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Participation and Student Outcomes

By Deven Carlson and Stéphane Lavertu

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FOREWORD

By Aaron Churchill and Chad L. Aldis

In April, Secretary of Education Betsy DeVos toured the Van Wert school district in rural northwestern Ohio along with American Federation of Teachers President Randi Weingarten. In such sparsely populated communities, private and charter schools are usually scarce. But does that mean school choice does not exist? Absolutely not: In a *Cleveland Plain Dealer* op-ed published just before her visit, Secretary DeVos noted that "parents or guardians of nearly 20 percent of students who live within Van Wert's district lines choose to send their children to a nearby district."

She was of course referring to interdistrict open enrollment, a public school choice policy that allows students to attend school outside of their "home district" without having to pay tuition. While open enrollment often flies under the radar, it's among the oldest and most widespread forms of school choice in America. Minnesota passed the nation's first open enrollment law in 1988, and several other states, including Ohio, enacted similar laws shortly thereafter. Forty-four states now allow some form of open enrollment: Some states require their districts to participate in open enrollment (it's mandatory), while others leave that decision to local districts.[1]

Like any choice initiative, open enrollment offers families a wider range of alternatives than just their "zoned" public school. They may opt to open-enroll their child for any number of reasons, including access to more rigorous or specialized academic programs or to ensure their kids can attend school with close friends. Sometimes a school operated by a nearby district is actually closer than their assigned school. Open enrollment can also offer continuity to families who move their residence across district lines: They can open enroll into their "old" school district instead of having to switch to a new one.

Open enrollment also offers districts an opportunity to expand their reach across traditional boundary lines. Districts with excess capacity in their schools can generate additional revenue by welcoming open enrollees. Assuming the district attracts more open enrollees than it loses, the funding that accompanies the newcomers may help districts widen their academic offerings, ease local tax burdens, or simply deal with the fiscal consequences of enrollment loss.

Interdistrict open enrollment also draws its share of concerns. While the "receiving" districts garner additional revenue as well as pupils, the "sending" districts lose state money whenever a student exits. Meanwhile, some people fret about how accepting open enrollees might dilute the resources available to educate "in-district" students. (An uglier version of that concern is distaste for educating "other" children in "their" schools.) Another obvious issue is capacity. Schools with no empty seats cannot serve more students without making costly new investments—and some inbound children may have needs that a given school is ill-equipped to meet. Consequently, state open enrollment policies typically allow districts to deny admission in cases like these.

From where we sit, the central question about open enrollment is whether it does any good for the kids who avail themselves of it. To our knowledge, just two rigorous statewide analyses—one each from Michigan and Colorado—have studied the students who use open enrollment to attend public schools in other districts. Both studies found scant evidence that students see test score gains or losses when they open enroll. In Ohio, a small-scale study in Mahoning County (Youngstown and its surrounding areas) found no relationship between open enrollment and test results.

We sought to add to this meager literature by examining statewide data from Ohio (Fordham's home state). The Buckeye State has a voluntary open enrollment policy, so districts are able to decide whether to participate. Today, 80 percent of Ohio's 610 school districts allow open enrollees and more than 70,000

[1] Interdistrict open enrollment should not be confused with intradistrict open enrollment—choice within districts—which is not the topic of this report.

students use this choice option. To conduct this analysis, we turned to professors Deven Carlson of the University of Oklahoma and Stéphane Lavertu of The Ohio State University, both of whom led a previous Fordham study (on school closures in Ohio). They are exceptionally skilled in empirical methods, and with the assistance of the Ohio Department of Education and the Ohio Education Research Center, were able to examine anonymous student-level data over the six-year period of 2008-09 to 2013-14.

The authors used these data to explore several questions: Which districts welcome open enrollees—and which do not—and what are their characteristics? What types of students open enroll? Are they more likely to be from advantaged or disadvantaged backgrounds? What is the relationship between open enrollment and changes in test scores or the likelihood of high school graduation? Are there differences in outcomes by key subgroups of students or by regions of the state?

Their analysis yields four main findings:

1. **Few affluent suburban districts permit open enrollment**. As the map on page 12 shows, non-open-enrolling districts—"walled" districts, one might say—encircle Ohio's largest inner cities, known as the Big 8. These major urban districts—including Cincinnati, Cleveland, and Columbus—average 63 percent black and Hispanic students and have long struggled with low student achievement. In contrast, the non-participating districts on their borders enroll far fewer minority youngsters (18 percent) and post some of the highest test scores in the state. These "doughnut rings" around the Big 8 effectively bar tens of thousands of low-income, minority students from the opportunity to attend school in higher-achieving districts. It may be, of course, that some of those districts have no room for more pupils; but we cannot avoid suspecting that a form of exclusion is also at work.

2. **The study reveals two distinguishable groups: "Transitory" and "consistent" open enrollees.** About two thirds of open enrollees fall into the former category—they attended both their home district and open enrolled into another during the years they were observed in the study. The other third open enrolled every year under observation. The backgrounds of the two groups differ: Transitory open enrollees are more likely to be lower-achieving and students of color when compared to consistent participants. The analyses of academic outcomes focus on consistent open enrollees—students who likely receive sufficient "dosages" of the program—though the results for transitory participants are also analyzed and reported.

3. **Consistent open enrollment is associated with zero to modestly positive academic gains.** While the analysis cannot prove causality, the authors' rigorous statistical analyses showed zero to positive results for consistent open enrollees. The variation hinged in part on the analytic approach. Compared to similar pupils who never participate, open enrollees gain about two to four percentiles on state math and reading exams—a modest but not trivial outcome. Under a slightly different statistical approach, the gains are not statistically significant. An analysis of graduation rates also indicates that consistent open enrollment throughout high school boosts the likelihood of on-time graduation. The years of available data, however, limit this analysis to just one cohort of students. As for the transitory open enrollees, the analysis found no evidence that they either make gains or experience losses on state exams.

4. **Consistent open enrollment among African American students is related to substantial academic progress.** Although African American students were just 6 percent of the open enrollees in our Ohio data set, the evidence indicates that those who open enroll on a consistent basis made relatively large gains. Compared to their non-open-enrolling peers, participation is associated with test score gains of about ten percentiles—e.g., moving from the 50th to 60th percentile in math or reading. The positive findings for African American students correspond to analyses indicating that all consistent open enrollees who live in the Big 8—where many minority students reside—make gains relative to peers who remain in those districts.

* * *

We offer two takeaways.

First, when families use choice on a consistent basis, their children are more likely to benefit. That appears to be the case for Ohio's open enrollees—those who use it for consecutive years make test score gains, albeit modest, while their transitory peers do not reap the same achievement benefits. This finding mirrors charter school studies that have also found that students tend to accumulate gains when they attend the same school for multiple years.

