students to attend participating private schools. The enacting legislation was ratified by the General Assembly and signed into law by Governor Pat McCrory in July 2013 as part of the Current Operations and Capital Improvements Appropriations Act of 2013, which was North Carolina's biennial budget bill for 2013-14 and 2014-15. It was later amended and codified in Part 2A to Article 39 of Chapter 115C of the North Carolina General Statutes. We study whether the program altered the public school landscape by documenting the expansion of the program from its first year of operation (2013-14) through 2018-19. Over this five-year stretch, student enrolment in the OS program grew sixteen-fold and the number of participating private schools crossed the 500-school mark. What have these changes meant for North Carolina's traditional public schools? Answering this question is of both practical and academic importance because a 2015 North Carolina statute (§115C-562) required an analysis of "competitive effects on public school performance on standardized tests as a result of the scholarship grant program"

(Scholarship grants, 2015). This language was later repealed but the research question was never answered.

There have been over twenty studies of the competitive effects of private school choice programs across the nation, almost all of which conclude that competition from private school choice has had a neutral or positive impact on non-choosing students in traditional public schools. Over half of these studies, however, focus on the experiences of schools in a narrow geographical range: the city of Milwaukee, Wisconsin (Carnoy et al, 2007; Chakrabarti, 2013; Greene & Forster, 2002; Greene & Marsh, 2009; Hoxby, 2003; Mader, 2010) or the state of Florida (Bowen & Trivitt, 2014; Chakrabarti, 2008; Figlio & Hart, 2014; Figlio, Hart, & Karbownik, 2023; Figlio & Rouse, 2006; Greene, 2001; Rouse, Hannaway, Goldhaber, & Figlio, 2013; Winters & Greene, 2011). With over 33 states plus Washington D.C. and Puerto Rico permitting state-funded private school choice in 2024, it is vital that researchers include new contexts in their analyses to maximize what we can learn about the diverse experiences of the varied programs across the country. Does North Carolina's means-tested private school choice program help or hurt the state's public schools?

Thus, an opportunity to fulfill the research intent of the original statute and to increase representation in the body of literature on this topic by studying this research question in North Carolina for the first time are two imperatives for this study. A third rationale for this study is the opportunity to take advantage of methodological advances in this area by operationalizing competition as a drive-time measure, which we explain in greater detail in the methods section.

To learn how North Carolina's OS program impacts public schools in that state, we take advantage of differences in the competitive landscape experienced by public schools on the eve of the OS program becoming law. Using five distinct measures of a public school's pre-policy

shares of likely private school competitors (Figlio & Hart, 2014; Egalite & Catt, 2023), we follow Figlio, Hart, and Karbownik (2023) in accounting for the state-level expansion in the usage of private school vouchers over time. Incorporating these measures into our empirical model, a quasi-experimental approach provides a plausible causal approach by which to analyze whether students in traditional public schools facing relatively higher levels of private school competition experienced a differential academic impact of the OS program's expansion compared to their counterparts attending traditional public schools facing relatively lower levels of competition.

We find that as the OS program grew throughout its first five years of operation, public school students that were more exposed to private school competition were largely unaffected in terms of their academic achievement. Across different iterations of the empirical model, we find no evidence of academic benefit or harm of the program and, in some instances, small additional increases in test scores in public schools facing higher levels of competition when statewide enrollment in the voucher program increased. For example, a 10 percent increase in statewide enrollment in the voucher program— in public schools with above-median grade-relevant seats in neighboring private schools within a 30-minute drive—is associated with an increase of 0.026 SD in public school students' math standardized test scores and 0.013 SD in their reading scores. We also conduct numerous subgroup analyses and interpret these findings as neutral. In summary, while the majority of estimated impacts are both statistically and practically non-significant, we find no evidence to suggest negative competitive impacts of the OS program on public school achievement.

Theoretical Framework

The case for a market-based approach to education was laid out by Milton Friedman (1955), who suggested that governments "should continue to administer some schools" but parents who chose to send their children to other schools "be paid a sum equal to the estimated cost of educating a child in a government school." Friedman argued that such an arrangement would promote a range of benefits, such as incentivizing the development of a diverse range of schooling options and providing a mechanism for determining teacher salary scales. Other scholars have since made the case that education is different from other market settings, complicating the theoretical case for vouchers. Because school finance formulas largely rest on student counts, public school leaders at all levels—school and district— are incentivized to maximize student enrolment as the loss of each student to a private school directly impacts the budget for next year.

It is unclear a priori whether North Carolina's public schools will respond positively or negatively to growth in the OS program. On the one hand, public school leaders might respond positively to the competitive environment created by the expansion of state-funded private school choice by innovating and diversifying their offerings to better serve public school students, leading to a more effective educational experience that is personalized and more adaptive to individual students (Chubb and Moe, 1990). Competition between schools could be a motivator for consistent improvement in the public sector to retain those students the state has now provided with the financial means to depart for the private sector, if they so desire (Epple, Romano, & Urquiola, 2017). The types of innovations that might be adopted could be curricular or pedagogical in nature or they could be managerial in nature, related to staffing and scheduling decisions (Grissom, Egalite, & Lindsay, 2021). If a public school was overcrowded to begin with, student transfers might ease demand on school services and could lower class sizes, leading

to a better teacher: student ratio. Furthermore, if the students who depart the traditional public school with a private school voucher are among the lowest performing (Figlio, 2014) and most socioeconomically disadvantaged (Abdulkadiroğlu, Pathak, and Walters, 2018) students in their prior public schools, this movement might ease pressure on the sending school.

On the other hand, students who remain in traditional public schools might experience academic harm if a voucher program redirects critical financial and other resources from the public to the private sector. In addition to losing per-pupil funds, a traditional public school might lose high-quality principals, teachers, or instructional aides and other para-professional staff if those individuals follow the students to the private sector.

Epple, Romano, & Urquiola (2017) conclude that the design of individual programs matters greatly in determining how an individual state will likely experience private school choice. This consideration underlines the need to conduct research on this topic in states with diverse voucher program designs.

The North Carolina OS Program

Although 2014-15 is officially the OS program's first year of operation, legal developments that transpired in the early days of the program did little to signal program permanence. A pair of lawsuits filed by the North Carolina Association of Educators—the state affiliate of the National Education Association, the largest labor union in the United States—and the North Carolina School Boards Association challenged the constitutionality of the OS program shortly after it passed into law, seeking a permanent injunction against the program. Superior Court Judge Robert Hobgood halted disbursement of scholarship funds in August 2013 but an appellate court ruling in September of that year granted permission for the 1,878 students who had already accepted the vouchers before the judge's ruling to receive voucher funds. Thus,

implementation of the OS program continued despite these two lawsuits—*Hart vs. State* and *Richardson vs. State*—and the application cycle for the following year opened in February 2014. The program was enjoined twice in 2014—from February to June and again from August to December. In October 2014, the State Supreme Court agreed to hear the two cases, ruling in favor of the program in July 2015, noting that "our constitution specifically envisions that children in our state may be educated by means outside of the public school system."

With its legal hurdles cleared, the OS program has grown steadily in both enrollment and private school participation over time (Figure 1). In the 2022-23 school year, the program served 25,547 students in 544 private schools. The total value of these scholarships was $133,872,245.

≪ FIGURE ONE ABOUT HERE ≫

Student eligibility rules have evolved to include a broader cross-section of North Carolinians over this period of maturation. By the final year of this study, 2018-19, eligible students were defined as residents of North Carolina who had not yet received a high school diploma. An eligible student could either be a child in foster care or a member of a family which meets a household income requirement. The income cap for a family of four to qualify for full tuition up to $4,200 was set at $45,510. Finally, the eligible student must have used OS funds in the previous year; been previously enrolled in a public school full-time; be entering Kindergarten or first grade; or have a parent on full-time active military duty.

In addition to gradually expanding student eligibility for participation in the OS program, the North Carolina General Assembly has increased funding for the program over time, paying particular attention to the maximum possible value of the voucher. This value was initially set at a maximum possible value of $4,200, with no clear mechanism for growth over time, which

private school leaders cited as a hurdle to their participation in the program (Egalite, Gray, & Stallings, 2017). In 2021-22, for the first time, the voucher was calculated as a dynamic value, set at 90 percent of the state's per-pupil funding. This ensures that state funding for both sectors grow in tandem with one another. This translates to a maximum voucher value of $6,168 for the 2022-23 school year.