Sticking with choice is not easy, however. It takes commitment on the part of families and students; receiving schools, of course, have a role to play in ensuring that every pupil feels welcomed and well-served year after year. Policy makers can also guide parents in making decisions that work for their kids. Through a transparent school accountability system—properly balanced between growth and proficiency measures—they can nudge families towards quality schools or steer them away from less satisfactory ones. Regional or community organizations can help families navigate among their choices by hosting school exploration fairs, promoting school visits, or publishing clear, impartial information about the schools in their vicinity. With expanding choice—especially when it crosses district boundaries—transportation policies may need to be retooled to break down logistical barriers. Briefly stated, families need the information that enables them to make wise choices and the wherewithal to make those choices viable in both the short and the long run.

Second, we note the disturbing map of Ohio's open enrollment program. Urban, minority students—those whom data indicate benefit the most from open enrollment—have the fewest open enrollment options. The reason: Most suburban districts that adjoin Ohio's big cities refuse to accept non-resident students. This is troubling in several respects, not least because it perpetuates an educational system where low-income and minority students are denied opportunities available to their more advantaged peers. It also calls into question how "public" are school districts that don't accept all-comers. These are akin to "public" swimming pools that are only open to families living inside a gated community. It's painful to speculate about how many residents of those privileged enclaves are outraged by President Trump's proposed border wall even as they turn a blind eye to the walls in their own backyard.

We acknowledge that some closed districts may not have the capacity to on-board many additional students. We also realize that some residents may not like the idea of educating kids whose families don't pay taxes in their towns, whether those prospective arrivals live in poor urban areas or wealthy districts next door. We understand, too, that for many families, it's simply impractical to make long, daily treks across district lines. Still and all, it's wrong to deny the *possibility* of educational service to any family, much less to turn away neighbors in need. At the very least, we ask today's walled districts to quit calling what they do "public education." Because they don't welcome everyone, they're functionally more like "private school districts" where the price of a home buys a seat for one's child in the local school. We also suggest that residents of such places ask themselves whether it's fair to criticize urban schools—district, charter, or private—when their own schools refuse to admit children living just a few miles away.

With the election of President Trump, many are wondering how to revitalize rural and small-town communities, schools included. For families living in places such as Van Wert, Ohio, interdistrict open enrollment has become an important school option for their kids. To their credit, the overwhelming majority of Ohio districts have opened their doors to students no matter where they live. It doesn't matter that altruism and public-mindedness is not necessarily what drives that openness. As one Ohio superintendent told the *Lima News*, "Our district has become smaller and smaller and it is no secret that open enrollment is our lifeblood." Meanwhile, for the refusenik districts—listed below—we urge board members and superintendents—and voters—to reconsider their decision to wall off their public schools. Indeed, in the spirit of President Reagan, we say please tear down those walls.

Districts Not Participating in Open Enrollment in the 2016-17 School Year

District Name	Metro Area	District Name	Metro Area	District Name	Metro Area
Copley-Fairlawn	Akron	Euclid	Cleveland	Westerville	Columbus
Highland	Akron	Fairview Park	Cleveland	Whitehall	Columbus
Hudson	Akron	Garfield Heights	Cleveland	Worthington	Columbus
Medina	Akron	Independence	Cleveland	Beavercreek	Dayton
Nordonia Hills	Akron	Kirtland	Cleveland	Brookville	Dayton
Revere	Akron	Lakewood	Cleveland	Centerville	Dayton
Tallmadge	Akron	Maple Heights	Cleveland	Dayton	Dayton
Twinsburg	Akron	Mayfield	Cleveland	Fairborn	Dayton
Canton	Canton	Mentor	Cleveland	Huber Heights	Dayton
Jackson	Canton	North Olmstead	Cleveland	Kettering	Dayton
Lake	Canton	North Royalton	Cleveland	Lebanon	Dayton
North Canton	Canton	Olmstead Falls	Cleveland	Miamisburg	Dayton
Plain	Canton	Orange	Cleveland	Northmont	Dayton
Deer Park	Cincinnati	Parma	Cleveland	Oakwood	Dayton
Finneytown	Cincinnati	Perry	Cleveland	Springboro	Dayton
Forest Hills	Cincinnati	Richmond Heights	Cleveland	Trotwood-Madison	Dayton
Indian Hill	Cincinnati	Rocky River	Cleveland	Valley View	Dayton
Loveland	Cincinnati	Shaker Heights	Cleveland	Vandalia-Butler	Dayton
Madeira	Cincinnati	Solon	Cleveland	Crestview	Mansfield
Mariemont	Cincinnati	South Euclid-Lyndhurst	Cleveland	Lexington	Mansfield
Mount Healthy	Cincinnati	Strongsville	Cleveland	Granville	Newark
Northwest	Cincinnati	Warrensville Heights	Cleveland	Licking Heights	Newark
Norwood	Cincinnati	Westlake	Cleveland	Southwest Licking	Newark
Oak Hills	Cincinnati	Wickliffe	Cleveland	Fort Loramie	Sidney
Sycamore	Cincinnati	Willoughby-Eastlake	Cleveland	Anthony Wayne	Toledo
Wyoming	Cincinnati	Bexley	Columbus	Maumee	Toledo
Aurora	Cleveland	Dublin	Columbus	Ottawa Hills	Toledo
Avon	Cleveland	Gahanna-Jefferson	Columbus	Perrysburg	Toledo
Avon Lake	Cleveland	Grandview Heights	Columbus	Rossford	Toledo
Bay Village	Cleveland	Groveport Madison	Columbus	Springfield	Toledo
Beachwood	Cleveland	Hamilton	Columbus	Sylvania	Toledo
Bedford	Cleveland	Hilliard	Columbus	Washington	Toledo
Berea	Cleveland	New Albany-Plain	Columbus	Boardman	Youngstown
Brecksville-Broadview Heights	Cleveland	Olentangy	Columbus	Campbell	Youngstown
Brooklyn	Cleveland	Pickerington	Columbus	Canfield	Youngstown
Cleveland-University Heights	Cleveland	South-Western	Columbus	Poland	Youngstown
Cuyahoga Heights	Cleveland	Upper Arlington	Columbus	Springfield	Youngstown

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Chad L. Aldis, Vice President for Ohio Policy and Advocacy

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EXECUTIVE SUMMARY

Interdistrict open-enrollment programs allow students to attend public schools located in districts other than those in which they reside. They are among the largest and most widespread school-choice programs in the United States. In Ohio, over 70,000 students use the program annually to attend schools outside their districts of residence. However, despite the scale of such open-enrollment programs, relatively little is known about their operations and the outcomes of students who participate in them.