Prior Research

Researchers across the world have studied the impact of voucher programs to determine their systemic impact on issues including test scores and student sorting in locations as diverse as Sweden (Böhlmark, Holmlund, & Lindahl, 2016), Chile (Hsieh & Urquiola, 2006), and Kenya (Lucas & Mbiti, 2012). To help make sense of this body of work, there have been several comprehensive reviews of the literature on school vouchers. For example, a 2013 systematic review of the competitive effects literature summarized findings from seven locations across the United States, concluding that competition from private school choice programs had neutral to positive impacts on public school student achievement (Egalite, 2013). Taking an international perspective, a 2017 survey of the economics literature concluded that "Evidence on both small-scale and large-scale programs suggests that competition induced by vouchers leads public schools to improve" (Epple, Romano, & Urquiola, 2017). More recently, Jabbar and colleagues (2019) used meta-analysis to statistically synthesize the findings of every independent study that has been conducted on this topic, concluding that "competition from private school choice (through voucher policies) can have significant positive impacts on overall student achievement."

Collectively, the findings from these studies provide support for the introduction of a private school choice program. Nevertheless, it is important to note that existing research

generally focuses on the initial years after the enactment of a private school voucher program and are often unable to provide a perspective on the long-run changes to public schools. What do we know about the effects of large-scale programs that have significantly expanded over multiple years?

The largest private school choice program in the United States is the Florida Tax Credit (FTC) scholarship program, which was enacted and launched in 2001 and currently enrolls over 106,000 students (EdChoice, 2025). A recent analysis by Figlio, Hart, & Karbownik (2023) offers useful insight that can inform our understanding of how public schools respond to the large-scale expansion of a statewide private school choice program. The study in question covers a fifteen-year period, during which time the number of participating students grew to represent about four percent of Florida's school-aged population. Non-choosing students experienced a variety of benefits as the FTC expanded. Specifically, students in traditional public schools that faced the highest level of exposure to private school competition saw improvements in their standardized test scores and reductions in suspensions and absences, relative to students in public schools that faced relatively lower levels of competition. The students who experienced the greatest benefits were those with lower family incomes and lower levels of mother's educational attainment.

Collectively, these studies of the short- and long-run impacts of expanding private school choice by way of vouchers and tax-credit scholarships offer an optimistic, but not definitive outlook. As Epple, Romano, and Urquiola (2017) remind us, educational markets are complex and wide-ranging research is necessary for the field to make progress.

In this paper, we describe variation in the initial competitive landscape as it was experienced by North Carolina's traditional public schools on the eve of the OS program

becoming law. We do this by relying on five measures of school competition, which were pioneered by Figlio & Hart (2014) and have been used in numerous studies since then. We then estimate the expansion effect of the OS program in its first five years to make inferences about the public school impact of North Carolina's means-tested private school choice program.

Methods

Data and Sample

Data were provided by the North Carolina Department of Public Instruction and cover years 2012-13 through 2018-19. This timespan covers two years of pre-policy data (2012-13 and 2013-14) and five years of outcome data (2014-15, 2015-16, 2016-17, 2017-18, and 2018-19) for students in tested grades, three through eight. Panel A of Table 1 describes the empirical sample, which includes data on approximately 1.5 million unique students, 49 percent of whom are female, 25 percent Black, 17 percent Hispanic, 49 percent white, and nine percent identifying as "other race." Fourteen percent of our sample has been identified as a student with a disability, which is consistent with the state average.

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Panel B of Table 1 describes the five competition measures on which we rely: proximity, density, diversity, slots, and places of worship. In building these measures, we improve upon prior work using these measures (Figlio, Hart, & Karbownik, 2023) by using drive-time in place of the straight-line distance between a public and private school. Drive-time is aggregated from millions of anonymized vehicle sensors to account for the realized distance between two points. It takes into consideration traffic patterns, stop signs, and vehicle turn times. Appendix A provides a technical description of the drivetime calculations.

Drive time is a superior measure to geodetic (straight-line) distance when assessing access to nearby schools because it more accurately reflects the real-world experience of families navigating transportation networks. Unlike geodetic distance, which assumes a direct path "as the crow flies," drive time accounts for actual road infrastructure, traffic patterns, and geographic barriers such as rivers, highways, or limited-access roads that can significantly affect school accessibility. Particularly in rural or suburban areas, where road networks may be sparse or indirect, straight-line distance can underestimate the time and effort required to reach a school. By capturing the practical constraints families face in choosing among nearby private schools, drive time provides a more realistic and policy-relevant measure of competitive pressure in education markets.

On average, the nearest private school was 9.66 minutes or 5.48 miles away from a traditional public school in 2013-14. As we might expect, private school density increases as the driving radius around a given public school increases. On average, there were 3 private schools within a 10-minute drive-time radius, 11 schools within 20 minutes, 22 schools within 30 minutes, and 73 schools within an hour's driving distance. We also build a measure of private school diversity, defined in terms of a school's religious affiliation (including no affiliation) to capture another component of school competition. On average, there is just one type of private school within a 10-minute drive-time radius around a traditional public school, there are four different types of private schools within 20 minutes, and five different types of private schools within 30 minutes.

Under the proximity, density, and diversity measures of competition considered thus far, a private school competitor is identified without regard to the grade levels it serves but a public high school is unlikely to perceive a private elementary school as much of an enrolment threat,

given the different age group it targets. Therefore, we also rely on the "slots" measure. This refers to the total enrollment of relevant grade-level private school competitors within a given radius of a public school. Slots can be thought of as the number of private seats available for students in a relevant grade-level. On average, the number of "slots" within a 10-minute driving distance of a public school is 180 students. Within 20 minutes, there are 870 students; and within 30 minutes, there are 1,947 students.

The fifth competition measure is places of worship (POW), which counts churches, synagogues, and mosques. We describe the source of these data and other relevant details in Appendix A. The POW measure is intended to be forward-looking because it captures the potential location of where new private schools might be expected to develop after a new voucher program passes into law, creating a source of public funding for religious education. On average, there were 14 places of worship within a 10-minute drive-time radius, 54 places of worship within 20 minutes, and 120 places of worship within 30 minutes.

Finally, we create a single, composite competitive pressure index using principal components analysis. This school-level measure is based on all five competition measures and produced a single component with an eigenvalue greater than one.

This project was reviewed by the NC State institutional Review Board for the use of Human Subjects in Research and protocol 20851 was approved. The requirement for informed consent was waived.

Empirical Model

We estimate the effect of expanding participation in North Carolina's means-tested private school choice program by estimating models of the form:

$$Y_{iglst} = \beta_1 C_s * Expansion_t + \sigma_{il} + \gamma_{gt} + \epsilon_{iglst} \qquad [1]$$

Y_{igst} represents the average standardized math or reading score for student *i* in grade *g*, at academic level *l* (students are coded as being at the elementary or middle school level), school *s,* in year *t*; σ_{il} is a student-by-academic-level fixed effect, which means all estimates are generated within-student. This ensures we are accounting for all time-invariant factors influencing student achievement at a given academic level. As Figlio, Hart, and Karbownik (2023) point out, this is similar to controlling for lagged test scores as a means to account for prior motivation and investments in a child's academic development. γ_{gt} is a grade-by-year fixed effect to account for common shocks, and ϵ_{iglst} is an idiosyncratic disturbance term. We cluster standard errors at the school level because our key variable—private school competition—is measured at that level, meaning students within the same school share the same exposure, which creates potential correlation in their outcomes. Clustering by school adjusts for this dependence to ensure valid inference.