This report examines three main aspects of Ohio's interdistrict open-enrollment program, in which districts have the option of participating. First, it analyzes which districts do and do not participate, describing their characteristics and examining factors associated with participation decisions. Second, it analyzes the characteristics of participating students, as well as their schooling patterns and trajectories. Third, this report examines the relationship between interdistrict open-enrollment participation and student outcomes, specifically achievement (as gauged by state tests) and the probability of on-time high school graduation.

The analyses that follow are based on both district- and student-level data made available by the Ohio Department of Education (ODE). The former include districts' participation status in the open-enrollment program as well as information on a range of district characteristics, such as enrollment levels, demographics, socioeconomic status, and academic achievement. The student-level data include anonymized individual records for every student who attended Ohio public schools between 2008–09 and 2013–14. These records contain information on students' demographics, their scores on state tests, and—importantly for our purposes—their participation in Ohio's interdistrict open-enrollment program. For such participants, the data tell us the district in which each student resides, as well as the district and school that they attend via interdistrict choice.

Our analyses yield several important findings:

- In recent years, about 70 percent of Ohio districts have accepted open enrollers from any district in the state, while approximately 20 percent of districts have opted out of the program entirely. The remaining 10 percent of districts accept transfers from adjacent districts only.
- Districts that do not accept open-enrolling students are very different from districts that do. In general, districts that don't accept transfers are larger and more prosperous, have higher-achieving students, and are more racially and ethnically diverse than districts that do. Non-participating districts are also concentrated in the suburbs surrounding Ohio's "Big 8" school districts: Akron, Canton, Cincinnati, Cleveland, Columbus, Dayton, Toledo, and Youngstown. The map on page 12 uses data from the 2013–14 school year to illustrate how these participation decisions play out geographically.
- Districts that refuse interdistrict transfers serve a significantly larger percentage of white students than their Big 8 neighbors. Nonparticipating districts also enrolled significantly fewer students classified as disabled, English learners, or economically disadvantaged, compared to nearby Big 8 districts.
- On average, students who use interdistrict open enrollment are relatively advantaged along both socioeconomic and achievement dimensions. These conclusions hold regardless of whether open enrollers are compared to the average student in the state or only to students in their districts of residence.

- There are two distinct populations of open enrollers: those who participate consistently over multiple years and those who transition in and out of the program. Consistent participants tend to be more advantaged than their more transitory peers. As a whole, open enrollers look relatively advantaged because of the characteristics of consistent, longer-term participants, who account for about one-third of participants.
- Open enrollers transfer to districts that are higher achieving, more advantaged, and smaller than their districts of residence. This pattern of transfers holds for both students who participate in open enrollment consistently and those who do not. However, open enrollers also transfer to districts with value-added scores that are similar to—or even slightly lower than—those of their home district.
- For students who transition in and out of open enrollment, there is little difference on average in the characteristics of schools they attend in the years they do and do not open enroll. For students who consistently open enroll, our data do not permit comparison of the characteristics of schools that students attend via open enrollment to those that they would have attended in their districts of residence.
- As for their own achievement, consistent open enrollers rack up significant achievement gains when compared to students who never open enroll. These gains are particularly large for black students and for those who transfer out of high-poverty urban districts.
- For the single cohort of high school entrants that our data allow us to examine, open-enrollment participation during students' high school years—grades 9 to 12—is associated with a greater likelihood that students graduate on time. Among students who open enrolled in eighth grade, those who continued to open enroll for at least one year in high school were about eight percentage points more likely to graduate on time from high school. The odds of on-time graduation are even higher if students open enroll throughout their full high school career.

Overall, we see that students are using Ohio's interdistrict-choice program to gain access to school districts of higher quality than those in which they reside, at least on some dimensions. The analysis also provides evidence that consistent open enrollment is related to meaningful achievement gains—particularly for black students and those in high-poverty urban areas—although we caution readers that our methodology does not allow strong causal claims. Considered as a whole, however, the analysis suggests that Ohio's interdistrict open-enrollment program provides a valuable educational option for students in the state and suggests that state leaders may want to delve deeper into the issue of why so many districts decline to participate in it.

INTRODUCTION

Historically, where students lived determined which public schools they attended. Almost without exception, school districts made school assignments by drawing attendance boundaries for each school and then assigning to those schools students who resided within their boundaries. Over the past twenty-five years, however, a number of policies have weakened the relationship between students' residential location and the school they attend. Charter schools and private school voucher programs are the most visible examples of such policies—they have generated significant media attention and political controversy—but students also have educational options through magnet schooling, virtual education, homeschooling, and intradistrict-choice programs. Often lost in the shuffle of school-choice policies are interdistrict open-enrollment programs, which allow students to attend public schools located in districts other than those in which they reside at no direct cost to families. Although interdistrict-choice policies often fly below the radar, they are among the largest and most widespread school-choice programs in the United States. In the 2015–16 school year, forty-four states, including Ohio, allowed some form of interdistrict open enrollment.

Interdistrict open-enrollment programs take two primary forms: voluntary and mandatory. In the former case, each school district decides whether it will allow students from other districts to enroll. Mandatory programs, on the other hand, compel districts to accept student transfers from other districts, although state laws generally specify conditions that districts can use as a basis for refusing transfers. A lack of capacity is the most common basis for refusal. Both types of programs generally prohibit students' districts of residence from restricting transfers out of the district. Table 1 presents the number of states with voluntary and mandatory interdistrict open-enrollment policies. As we see, twenty-one states have voluntary interdistrict open-enrollment programs, thirteen states have mandatory programs, and ten states have both kinds. In states with both program types, there is typically a voluntary program for the general student population and a mandatory program for one or more student subgroups, such as at-risk students or those with a disability.

Table 1. Number of states and District of Columbia with open enrollment programs

Type of OE program	Number of states
None	7
Voluntary only	21
Mandatory only	13
Both voluntary and mandatory	10

Source: National Center for Education Statistics

Although Minnesota adopted the nation's first interdistrict open-enrollment policy in 1988, Ohio was close on its heels and initiated its voluntary statewide program only one year later. Thus, Ohio's open-enrollment policy has had over a quarter century to develop into a mature choice program. Over this time, however, the operations and effects of Ohio's program have gone largely unanalyzed. This report is designed to change that. In particular, this report examines three main aspects of Ohio's voluntary interdistrict open-enrollment program as it functioned between the 2008–09 and 2014–15 school years. First, it shows which districts do and do not participate and describes their characteristics, while examining factors that may be associated with their decisions. Second, the report analyzes the characteristics of students who transfer out of their districts of residence under Ohio's interdistrict-choice policy and their subsequent participation patterns. In particular, we analyze whether certain student characteristics—gifted or special-needs status, race, income,

test scores, and others—are associated with open-enrollment participation. This section also seeks to identify the purposes for which students use open enrollment, examining such factors as students' age of initial participation, their length of participation, and the quality of the district and school into which they transfer. Finally, this report examines how open-enrollment participation relates to students' educational outcomes, particularly their test scores and their likelihood of graduating from high school. Prior to addressing these three main topics, however, the report provides brief background on research into interdistrict open enrollment and an overview of Ohio's program.

Research on open enrollment

Despite the prevalence of interdistrict open enrollment, there has been relatively little analysis of these programs—particularly in comparison to the large amount of work on charter schools and private school vouchers. The limited work that exists typically examines one of two topics. One set of studies analyzes the relationship between interdistrict open enrollment and educational outcomes, such as student achievement.[1] Studies of the interdistrict-choice programs in Colorado (Carlson, Lavery, and Hughes 2016) and Michigan (Cowen and Creed 2016) conclude that there is no meaningful relationship between open-enrollment participation and student test scores. In contrast, an analysis of interdistrict choice in Connecticut finds participation to have a positive effect on students' achievement (Bifulco, Cobb, and Bell 2009). However, that study focuses on interdistrict transfers into magnet schools, whereas the work from Colorado and Michigan examines transfers into all schools that receive students via open enrollment. The latter two studies are thus more similar to the achievement-related analyses in this report.[2]

The second set of studies analyzes—at both the district and student levels—various aspects of participation in interdistrict open-enrollment programs. At the district level, Fowler (1996) surveyed Ohio district superintendents about their decisions to participate, or not, in the state's voluntary interdistrict-choice program. Superintendents in participating districts cited increased enrollment—and state funding—as a major reason for their participation. Nonparticipating districts most commonly cited capacity constraints as their main reason for opting out of the program. Studies examining districts that enroll students via open enrollment—either voluntarily or because their state has a mandatory policy—provide evidence that the number of transfers into and out of districts is associated with several factors, including achievement levels, the racial and socioeconomic makeup of a district, and extracurricular opportunities, among others (Armor and Peiser 1998; Fossey 1994; Reback 2008; Welsch, Statz, and Skidmore 2010; and Carlson, Lavery, and Witte 2011).

Student-level analyses have been done in just two states—Michigan and Colorado—and they provide evidence that participation patterns are state specific. Work from Michigan shows that participants are disadvantaged along several dimensions (Cowen, Creed, and Keesler 2015), whereas the Colorado studies indicate that participating students are relatively advantaged (Lavery and Carlson 2015; Carlson, Lavery, and Hughes 2016; and Powers, Topper, and Silver 2012). The Colorado results also indicate that students with certain designations—gifted and talented, special education, and English language learner (ELL)—are less likely to open enroll than their peers without these designations. Results from both states provide evidence that participation is often short lived, with disadvantaged populations most likely to shuffle in and out of interdistrict-choice programs.

Interdistrict open enrollment in Ohio

One year after Minnesota enacted the nation's first open-enrollment law in 1988, Ohio followed suit and adopted a voluntary interdistrict-choice policy.[3] Today, more than 72,000 students across the Buckeye State attend district-run schools outside their districts of residence via open enrollment.

Ohio's voluntary interdistrict-choice policy requires each district annually to decide whether to (1) refuse all interdistrict transfers, (2) allow transfers from any school district, or (3) allow transfers from adjacent districts only. In the 2015–16 school year, 449 districts (73 percent) chose to allow transfers from any district, fifty districts (8 percent) elected to accept transfers from adjacent districts only, and the remaining 116 districts (19 percent) did not accept any nonresident students. It is worth noting that districts opting out of open enrollment can elect to enroll out-of-district students and charge them tuition, but very few students cross district boundaries via tuition payments.[4]

Districts that elect to accept transfers from other districts via interdistrict open enrollment—whether any district or just adjacent ones—must have clear and well-defined policies and procedures for accepting transfers. In particular, districts must set clear capacity limits by grade level, school building, and educational program. These limits effectively specify the maximum number of transfers the district will accept via open enrollment. In addition, districts' policies and procedures generally specify how applicants will be allocated across schools in the district. State policy provides districts with significant discretion on this issue. The statute does, however, prohibit districts from selecting students based on academic, athletic, or artistic ability.

Sidebar: Open-enrollment policies

Five additional aspects of Ohio's interdistrict-choice policies warrant discussion. First, the policies specify that districts must first enroll all students who reside in the district before they consider accepting nonresident students. Second, the authorizing legislation allows districts to refuse transfers from students who were expelled or suspended for ten or more consecutive days in the previous school year; this is the only form of "selectivity" allowed under the program. Third, the open-enrollment policies require districts to develop procedures that ensure maintenance of "appropriate racial balance" in district schools.[5] Fourth, Ohio's interdistrict-choice policies make clear that resident districts have no transportation responsibilities and that the district into which a student open enrolls is only required to provide transportation from an existing bus stop within the district. In effect, families bear transportation responsibilities. Finally, for each student enrolled via interdistrict choice, the receiving district receives the per-pupil state-aid amount set by the General Assembly, which was $5,800 in 2014–15—dollars that are subtracted from the resident district. Receiving districts may also bill resident districts for special-education services provided to students enrolled via interdistrict choice. Other than that, however, no local dollars change hands under the program.

DISTRICT PARTCIPATION

District participation over time

Ohio districts may choose whether they will accept students through the state's voluntary interdistrict-choice program. Based on data from ODE, figure 1 presents the percentage of districts in each of the three participation categories: (1) accept no interdistrict transfers, (2) accept interdistrict transfers from adjacent districts only, and (3) accept interdistrict transfers from any district. Appendix tables 1 and 2 display these data in tabular form.[6]

Figure 1. District participation in Ohio's interdistrict open-enrollment program, by year