The parameter of interest is the β_1 coefficient on the two-way-interaction of C_s and $Expansion_t$. C_s is a school-level measure of pre-program competitive pressure, operationalized as being above or below the median on five possible measures of competitive pressure: proximity, density, diversity, slots, places of worship. We calculate these medians within-locale—locale is a designation of the U.S. Census Bureau, representing city, suburb, town, or rural area—so we can account for regional variation by population size. Also of note is that instead of using contemporaneous measures, the five competitive pressure measures are captured *before* the OS program began. This consideration rules out bias from possibly endogenous private school location and expansion decisions made in response to the establishment of the OS program or in response to changes over time expanding student eligibility or funding for the program. *Expansion* is the log of total program participants, which captures annual growth in statewide

usage of the voucher program. In a nutshell, the β_1 coefficient captures the differential effect of program expansion on student achievement in public schools located in areas with relatively higher levels of private school competition, compared to public schools in areas with lower levels of competition.

The use of the student fixed effect is motivated by a desire to account for time-invariant factors that might systematically influence test scores for certain students. It requires us to assume that students in the treatment group (those attending public schools facing relatively higher levels of competitive pressure at baseline) would have experienced similar academic growth as their counterparts in the comparison group (those attending public schools facing relatively lower levels of competitive pressure at baseline), absent the intervention (expansion of the voucher program). It is not a violation of this assumption if student achievement levels are correlated with school competition level or other time-invariant characteristics of the student, including motivation, drive, and so on.

Results

Table 2 presents the average treatment effect of private school competition on public school students' academic performance. Across most measures, non-choosing students in public schools with higher levels of competition experience no change in their standardized test scores compared to those students attending public schools with lower levels of competition. The one exception to this occurs using the "slots" measure. Student academic performance at public schools with higher levels of grade-relevant private seats within 30-minutes drivetime increased as the OS program scaled. A one-percent increase is associated with a 0.0026 SD increase in math and 0.0013 SD in reading. To aid interpretation, we can think about effect sizes in terms of a 10 percent increase, which is associated with a 0.026 SD increase in math and 0.013 SD in

reading. Finally, results using the competitive pressure index generated from a principal components analysis of the five individual measures of competitive pressure reveal null effects. Given that we do not observe significant positive effects across multiple measures or using the summary index, we conclude there is no impact on the achievement of non-choosing students.

≪ TABLE TWO ABOUT HERE ≫

Prior research suggests that the effects of private school competition may not be uniform across all student groups. For instance, Figlio, Hart, and Karbownik (2023) find that the largest gains from Florida's long-running voucher program accrued to students from lower-income families and those whose mothers had lower levels of education. Accordingly, examining heterogeneous effects by subgroups such as race, gender, and disability status is a critical step in understanding how voucher-induced competition may affect students differently and in identifying which groups stand to benefit—or not—from such policy shifts.

Table 3 presents the findings for math. Consistent with the main findings already presented, we observe consistently positive effects when relying on the slots measure in a 30-min radius. Both males and female students in traditional public schools benefit from increased competitive pressure, with slightly higher effects for males (0.0028 SD, compared to 0.0023 SD). Similarly, both students with and without disabilities experience benefits in math, although the effect is larger for students who have never been designated as having special educational needs (0.0027 SD, compared to 0.0019 SD). The largest effect we observe is for Black students who remain in traditional public schools (0.0033 SD). To help scale this effect, we can think about a 10 percent increase in the availability of grade-relevant private school seats within 30 minutes' driving distance from their public school predicting an increase in math achievement of 0.033 SD for Black students. However, after applying a Bonferroni correction to account for the

increased risk of Type I errors due to multiple hypothesis testing, we find no statistically significant impact on the math achievement of non-choosing students in any of these subgroups.

≪ TABLE THREE ABOUT HERE ≫

Table 4 presents the findings for reading. Consistent with previous results, we observe statistically significant findings using the slots measure. Males experience a 0.0014 SD increase in reading achievement and students who have never been diagnosed with a disability experience a 0.0015 SD increase in reading achievement for every one percent increase in a grade-relevant private school within 30 minutes' driving distance. We also observe some significant findings for Hispanic students using the density and diversity measures within a 15-mile radius and a single small, negative coefficient using the proximity measure for males. Once again, applying a Bonferroni correction to account for the increased risk of Type I errors due to multiple hypothesis testing reveals no statistically significant impact on the reading achievement of non-choosing students in any of these subgroups.

We conclude that traditional public school students have, on average, experienced no academic benefit or harm as a result of increased competitive pressure associated with the OS program.

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Conclusion

The rapid expansion of private school choice programs across the United States has generated growing interest in understanding their broader effects, particularly on students who remain in traditional public schools. In this study, we examine the impact of private school competition on public school student achievement during the first five years of North Carolina's

Opportunity Scholarship (OS) program—a statewide, means-tested private school choice initiative.

Using rich administrative data and multiple measures of pre-program competitive pressure, we estimate whether increased exposure to private school options influences the academic performance of non-choosing students. Our results provide little evidence of either academic harm or benefit for these students. While we find small, positive effects in some specifications—particularly when using the availability of grade-relevant private school seats within a 30-minute radius ("slots")—these effects are not robust across alternative competition measures or after adjusting for multiple hypothesis testing.

Taken together, our findings indicate that the early years of the OS program did not produce detectable changes—positive or negative—in the academic performance of students who remained in North Carolina's traditional public schools. While isolated effects emerge in certain specifications, these are not consistent across measures or robust to corrections for multiple comparisons. These results suggest that, at least in the short term, the introduction of private school vouchers had limited academic spillover effects for non-participating students.

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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. https://doi.org/10.1257/app.20160634

Bowen, D. H., & Trivitt, J. R. (2014). Stigma without sanctions: The (lack of) impact of private school vouchers on student achievement. *Education Policy Analysis Archives*, *22*(87), 1–22.

Böhlmark, A., Holmlund, H. & Lindahl, M. (2016). Parental choice, neighbourhood segregation or cream skimming? An analysis of school segregation after a generalized choice reform. *Journal of Population Economics,* 29(4): 1155-1190.

Carnoy, M., Adamson, F., Chudgar, A., Luschei, T. F., & Witte, J. F. (2007). *Vouchers and public school performance: A case study of the Milwaukee Parental Choice Program*. Washington, D.C.: Economic Policy Institute. Retrieved from http://www.epi.org/publication/book_vouchers.

Chakrabarti, R. (2008). Can increasing private school participation and monetary loss in a voucher program affect public school performance? Evidence from Milwaukee. *Journal of Public Economics, 92*(5-6), 1371–1393. https://doi.org/10.1016/j.jpubeco.2007.06.009

Chakrabarti, R. (2013). Impact of voucher design on public school performance: Evidence from Florida and Milwaukee voucher programs. *The B.E. Journal of Economic Analysis & Policy, 13*(1), 349–394. https://doi.org/10.1515/bejeap-2012-0037

Chubb, J. E., & Moe, T. M. (1990). *Politics, markets, and America's schools*. Washington, DC: Brookings Institution.

EdChoice (2025). *The ABCs of School Choice.* Indianapolis, IN: EdChoice.

Egalite, A. J. & Catt, A.D. (2023). Effects of the Indiana Choice Scholarship Program on public school students' achievement and graduation rates. *Working Paper.* Most recent version available here https://www.edchoice.org/wp-content/uploads/2020/08/EdChoice-Working-Paper-2020-3-Competitive-Effects-of-the-Indiana-Choice-Scholarship-Program.pdf

Egalite, A. J. (2013). Measuring competitive effects from school voucher programs: A systematic review. *Journal of School Choice*, 7(1): 443-464.

Egalite, A. J., Gray, A., & Stallings, D. T. (2017). Parent perspectives: Applicants to North Carolina's Opportunity Scholarship Program share their experiences. *OS Evaluation Report No.* 2. Retrieved from https://ced.ncsu.edu/elphd/wp-content/uploads/sites/2/2017/07/Parent-Perspectives.pdf.

Epple, D., Romano, R. E., & Urquiola, M. (2017). School vouchers: A survey of the economics literature. *Journal of Economic Literature,* 55(2), 441-492.

Figlio, D. N. (2014). Evaluation of the Florida Tax Credit Scholarship Program participation, compliance and test scores in 2012-13. *Report to the Florida Department of Education.* Retrieved from https://www.floridaschoolchoice.org/pdf/FTC_Research_2012-13_report.pdf

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., & Rouse, C. E. (2006). Do accountability and voucher threats improve low-performing schools? *Journal of Public Economics, 92*(1-2), 239–255. https://doi.org/10.1016/j.jpubeco.2005.08.005.