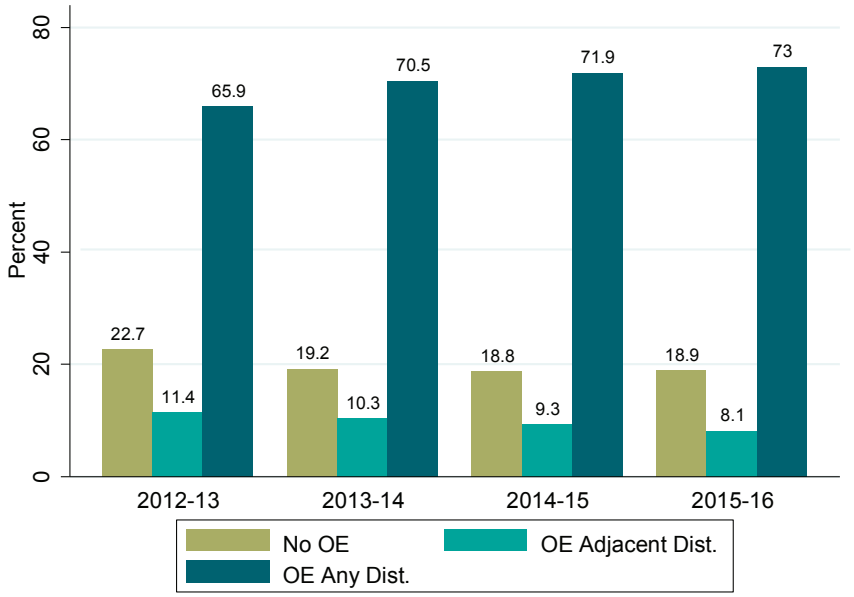


Figure 1 illustrates that a solid—and growing—majority of districts accept open-enrolling students from any district in Ohio. The percentage rose from 66 percent in 2012–13 to 73 percent in 2015–16. The number of districts electing not to participate in Ohio's interdistrict-choice program held steady at approximately 20 percent over this time period. Finally, figure 1 demonstrates that approximately 10 percent of districts chose to accept interdistrict transfers from adjacent districts only. The number of districts in this category exhibited a steady decline from 11 percent in 2012–13 to 8 percent in 2015–16. Unfortunately, we are unable to examine trends in district participation over the full twenty-plus years since implementation of the policy because such data have not been maintained.

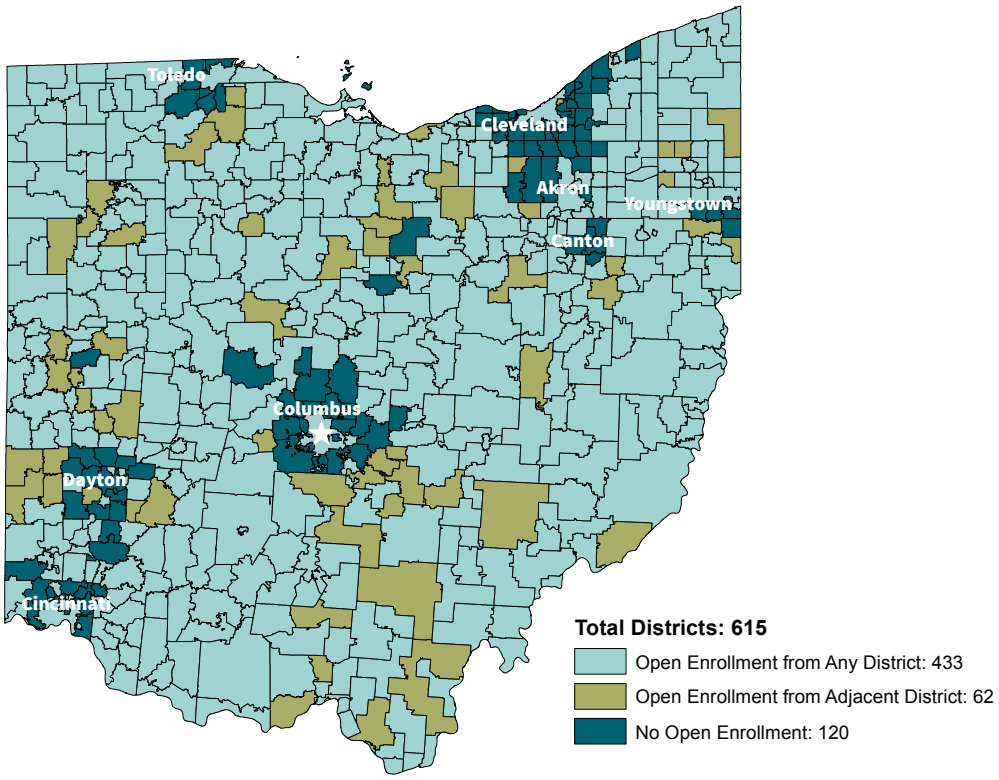
Although more than 70 percent of districts accept open enrollers from anywhere in the state, this set of districts only enrolls about 60 percent of students in Ohio, suggesting that these are disproportionately small and rural. On the flip side, only about 20 percent of districts do not accept transfers, but these districts enroll about one-third of all students in the state, indicating that these districts are larger than the average one in the state.

Characteristics of participating districts

Figure 1 shows a meaningful number of districts in each of the three open-enrollment categories specified by Ohio law. Figure 2 uses data from the 2013–14 school year to illustrate how these participation decisions play out geographically. In the map, it is immediately apparent that nonparticipating districts are

disproportionately clustered in the suburbs surrounding Ohio's Big 8 urban areas. Students in Cleveland, Columbus, Cincinnati, and Dayton have very few, if any, options for open enrolling out of their districts of residence.[7] They are surrounded by districts that do not accept open enrollers, and when there is no help with transportation it is hard to leapfrog the immediately surrounding districts to get to willing receivers. And even some of the outer-ring suburbs only accept transfers from adjacent districts, meaning that students from the city proper would be prohibited from enrolling. Figure 2 further shows that students in the remaining Big 8 districts—Akron, Canton, Toledo, and Youngstown—only have marginally more options for transferring out of their districts.

Figure 2. Ohio school districts by open-enrollment status: 2013–14 school year



Along with illustrating that nonparticipating districts are clustered in relatively advantaged suburbs, figure 2 also makes clear that participating districts are disproportionately located in rural areas of the state, which are overwhelmingly white and less advantaged economically. As in many states with interdistrict open enrollment, the participation of rural districts is probably driven at least in part by a desire to attract more students and the accompanying state funding. Many rural districts have experienced declining enrollments due to shrinking populations, and they may see open enrollment as a partial solution to the funding issues they face.

The reasons underlying the nonparticipation of Ohio suburban districts are more complex. Suburban districts in many states with interdistrict open enrollment often face issues created by growing student populations—particularly lack of capacity—and accepting interdistrict transfers would only exacerbate these issues. However, this dynamic does not appear to be at play in Ohio, where the data show that average enrollment in nonparticipating districts declined by approximately one hundred students from 2012–13 to 2014–15. Whatever the reasons underlying district participation decisions, the decision of many suburban districts surrounding the Big 8 to opt out of Ohio's interdistrict-choice program removes some of the highest-quality educational options in the state from potential open enrollers.

Sidebar: Fiscal issues in open enrollment

Financial considerations undoubtedly inform districts' decisions regarding participation in Ohio's interdistrict open-enrollment program. A district receives the per-pupil state-aid amount set by the General Assembly—about $6,000 in recent years—for each student enrolled via interdistrict choice. In many districts, this dollar amount is sufficient to cover the marginal cost of educating the student. However, in other districts, particularly those that raise a large amount of their revenue locally and have large per-pupil expenditures, the state-aid payment may not cover the marginal cost of educating an additional student. In addition to other considerations, these districts may be hesitant to subsidize out-of-district students with local tax revenue.

School-district finance data are consistent with such a scenario. Data show that districts refusing interdistrict transfers spend, on average, about $11,300 per pupil and raise approximately 60 percent of their revenue locally. Districts accepting transfers, in contrast, spend about $9,550 per pupil and only raise about 40 percent of their revenue locally. These two sets of districts clearly face very different financial considerations when deciding whether to participate in the Ohio's interdistrict transfer programs.

Figures 3–6 put numbers to these district participation decisions: they present the average characteristics of districts in each of the three participation categories for 2013–14. In particular, they show enrollment levels, the percentage of economically disadvantaged students,[8] racial and ethnic composition, the percentage of students with a disability, the percentage of students classified as ELLs, and average achievement levels. Data for other school years are very similar and are available in table A2 in the appendix.

Figure 3. Mean district enrollment, by interdistrict open-enrollment participation: 2013–14

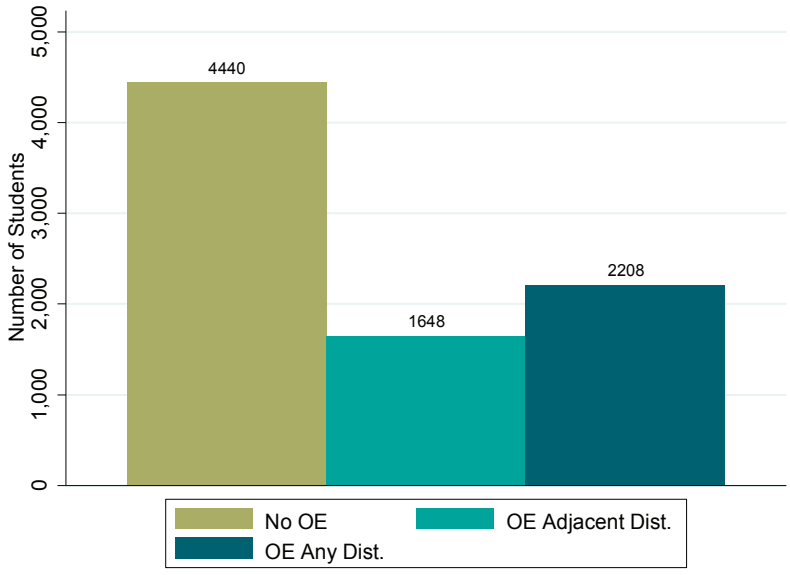


Figure 3 shows that the average district accepting interdistrict transfers is relatively small, enrolling around 2,200 students, whereas the typical district that closes its doors to transfers enrolls over 4,400 students. The low average enrollment of districts accepting transfers is consistent with conjectures—and previous research—that shrinking rural school districts often see open enrollment as a potential way to augment their bottom line.

Figure 4. Mean district racial/ethnic composition, by interdistrict-open-enrollment participation and race/ethnicity: 2013–14

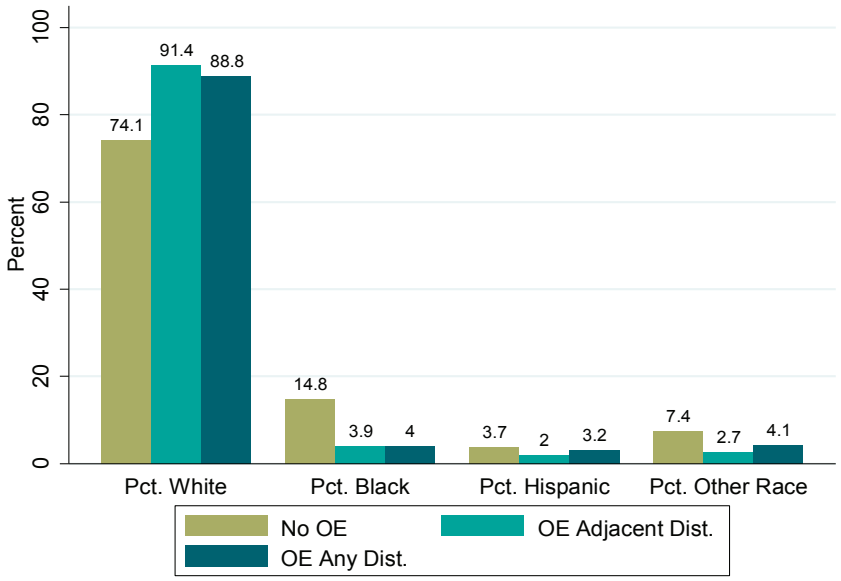


Figure 4 demonstrates that districts opening their doors to transfers are overwhelmingly white—on the order of 90 percent—while those that refuse open enrollers are much more racially diverse. On average, these districts are about 74 percent white, 15 percent black, and 11 percent Hispanic or Asian.

Figure 5. Mean district characteristics, by interdistrict open-enrollment participation and characteristic: 2013–14

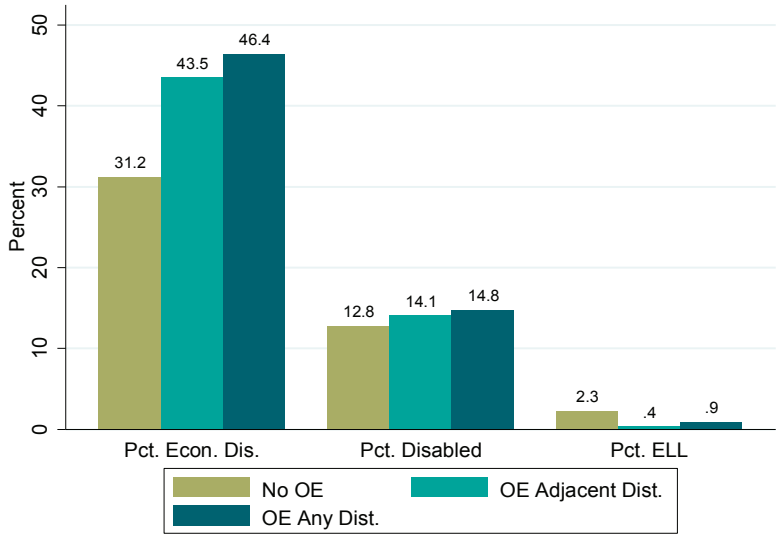


Figure 5 illustrates that districts refusing to accept out-of-district transfers are, on average, significantly more prosperous than districts that open their doors to open enrollers. In particular, the average district refusing transfers has only 32 percent of students classified as economically disadvantaged, while the typical district accepting open enrollers has about 45 percent of students with such a classification. There are relatively few differences across these districts in the percentage of students with disabilities or classified as ELLs.