Figlio, D., Hart, C. M. D., & Karbownik, K. (2023). Effects of maturing private school choice programs on public school students. Forthcoming in *American Economic Journal: Economic Policy.*

Friedman, M. (1955). *The role of government in education*, in Robert A. Solo (Ed.), Economics and the Public Interest, pp. 123-144 (New Brunswick, NJ: Rutgers University Press).

Greene, J. P. (2001). *An evaluation of the Florida A-Plus Accountability and School Choice Program* [Civic Report]. The Manhattan Institute for Policy Research. http://www.manhattan-institute.org/html/cr_aplus.htm

Greene, J. P., & Forster, G. (2002). *Rising to the challenge: The effect of school choice on public schools in Milwaukee and San Antonio*. Civic Bulletin No. 27. New York City: Manhattan Institute for Policy Research. Retrieved from http://files.eric.ed.gov/fulltext/ED474258.pdf

Greene, J. P., & Marsh, R., H. (2009). *The effect of Milwaukee's Parental Choice Program on student achievement in Milwaukee public schools*. SCDP Comprehensive Longitudinal Evaluation of the Milwaukee Parental Choice Program Report 11. Fayetteville, AR: School Choice Demonstration Project, University of Arkansas. Retrieved from http://www.uaedreform.org/the-effect-of-milwaukees-parental-choice-program-on-student-achievement-in-milwaukee-public-schools

Greene, J. P., & Winters, M., A. (2004). Competition passes the test. *Education Next*, *4*(3), 66–71.

Greene, J. P., & Winters, M., A. (2007). An evaluation of the effect of DC's voucher program on public school achievement and racial integration after one year. *Catholic Education: A*

Journal of Inquiry and Practice, 11(1), 83–101. Retrieved from http://digitalcommons.lmu.edu/ce/vol11/iss1/7

Grissom, J. A., Egalite, A. J., & Lindsay, C. A. (2021). How Principals Affect Students and Schools: A Systematic Synthesis of Two Decades of Research. New York City, NY: The Wallace Foundation. Retrieved from https://www.wallacefoundation.org/principalsynthesis.

Hsieh, C., & Urquiola, M. (2006). The effects of generalized school choice on achievement and stratification: Evidence from Chile's voucher program. *Journal of Public Economics*, 90(8-9): 1477- 1503.

Hoxby, C., M. (2003). School choice and school productivity. In Hoxby, Caroline, M. (Ed.), *The economics of school choice*. Chicago, IL: University of Chicago Press. Retrieved from http://www.nber.org/chapters/c10091.pdf

Jabbar, H., Fong, C., Germain, E., Li, D., Sanchez, J., Sun, W.-L., & Devall, M. (2019). The competitive effects of school choice on student achievement: A systematic review. *Educational Policy,* 1–35.

Lucas, A. M. & Mbiti, I. M. (2012). Access, sorting, and achievement: The short-run effects of free primary education in Kenya. *American Economic Journal: Applied Economics*, 4(4): 226-53.

Mader, N. S. (2010). School Choice, Competition, and Academic Quality: Essays on the Milwaukee Parental Choice Program. *Unpublished Dissertation, University of Wisconsin-Madison.*

Rouse, C., Hannaway, J., Goldhaber, D., & Figlio, D. (2013). Feeling the Florida Heat: How low performing schools respond to voucher and accountability pressure. *American Economic Journal: Economic Policy, 5*(2), 251–281. doi:10.1257/pol.5.2.251

Scholarship grants, North Carolina Statute (2015). § 115C-562.

Winters, M., A., & Greene, J. P. (2011). Public school response to special education vouchers: The impact of Florida's McKay Scholarship Program on disability diagnosis and student achievement in public schools. *Educational Evaluation and Policy Analysis*, *33*(2), 138–158.

Table 1.

Descriptive statistics of the student-level empirical sample and of school-level competition from North Carolina private schools at baseline

Panel A: Demographic Characteristics										
	All Students					Empirical Sample				
Female	0.49					0.49				
Race/Ethnicity										
Black	0.25					0.25				
Hispanic	0.17					0.17				
White	0.49					0.49				
Other	0.08					0.09				
Ever SWD	0.14					0.14				
Maximum Number of Observations	4,819,391					4,581,625				
Unique Observations	1,527,952					1,465,813				
Panel B: Competition Measures										
	Minutes					Miles				
	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
[1] Proximity	2,616	9.66	7.47	0.04	141.74	2,616	5.48	5.35	0.02	55.37
[2] Density										
# Schools within 10 mins (5 miles)	1,638	3.45	2.86	1.00	17.00	1,598	4.03	3.44	1.00	20.00
# Schools within 20 mins (10 miles)	2,402	10.62	10.43	1.00	59.00	2,193	8.63	8.72	1.00	48.00
# Schools within 30 mins (15 miles)	2,583	22.22	21.29	1.00	100.00	2,454	13.39	13.66	1.00	64.00
[3] Diversity										
Types of schools within 10 mins (5 miles)	2,635	1.41	1.57	0.00	8.00	2,635	1.51	1.74	0.00	8.00
Types of schools within 20 mins (10 miles)	2,635	3.69	2.57	0.00	11.00	2,635	3.03	2.50	0.00	10.00
Types of schools within 30 mins (15 miles)	2,635	5.41	2.81	0.00	12.00	2,635	4.14	2.74	0.00	11.00
[3] Slots										
Priv. sch. enrollment within 10 mins (5 miles)	2,635	180	350.93	0.00	3,734	2,635	214	419.79	0.00	3,749
Priv. sch. enrollment within 20 mins (10 miles)	2,635	870	1,379.65	0.00	13,631	2,635	678	1,169.98	0.00	10,845

Priv. sch. enrollment within 30 mins (15 miles)	2,635	1,947	2,759.29	0.00	22,499	2,635	1,179	1,870.65	0.00	15,829
[5] Places of Worship										
# POW within 10 mins (5 miles)	2,312	14	17.00	1.00	98	2,215	16	19.51	1.00	93
# POW within 20 mins (10 miles)	2,597	54	62.15	1.00	316	2,553	40	49.32	1.00	247
# POW within 30 mins (15 miles)	2,623	120	117.33	1.00	454	2,606	68	77.98	1.00	338

Notes: Minutes and miles are measures of drive-time. Competition measures are assessed at the state level and captured in 2013-14 so that they are measured before the OS program began. “Slots” refers to total private school enrollment within relevant grade-level competitors. SWD stands for students with disabilities. POW stands for Places of Worship, which includes churches, synagogues, and mosques.

Table 2.
Average Treatment Effect of Private School Competition on Public School Students' Academic Performance, Overall Findings

	Math	Reading
Panel A: Minutes		
[1] Proximity		
Drivetime to nearest school	-0.0002	-0.0004
	(0.0010)	(0.0006)
[2] Density		
# schools within 10 mins	0.0005	0.0005
	(0.0012)	(0.0006)
# schools within 20 mins	0.0010	0.0005
	(0.0011)	(0.0006)
# schools within 30 mins	0.0006	0.0007
	(0.0011)	(0.0006)
[3] Diversity		
Types of schools within 10 mins	0.0001	-0.0001
	(0.0015)	(0.0007)
Types of schools within 20 mins	0.0005	0.0003
	(0.0011)	(0.0006)
Types of schools within 30 mins	0.0012	0.0003
	(0.0011)	(0.0006)
[4] Slots		
Priv. sch. enrollment within 10 mins	0.0011	0.0003
	(0.0011)	(0.0006)
Priv. sch. enrollment within 20 mins	0.0015	0.0001
	(0.0011)	(0.0006)
Priv. sch. enrollment within 30 mins	0.0026**	0.0013**
	(0.0011)	(0.0006)
[5] Places of Worship		
# places of worship within 10 mins	0.0005	0.0007
	(0.0011)	(0.0006)
# places of worship within 20 mins	0.0006	0.0009
	(0.0011)	(0.0006)
# places of worship within 30 mins	0.0009	0.0011*
	(0.0011)	(0.0006)
[6] Competitive Pressure Index		
Composite measure	0.0099	0.0011
	(0.0086)	(0.0047)
Panel B: Miles		
[1] Proximity		
Drivetime to nearest school	-0.0002	-0.0004
	(0.0010)	(0.0006)
[2] Density		