Figure 6. Mean district achievement levels, by interdistrict open-enrollment participation and subject: 2013–14

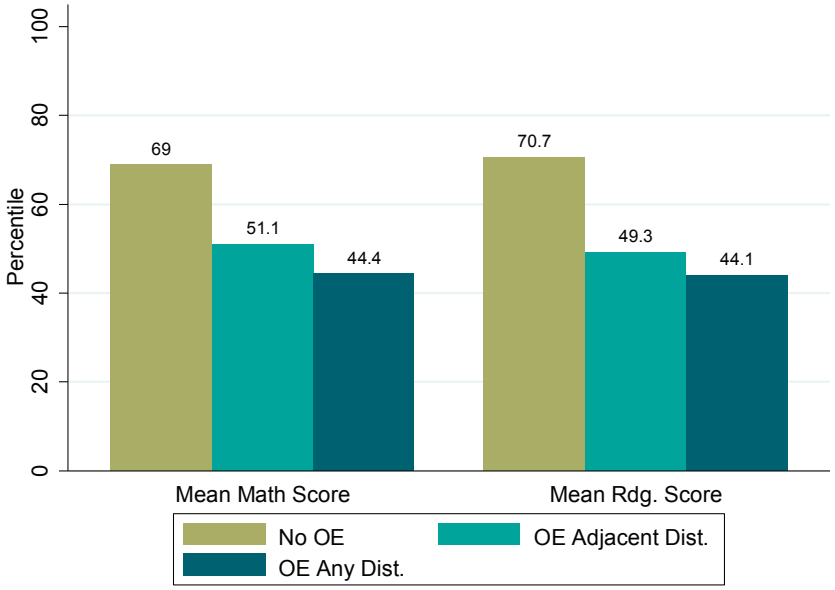


Figure 6 presents the average math and reading achievement scores in percentile terms for districts in each of the three participation categories. Figure 6 reveals that the average nonparticipating district has a much higher mean achievement level than a typical district accepting open enrollers. In particular, the average nonparticipating district scores at about the sixty-ninth percentile of districts in the state. In contrast, the average district accepting open enrollers from adjacent districts scores at about the fiftieth percentile, and the average district accepting transfers from any district scores at approximately the forty-fourth percentile of districts in the state.

Considering figures 3–6 together, there are two immediate takeaways. First, districts that accept interdistrict transfers solely from adjacent districts are, on average, very similar to districts that elect to accept transfers from any district in the state. In both sets of districts, the average enrollment is about 2,000 students, about 45 percent of students are economically disadvantaged, and about 90 percent are white. Furthermore, the average district that accepts open enrollers has about 15 percent of students classified as disabled and less than 1 percent classified as ELLs. Districts that accept open enrollers from any district are slightly below the state average on math and reading exams, while districts that only accept transfers from adjacent ones score almost exactly at the statewide average.

Second, districts that choose not to accept open-enrolling students are very different, by and large, from districts that do. They're larger, more advantaged, and enroll a greater percentage of nonwhite students than districts that accept open enrollers. With respect to enrollment, the typical district that does not accept interdistrict transfers enrolls about 4,500 students, which is more than two times as large as the mean district accepting transfers. Socioeconomically, the average nonparticipating district only has 30 percent of students classified as economically disadvantaged, a number substantially lower than the 45 percent of economically disadvantaged students in participating districts. In addition, nonparticipating districts also have a lower average percentage of students with a disability than their participating peers. Overall, figures 2–6 paint a picture of prosperous, high-achieving, suburban districts electing not to accept interdistrict transfers, while rural districts in the state, which are less affluent and lower achieving, largely choose to accept transfers.

Sidebar: Characteristics of districts around the Big 8

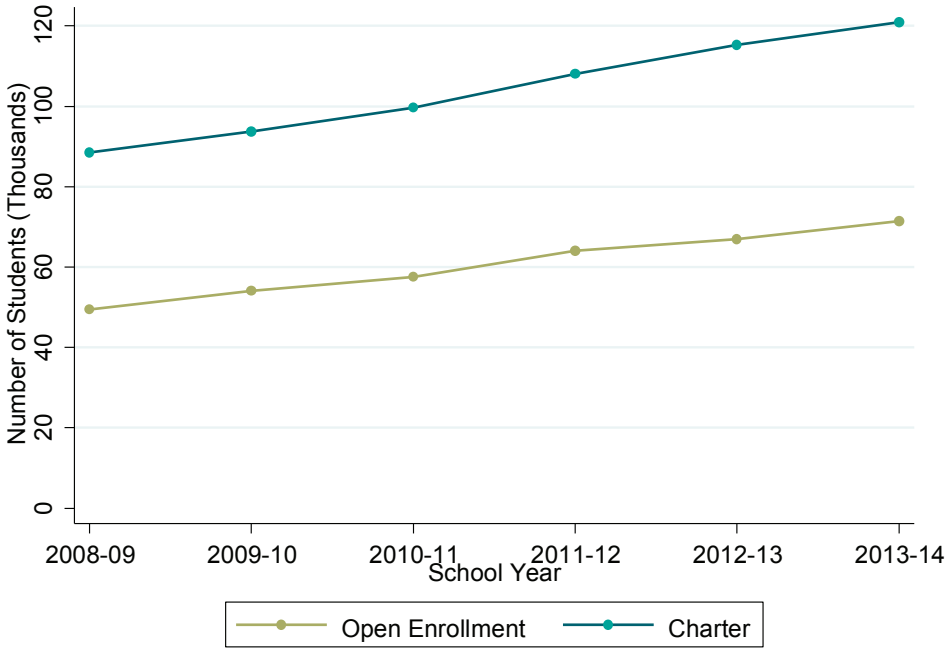
Although the data show that districts refusing transfers enroll a lower percentage of white students than those that open their doors, they also show that districts opting out of interdistrict open enrollment serve a significantly larger percentage of white students than the urban districts nearby. Over the time that our data span, the average Big 8 district was less than 30 percent white, while the typical district refusing transfers was more than 70 percent white. Correspondingly, districts not accepting transfers enrolled far smaller proportions of black students (14 percent versus 55 percent) and Hispanic students (4 percent versus 8 percent) than their Big 8 neighbors. Nonparticipating districts also enrolled significantly fewer students classified as disabled, ELLs, or economically disadvantaged. And districts that refuse interdistrict transfers have average achievement levels that are far higher than those of the Big 8 districts. The average Big 8 district has a mean student-achievement level at about the second percentile of all districts in the state, while the average district refusing transfers scores at about the seventieth percentile of all districts. Table A2 in the appendix provides a detailed year-by-year comparison of districts not accepting interdistrict transfers, which are exclusively located in the suburbs surrounding the Big 8 urban districts, to their nearby Big 8 neighbors.