# schools within 5 miles	-0.0001	0.0003
	(0.0012)	(0.0006)
# schools within 10 miles	0.0000	0.0005
	(0.0011)	(0.0006)
# schools within 15 miles	0.0022**	0.0009
	(0.0010)	(0.0006)
[3] Diversity		
Types of schools within 5 miles	-0.0007	-0.0007
	(0.0012)	(0.0006)
Types of schools within 10 miles	-0.0013	-0.0004
	(0.0011)	(0.0006)
Types of schools within 15 miles	0.0016	0.0009
	(0.0011)	(0.0006)
[4] Slots		
Priv. sch. enrollment within 5 miles	0.0004	0.0000
	(0.0011)	(0.0006)
Priv. sch. enrollment within 10 miles	0.0018*	0.0006
	(0.0011)	(0.0006)
Priv. sch. enrollment within 15 miles	0.0020*	0.0007
	(0.0011)	(0.0006)
[5] Places of Worship		
# places of worship within 5 miles	-0.0020*	0.0003
	(0.0011)	(0.0006)
# places of worship within 10 miles	-0.0003	-0.0001
	(0.0010)	(0.0006)
# places of worship within 15 miles	0.0003	0.0006
	(0.0011)	(0.0006)
[6] Competitive Pressure Index		
Composite measure	0.0019	0.0003
	(0.0023)	(0.0023)
Mean of Y	0.01	0.00
SD of Y	1.00	1.00
Observations	4,513,192	4,556,603

Notes: All models include student-by-school-level fixed effects, grade-by-year fixed effects, and account for clustering at the school level. The variable of interest is program expansion (measured as the log of program participants) interacted with an indicator for being above the median value on one of five competition metrics (proximity, density, diversity, slots, or places of worship) in a given locale (city, suburb, town, rural). *** p<.01, ** p<.05, * p<.10

Table 3.

Average Treatment Effect of Private School Competition on Public School Students' Academic Performance, Subgroup Effects, Math

Competition Measure 1:		Competition Measure 2: Density			Competition Measure 3: Diversity			Competition Measure 4: Slots			Competition Measure 5: POW		
	Proximity	10 mins	20 mins	30 mins	10 mins	20 mins	30 mins	10 mins	20 mins	30 mins	10 mins	20 mins	30 mins
Panel A: Minutes													
Females	-0.0001	0.0008	0.0011	0.0004	0.0004	0.0005	0.0012	0.0012	0.0017	0.0023**	0.0006	0.0005	0.0005
	(0.0010)	(0.0013)	(0.0012)	(0.0011)	(0.0015)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0011)	(0.0011)	(0.0012)
Males	-0.0004	0.0002	0.0009	0.0007	-0.0002	0.0006	0.0011	0.0009	0.0014	0.0028**	0.0004	0.0006	0.0013
	(0.0010)	(0.0012)	(0.0011)	(0.0010)	(0.0014)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0010)	(0.0011)	(0.0011)
Black	-0.0009	0.0000	0.0016	0.0013	0.0003	0.0008	0.0016	0.0004	0.0021*	0.0033***	0.0015	0.0018	0.0012
	(0.0010)	(0.0012)	(0.0012)	(0.0012)	(0.0013)	(0.0012)	(0.0012)	(0.0011)	(0.0012)	(0.0012)	(0.0011)	(0.0012)	(0.0012)
Hispanic	-0.0006	0.0008	0.0008	0.0002	0.0001	0.0007	-0.0004	0.0013	0.0005	0.0009	0.0005	0.0002	0.0007
	(0.0013)	(0.0016)	(0.0015)	(0.0014)	(0.0020)	(0.0016)	(0.0015)	(0.0015)	(0.0014)	(0.0015)	(0.0015)	(0.0015)	(0.0016)
White	0.0005	0.0016	0.0008	0.0001	0.0009	0.0003	0.0013	0.0018	0.0016	0.0025*	0.0000	0.0000	0.0007
	(0.0012)	(0.0016)	(0.0013)	(0.0013)	(0.0019)	(0.0014)	(0.0013)	(0.0014)	(0.0014)	(0.0014)	(0.0013)	(0.0013)	(0.0014)
Ever SWD	-0.0004	0.0008	0.0014	0.0004	0.0013	0.0007	0.0005	0.0017*	0.0008	0.0019**	0.0009	0.0011	0.0007
	(0.0008)	(0.0009)	(0.0009)	(0.0008)	(0.0011)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0008)	(0.0009)	(0.0009)
Never SWD	-0.0002	0.0004	0.0010	0.0006	-0.0002	0.0005	0.0013	0.0009	0.0017	0.0027**	0.0004	0.0004	0.0010
	(0.0010)	(0.0013)	(0.0012)	(0.0011)	(0.0015)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0011)	(0.0011)	(0.0012)
Panel B: Miles													
		5 miles	10 miles	15 miles	5 miles	10 miles	15 miles	5 miles	10 miles	15 miles	5 miles	10 miles	15 miles
Females	-0.0007	0.0001	-0.0001	0.0020*	-0.0003	-0.0014	0.0016	0.0005	0.0020*	0.0019	-0.0020*	-0.0005	0.0001
	(0.0011)	(0.0013)	(0.0011)	(0.0011)	(0.0013)	(0.0012)	(0.0011)	(0.0012)	(0.0011)	(0.0012)	(0.0011)	(0.0011)	(0.0011)
Males	-0.0011	-0.0003	0.0001	0.0024**	-0.0010	-0.0012	0.0016	0.0002	0.0016	0.0020*	-0.0020*	-0.0002	0.0005
	(0.0010)	(0.0012)	(0.0011)	(0.0010)	(0.0012)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0010)	(0.0010)	(0.0011)
Black	-0.0009	-0.0010	0.0003	0.0018	-0.0015	-0.0008	0.0022**	-0.0004	0.0026**	0.0017	-0.0009	-0.0003	0.0012
	(0.0011)	(0.0012)	(0.0011)	(0.0012)	(0.0012)	(0.0012)	(0.0011)	(0.0011)	(0.0011)	(0.0013)	(0.0011)	(0.0012)	(0.0012)
Hispanic	-0.0001	0.0005	0.0010	0.0025*	-0.0004	-0.0006	0.0021	0.0009	0.0018	0.0008	-0.0025*	-0.0008	0.0000
	(0.0013)	(0.0017)	(0.0015)	(0.0015)	(0.0018)	(0.0015)	(0.0015)	(0.0015)	(0.0014)	(0.0015)	(0.0014)	(0.0014)	(0.0016)
White	-0.0009	0.0010	-0.0001	0.0022*	0.0006	-0.0014	0.0010	0.0010	0.0011	0.0024*	-0.0024*	0.0000	-0.0001
	(0.0013)	(0.0015)	(0.0013)	(0.0013)	(0.0016)	(0.0013)	(0.0014)	(0.0014)	(0.0013)	(0.0014)	(0.0013)	(0.0013)	(0.0013)
Ever SWD	-0.0010	0.0008	-0.0002	0.0018**	-0.0002	-0.0010	0.0012	0.0010	0.0005	0.0011	-0.0006	0.0003	0.0003
	(0.0008)	(0.0009)	(0.0008)	(0.0009)	(0.0010)	(0.0008)	(0.0009)	(0.0009)	(0.0008)	(0.0009)	(0.0008)	(0.0009)	(0.0009)

Never SWD	-0.0010	-0.0003	0.0000	0.0023**	-0.0008	-0.0014	0.0017	0.0002	0.0020*	0.0022*	-0.0022**	-0.0004	0.0004
	(0.0011)	(0.0013)	(0.0011)	(0.0011)	(0.0013)	(0.0012)	(0.0012)	(0.0012)	(0.0011)	(0.0012)	(0.0011)	(0.0011)	(0.0012)
	(0.0016)	(0.0018)	(0.0017)	(0.0017)	(0.0018)	(0.0016)	(0.0017)	(0.0016)	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0017)

Notes: All models include student-by-school-level fixed effects, grade-by-year fixed effects, and account for clustering at the school level. The variable of interest is program expansion (measured as the log of program participants) interacted with an indicator for being above the median value on one of five competition metrics (proximity, density, diversity, slots, or places of worship) in a given locale (city, suburb, town, rural). *** p<.01, ** p<.05, * p<.10

Table 4.

Average Treatment Effect of Private School Competition on Public School Students' Academic Performance, Subgroup Effects, Reading

Competition Measure 1:		Competition Measure 2: Density			Competition Measure 3: Diversity			Competition Measure 4: Slots			Competition Measure 5: POW		
	Proximity	10 mins	20 mins	30 mins	10 mins	20 mins	30 mins	10 mins	20 mins	30 mins	10 mins	20 mins	30 mins
Panel A: Minutes													
Females	0.0002	0.0009	0.0006	0.0005	0.0005	0.0005	0.0002	0.0007	0.0002	0.0011*	0.0008	0.0010*	0.0008
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Males	-0.0011*	0.0001	0.0003	0.0010	-0.0006	0.0000	0.0003	0.0000	0.0000	0.0014**	0.0006	0.0008	0.0013*
	(0.0006)	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0007)
Black	-0.0011	-0.0002	0.0005	0.0005	0.0001	0.0000	0.0003	0.0000	0.0001	0.0014*	0.0013*	0.0010	0.0004
	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0007)	(0.0008)	(0.0007)	(0.0008)	(0.0008)	(0.0007)	(0.0007)	(0.0008)
Hispanic	-0.0011	0.0007	0.0011	0.0016*	0.0003	0.0005	0.0004	0.0008	-0.0004	0.0013	0.0007	0.0013	0.0017*
	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0011)	(0.0009)	(0.0009)	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0010)
White	-0.0002	0.0009	-0.0002	-0.0001	0.0000	0.0000	-0.0001	0.0006	0.0001	0.0005	0.0000	-0.0002	0.0004
	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0007)	(0.0007)
Ever SWD	-0.0008	0.0005	-0.0002	-0.0001	0.0004	0.0002	-0.0002	0.0009	-0.0005	0.0010	0.0003	0.0002	0.0001
	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0008)
Never SWD	-0.0004	0.0005	0.0006	0.0010	-0.0003	0.0004	0.0004	0.0002	0.0003	0.0015**	0.0007	0.0011*	0.0013**
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
High- Usage	-0.0003	-0.0003	-0.0001	0.0001	-0.0010	-0.0008	0.0004	-0.0005	0.0005	0.0009	0.0002	0.0001	0.0002
County	(0.0009)	(0.0010)	(0.0010)	(0.0010)	(0.0011)	(0.0010)	(0.0010)	(0.0010)	(0.0011)	(0.0011)	(0.0010)	(0.0010)	(0.0010)
Panel B: Miles													
		5 miles	10 miles	15 miles	5 miles	10 miles	15 miles	5 miles	10 miles	15 miles	5 miles	10 miles	15 miles
Females	0.0000	0.0008	0.0010*	0.0009	-0.0001	0.0002	0.0011*	0.0002	0.0007	0.0008	0.0002	0.0001	0.0005
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Males	-0.0012**	-0.0002	0.0001	0.0009	-0.0013*	-0.0009	0.0008	-0.0003	0.0004	0.0006	0.0002	-0.0003	0.0006
	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0006)	(0.0007)
Black	-0.0013*	-0.0006	-0.0003	0.0004	-0.0010	-0.0012	0.0008	-0.0003	0.0005	0.0004	0.0005	-0.0005	0.0005
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0008)
Hispanic	-0.0010	0.0008	0.0017*	0.0020**	-0.0005	0.0005	0.0020**	0.0007	0.0007	0.0003	0.0003	-0.0002	0.0010
	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0010)	(0.0009)	(0.0009)	(0.0008)	(0.0008)	(0.0009)	(0.0008)	(0.0009)	(0.0010)
White	-0.0002	0.0009	0.0008	0.0006	-0.0002	0.0000	0.0005	0.0003	0.0007	0.0005	-0.0005	-0.0002	-0.0003
	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0007)
Ever SWD	-0.0010	0.0006	0.0000	-0.0001	-0.0005	-0.0003	0.0006	0.0005	-0.0002	-0.0003	0.0001	-0.0006	-0.0008
	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0008)	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0008)

Never SWD	-0.0006	0.0002	0.0006	0.0011*	-0.0008	-0.0004	0.0011*	-0.0002	0.0008	0.0010	0.0003	0.0000	0.0009
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)

Notes: All models include student-by-school-level fixed effects, grade-by-year fixed effects, and account for clustering at the school level. The variable of interest is program expansion (measured as the log of program participants) interacted with an indicator for being above the median value on one of five competition metrics (proximity, density, diversity, slots, or places of worship) in a given locale (city, suburb, town, rural). SWD refers to Students with Disabilities. A "high-usage county" refers to students in traditional public schools located in areas with above-median county-level OS recipients. *** p<.01, ** p<.05, * p<.10.

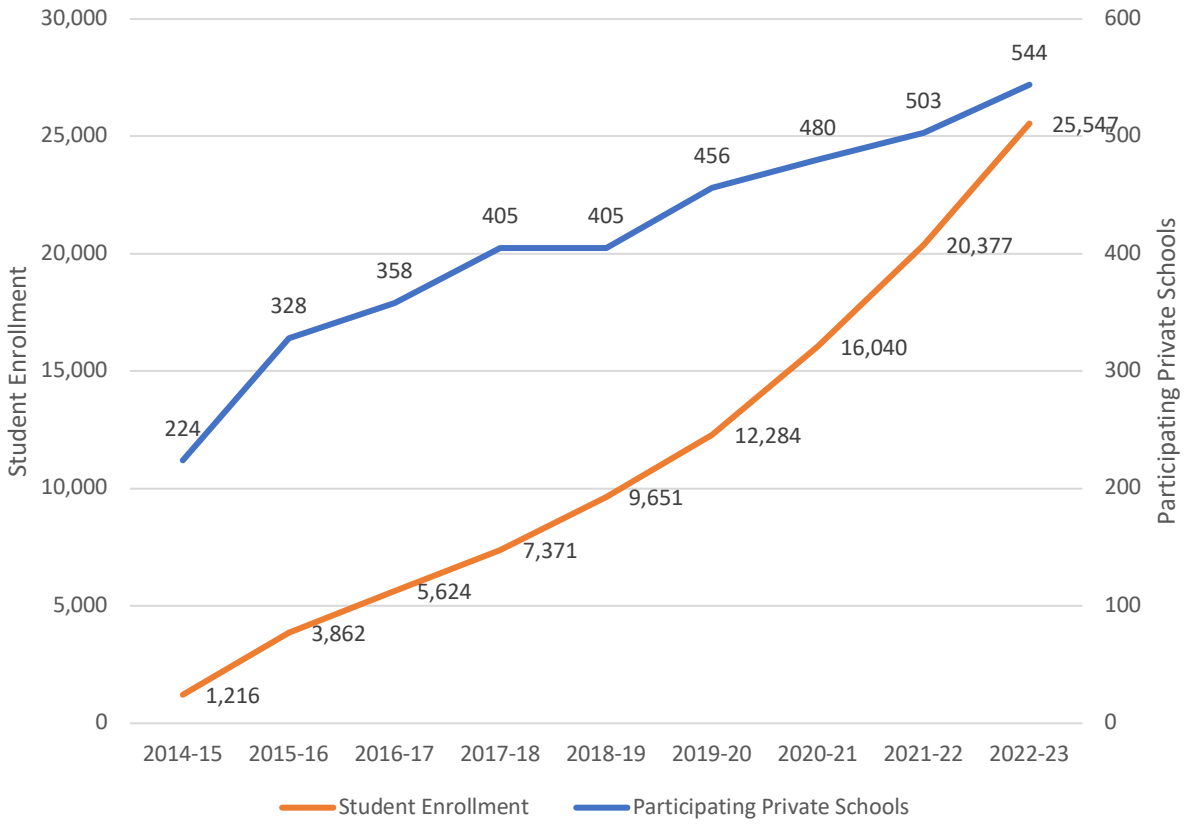

Figure 1.

Changes in student enrollment and private school participation in North Carolina's Opportunity Scholarship Program, 2014-15 to 2022-23. Source: The North Carolina State Education Assistance Authority

APPENDIX A

Drive Time Methodology

This appendix describes the technical details describing how the drive-time measure was calculated. Drive-time is the metric on which all measures of the strength of the competitive environment are built.

Calculating Distance from Public to Private Schools

We used a proprietary software called 'Maptitude' to calculate the distance in minutes and the travel time in miles from public schools (origins) to private schools (destinations) of interest. To do so, we generated a latitude and longitude for each public and private school. Using the Distance and Time Travel Tables tool in Maptitude, we then generated a table containing the fastest route (in miles and minutes) from each public school to every private school, statewide. To reduce errors, we utilized a decision rule of skipping any potential routes longer than 600 minutes. Because the lists of schools change each year, with some schools closing and new schools open, we repeated this process for each school year beginning in 2013-14 and ending 2017-18. Table A1shows the count of origins and destinations used in each year.

Table A1.
Counts of Public and Private Schools Used for Maptitude Calculations, by Year

Year	Origins	Destinations
2013-14	2,635	715
2014-15	2,631	718
2015-16	2,654	745
2016-17	2,694	753
2017-18	2,690	750

Notes: The terms "origins" and "destinations" are designations within the 'Maptitude' software. In this case, origins are public schools and destinations are private schools.

Determining Private School Grade-Span

Our analyses also required data on the specific grade levels served, by school. We downloaded the public school grade-span data from the Elementary and Secondary Information System (ELSi) maintained by the National Center for Education Statistics, an agency within the U.S. Department of Education. Unfortunately, the grade-span information for each year was not always complete. In these instances, we cross-referenced earlier or later years of ELSi listings to generate longitudinal entries on school-specific grade ranges.

To access data on private school grade-span, the most complete listings of private school data are maintained by the North Carolina Division of Non-Public Education (NC DNPE). For the years in question, the NC DNPE had reliable data for 2013-14, 2014-15, 2015-16, and 2016-17. Unfortunately, no private school data were available from NC DNPE for the 2017-18 school year. To address this missing data issue, we first copied the 2016-17 data into the 2017-18 listings. To verify records and fill in any gaps, we then cross-referenced entries with ELSi, which maintains private school records for every other school year (for the years in question, 2013-14, 2015-16, and 2017-18). We defaulted to the grade spans listed in the NC DNPE records if there was a conflict, but in cases where no data were available in the NC DNPE records, we used the ELSi data to fill in the gaps. In the end, we were able to provide grade span information for 94% or more of the private schools across all years (Table A2).

Table A2.
Private Schools Missing Grade-Span Data, by Year

Year	Private Schools Still Missing Grade-Span Data After Imputation	All Private Schools
2013-14	31	715
2014-15	9	718
2015-16	19	745
2016-17	36	753
2017-18	49	750

Notes: The data provided in columns 2 and 3 refers to private school counts. Data were initially accessed from NC DNPE; Missing entries were imputed with data from ELSi.

Determining Private School Religious Affiliation

The NC DNPE documents whether a private school is religious or independent, but the ELSi provides a more detailed description of private schools' specific religious affiliation. Therefore, we utilize the ELSi variable that identifies the school as "Catholic," "Other religious," or "Nonsectarian," and a second ELSi variable that further categorizes the school into one of the following categories: African Methodist Episcopal, Amish, Assembly of God, Assembly of God (Pentecostal), Baptist, Christian (no specific denomination), Church of Christ, Church of God, Church of God in Christ, Episcopal, Friends, Islamic, Jewish, Lutheran Church – Missouri Synod, Mennonite, Methodist, Nonsectarian, Orthodox, Other, Other Lutheran, Pentecostal, Presbyterian, Roman Catholic, and Seventh-Day Adventist. Because private school data hosted in ELSi comes from a biennial survey, not an annual survey, religious affiliation data were available for 2013-14, 2015-16, and 2017-18.

To compile a complete dataset that included all private schools and their religious affiliation across all years in question, we created a master dataset that listed private schools and their religious affiliation for 2013-14, 2015-16, and 2017-18. We then cross-checked this list across all years to ensure consistency in the designated religious affiliation over time. A number of private schools that closed early or opened late in our time span had only one year of religious affiliation data. Using Google searches, we vetted 10 percent of these schools. The records appeared correct in all cases.

Regarding private schools for which we had multiple years of data on their religious affiliation, the majority of cases were consistent over time. In a small number of cases, however, a private school had data from two or three time points but lacked agreement in the documented religious affiliation over time. For example, some schools were listed as nonsectarian in one year

and then religiously affiliated the next year. Each of these cases was checked manually through Google searches to confirm the correct religious affiliation.

This process provided religious affiliation data for 743 of the 886 total private schools across the five school years of interest. We then manually searched for the religious affiliations of the remaining schools by google-searching the school name and geographic location. If a phone number could be ascertained through the Google search, we called the school directly. Using these steps, we identified the religious affiliation of 75 schools. We could not determine the religious affiliation of the remaining 68 private schools.

Places of Worship

Our data on places of worship in North Carolina come from the Internal Revenue Services' charities and non-profits data set, filtered for North Carolina (Internal Revenue Service, n.d.). We then filtered on religious affiliation by relying on an entry's National Taxonomy of Exempt Entities activity code (Urban Institute, 2019). This resulted in 5,635 entries. We recognized this list was unlikely to be inclusive of all places of worship in North Carolina because not all religious institutions are required to file with the IRS, so we instituted several follow-up steps to augment the database.

First, we noticed that none of the Catholic churches were part of the IRS dataset. This is because North Carolina's Catholic churches are managed by two dioceses, the Charlotte Diocese and the Diocese of Raleigh. Thus, to ensure that Catholic churches were listed individually in the Places of Worship dataset, we added entries for every Catholic church and mission in North Carolina, retrieved from the respective diocesan websites.

Second, we integrated a places of worship dataset that was generated specifically for the city of Charlotte, North Carolina (Charlotte Open Data Portal, n.d.). This dataset contained 596

records, none of which were already included in the IRS dataset. We added these new records to the master dataset and concluded that the IRS dataset provided a good foundation but was incomplete.

To create a more complete dataset, we focused on the 12 largest cities in North Carolina, searching for open-source data similar to the Charlotte dataset. Limiting ourselves to the top twelve cities created a manageable list that included at least one city from each of North Carolina's three regions. The cities we searched were Charlotte, Raleigh, Greensboro, Durham, Winston-Salem, Fayetteville, Cary, Wilmington, High Point, Concord, Greenville, and Asheville. We first searched to see if the city had an Open Data portal, like Charlotte. For those that did, we searched this portal for "religious institutions" and "places of worship." If they did not, we used these keywords in a general search with the city name. Most cities did not have a list like that of the City of Charlotte.

We also wanted to ensure that our list from the IRS was focused on places of worship and not non-profit organizations and other institutions. To screen for this possibility, we went through the list manually, and marked records with the word "church," "synagogue," and "mosque," as places of worship. We then manually checked another 1,400 records from the 12 largest cities listed above using Google to confirm they were places of worship. Our main confirmation criteria were if the place of worship had a physical meeting space and if it offered services. In cases where records did not have an online footprint, we did not count the place of worship in the list. Of the 3,460 records we vetted using these two methods, 2,301 (67%) were confirmed as places of worship, meaning that we are able to use 41% of the original dataset (5,635 records) with confidence.

As a final step, we took the confirmed list from the IRS dataset, and merged in the datasets we found in our search. Our final list consists of 2,585 places of worship from the following sources:

1. IRS vetted records (2,301)
2. Listings from the Catholic Diocese (94)
3. Data from Greensboro's places of worship database (92)
4. Listings from mosquesmasjids.com (54)
5. Data from two Asheville websites listing places of worship (44)

Calculating Distances from Public Schools to Places of Worship

As before, we used Maptitude software to calculate the distance in minutes and the travel time in miles from public schools (origins) to places of worship (destinations). To do so, we generated a latitude and longitude for each public and private school. Using the Distance and Time Travel Tables tool in Maptitude, we then generated a table containing the fastest route (in miles and minutes) from each public school to every place of worship statewide, skipping routes longer than 600 minutes. In cases where the address attached to the place of worship was a post office box or a general location, we mapped to the closest address and zip code or the nearest city and zip code combination.

Because the lists of schools change each year as schools close and new schools open, we repeated this process for each school year beginning in 2013-14 and ending 2017-18. The list of places of worship does not vary over time because we did not have information about when places of worship opened and closed. Table A3 shows the count of origins and destinations examined each year.

Table A3.

Counts of Public Schools and Places of Worship Used for Maptitude Calculations, by Year

Year	Origins	Destinations
2013-14	2,635	2,585
2014-15	2,631	2,585
2015-16	2,654	2,585
2016-17	2,694	2,585
2017-18	2,690	2,585

Notes: The terms “origins” and “destinations” are designations within the ‘Maptitude’ software. In this case, origins are public schools and destinations are places of worship.

APPENDIX B

Test for Parallel Trends

Appendix B presents evidence that the assumptions for the difference-in-difference methodology employed in the analysis hold. We use two years of data representing pre-implementation of the voucher policy to test for anticipatory effects of the program and compare this to effects observed in the first post-policy year (2015). Consistently statistically significant “impacts” in 2013 and 2014 would raise concerns that the assumption of parallel trends between the two groups under comparison does not hold. We do not find evidence to this effect, lending confidence to the empirical approach pursued in the main text.

Table B1.

Tests of parallel trends in math and reading, minutes and miles, showing two lead years (2013, 2014) and the first post-policy year (2015)

	Math			Reading		
	2013	**2014**	**2015 (Post-Policy)**	**2013**	**2014**	**2015 (Post-Policy)**
Panel A: Minutes						
[1] Proximity	0.0047	0.0038	0.0075***	0.0037	0.0046	-0.0020
	(0.0029)	(0.0028)	(0.0023)	(0.0030)	(0.0029)	(0.0023)
[2] Density						
# schools within 10 mins	-0.0096	-0.0042	0.0168*	-0.0033	-0.0018	0.0107**
	(0.0122)	(0.0093)	(0.0095)	(0.0068)	(0.0059)	(0.0052)
# schools within 20 mins	-0.0050	0.0062	0.0133	0.0015	0.0078	-0.0013
	(0.0105)	(0.0083)	(0.0095)	(0.0063)	(0.0053)	(0.0053)
# schools within 30 mins	0.0030	0.0041	0.0039	0.0021	0.0044	-0.0009
	(0.0103)	(0.0083)	(0.0101)	(0.0063)	(0.0054)	(0.0060)
[3] Diversity						
Types of schools within 10 mins	0.0019	0.0079	0.0281**	0.0003	0.0090	0.0085
	(0.0144)	(0.0108)	(0.0116)	(0.0077)	(0.0067)	(0.0063)
Types of schools within 20 mins	-0.0050	0.0063	0.0092	0.0012	0.0085	-0.0057
	(0.0108)	(0.0085)	(0.0101)	(0.0065)	(0.0055)	(0.0053)
Types of schools within 30 mins	-0.0119	-0.0075	-0.0021	0.0006	0.0070	-0.0089
	(0.0106)	(0.0084)	(0.0097)	(0.0065)	(0.0055)	(0.0059)
[4] Slots						
Priv. sch. enrollment within 10 mins	-0.0073	0.0009	0.0220**	0.0025	0.0060	0.0109**
	(0.0110)	(0.0086)	(0.0089)	(0.0067)	(0.0058)	(0.0050)
Priv. sch. enrollment within 20 mins	-0.0133	0.0022	0.0074	0.0019	0.0098*	-0.0093*
	(0.0101)	(0.0081)	(0.0101)	(0.0063)	(0.0054)	(0.0055)
Priv. sch. enrollment within 30 mins	-0.0153	-0.0054	0.0133	-0.0078	0.0025	0.0003
	(0.0103)	(0.0083)	(0.0101)	(0.0063)	(0.0054)	(0.0059)
[5] Places of Worship						
# places of worship within 10 mins	-0.0013	0.0090	0.0239***	-0.0068	0.0008	0.0075
	(0.0104)	(0.0083)	(0.0086)	(0.0061)	(0.0053)	(0.0049)
# places of worship within 20 mins	0.0003	0.0069	0.0180*	0.0017	0.0037	0.0008

	(0.0102)	(0.0081)	(0.0092)	(0.0063)	(0.0053)	(0.0051)
# places of worship within 30 mins	0.0035	0.0037	0.0097	-0.0009	0.0027	-0.0045
	(0.0103)	(0.0081)	(0.0102)	(0.0063)	(0.0054)	(0.0057)
Panel B: Miles						
[1] Proximity	0.0089	0.0084	0.0018	0.0029	0.0029	-0.0012
	(0.0101)	(0.0080)	(0.0087)	(0.0062)	(0.0053)	(0.0049)
[2] Density						
# schools within 5 miles	0.0036	0.0057	0.0231**	0.0066	0.0034	0.0118**
	(0.0123)	(0.0095)	(0.0096)	(0.0071)	(0.0059)	(0.0053)
# schools within 10 miles	-0.0003	0.0096	0.0086	0.0019	0.0067	0.0063
	(0.0106)	(0.0083)	(0.0095)	(0.0063)	(0.0053)	(0.0055)
# schools within 15 miles	-0.0086	0.0015	0.0154	-0.0001	0.0074	0.0043
	(0.0106)	(0.0083)	(0.0095)	(0.0064)	(0.0054)	(0.0056)
[3] Diversity						
Types of schools within 5 miles	0.0060	0.0103	0.0218**	0.0076	0.0085	0.0092
	(0.0129)	(0.0098)	(0.0103)	(0.0073)	(0.0062)	(0.0056)
Types of schools within 10 miles	0.0053	0.0102	-0.0037	0.0037	0.0075	-0.0007
	(0.0105)	(0.0082)	(0.0096)	(0.0063)	(0.0054)	(0.0050)
Types of schools within 15 miles	-0.0104	-0.0030	0.0075	-0.0036	0.0088	0.0008
	(0.0109)	(0.0086)	(0.0097)	(0.0065)	(0.0056)	(0.0055)
[4] Slots						
Priv. sch. enrollment within 5 miles	-0.0057	-0.0001	0.0182**	0.0046	0.0058	0.0111**
	(0.0113)	(0.0088)	(0.0088)	(0.0069)	(0.0057)	(0.0050)
Priv. sch. enrollment within 10 miles	-0.0110	0.0065	0.0196**	-0.0004	0.0100*	0.0063
	(0.0103)	(0.0082)	(0.0094)	(0.0063)	(0.0053)	(0.0051)
Priv. sch. enrollment within 15 miles	-0.0146	-0.0005	0.0114	-0.0012	0.0079	-0.0042
	(0.0104)	(0.0083)	(0.0098)	(0.0064)	(0.0054)	(0.0057)
[5] Places of Worship						
# places of worship within 5 miles	0.0104	0.0150*	0.0010	-0.0015	-0.0002	0.0007
	(0.0105)	(0.0083)	(0.0085)	(0.0062)	(0.0053)	(0.0048)
# places of worship within 10 miles	0.0038	0.0064	0.0172**	0.0030	0.0042	-0.0029
	(0.0102)	(0.0082)	(0.0087)	(0.0062)	(0.0053)	(0.0051)
# places of worship within 15 miles	0.0019	0.0038	0.0069	0.0012	0.0041	-0.0015
	(0.0102)	(0.0081)	(0.0098)	(0.0063)	(0.0053)	(0.0057)

Notes: All models include student-by-school-level fixed effects, grade-by-year fixed effects, and account for clustering at the school level. *** p<.01, ** p<.05, * p<.10

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