STUDENT PARTICIPATION

The previous sections examine the characteristics of districts that elect to participate (or not) in Ohio's voluntary interdistrict-choice program, but they tell us nothing about the characteristics of students who actually transfer under the program. We enter that realm via data provided by ODE via the Ohio Education Research Center (OERC). These data contain annual, individual records for every student who attended Ohio public schools between the 2008–09 and 2013–14 school years. These records contain no student names or other identifying information, just an anonymous identifier. They also contain information on students' demographic characteristics, their scores on state tests, and—importantly for our purposes—their participation in Ohio's interdistrict-choice program. For such participants, the data show the districts in which they reside as well as the districts and schools they attend via interdistrict choice. Together, these rich data allow us to paint a detailed portrait of participants—and the dynamics of their participation—in Ohio's open-enrollment program.

Figure 7 plots the number of students attending schools outside of their districts of residence via Ohio's interdistrict-choice program in each year our data span. For purposes of comparison, the figure also presents the number of students enrolled in charter schools in Ohio, a state with among the largest percentage of students enrolled in charter schools. The figure shows that open-enrollment participation has increased over time, reaching nearly 70,000 students by the 2013–14 school year. Additionally, figure 7 shows that the growth rates of charter school enrollment and open-enrollment participation have generally been comparable in recent years.

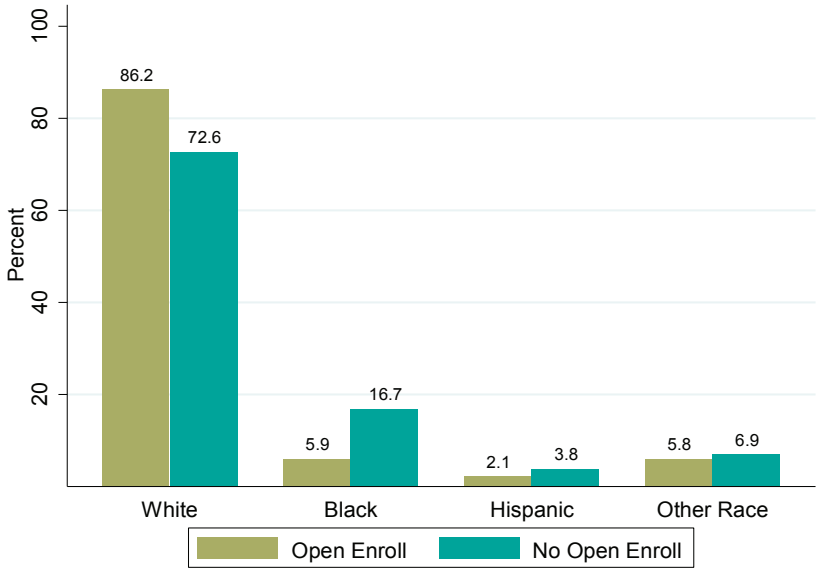
Figure 7. Number of students in charter schools and interdistrict open enrollment, by year



We next compare the characteristics of participants and nonparticipants statewide across all years in our data. These comparisons are presented in figures 8–10 below. Data on the characteristics of open-enrollment participants are presented in tabular form in table A3 in the appendix. Figure 8 presents the racial and ethnic composition of public school students in Ohio by open-enrollment participation. The main takeaway is the overrepresentation of white students—and underrepresentation of black students—in Ohio's interdistrict-

choice program. Over the years spanned by our data, about 73 percent of Ohio's student population was white, but among open enrollers the figure is 86 percent. In contrast, black students made up about 17 percent of Ohio's student population but only about 6 percent of open enrollers. Hispanics and students of other races were also slightly underrepresented in Ohio's interdistrict open-enrollment program, relative to the composition of the broader student population.

Figure 8. Racial/ethnic composition of open enrolling and non-open enrolling students



The underrepresentation of black students among open enrollers is perhaps unsurprising given the district participation decisions analyzed in the previous section. In Ohio, black students are disproportionately located in the state's Big 8 urban districts—those eight districts enroll more than one-third of black students in the state. And, as we described earlier, the vast majority of suburban districts surrounding the Big 8 elect to opt out of Ohio's open-enrollment program. Consequently, more than one-third of black students in Ohio have no practical opportunity to open enroll, which almost surely contributes to their underrepresentation in the program. That said, other school-choice programs in Ohio—namely charter schools and private school vouchers—are disproportionately used by students in the Big 8 districts. As such, it is not necessarily the case that black students in the Big 8 are without options when it comes to schooling; rather, open enrollment is not one of them.

Similarly, district participation decisions likely contribute to the overrepresentation of white students among open enrollers. The previous section showed that rural and small-town districts participate at near-universal rates in Ohio's interdistrict-transfer program, whereas urban and, especially, suburban districts participate at much lower rates. Not surprisingly, then, our data show that almost a full 65 percent of all student transfers via Ohio's open-enrollment program are from one rural or small-town district to another; the student population in these districts is overwhelmingly white. Only about 20 percent of open-enrollment transfers are initiated by students leaving urban districts.

Figure 9 provides a visual representation of the percentage of students with four designations—economically disadvantaged, disabled, gifted, and ELL—among participants and nonparticipants in Ohio's open-enrollment program. The figure demonstrates that students with each of these designations are underrepresented, often significantly so, among open enrollers. For example, across the years that we examine, about 42

percent of Ohio public school students who attended school in their resident district were classified as economically disadvantaged, but only 31 percent of open enrollers had that same designation. The reason for the underrepresentation of black students in Ohio's interdistrict-choice program may also apply to this socioeconomic disparity, as there is a high concentration of economically disadvantaged students in Ohio's Big 8 urban districts. Finally, figure 9 also reveals that gifted students, those with a disability, and ELLs are underrepresented among open enrollers. These results are consistent with those from an analysis of participation in Colorado's mandatory open-enrollment program, which also shows that economically disadvantaged students, ELLs, gifted students, and students with disabilities all open enroll at disproportionately low rates (Lavery and Carlson, 2014).

Figure 9. Characteristics of open enrolling and non-open enrolling students

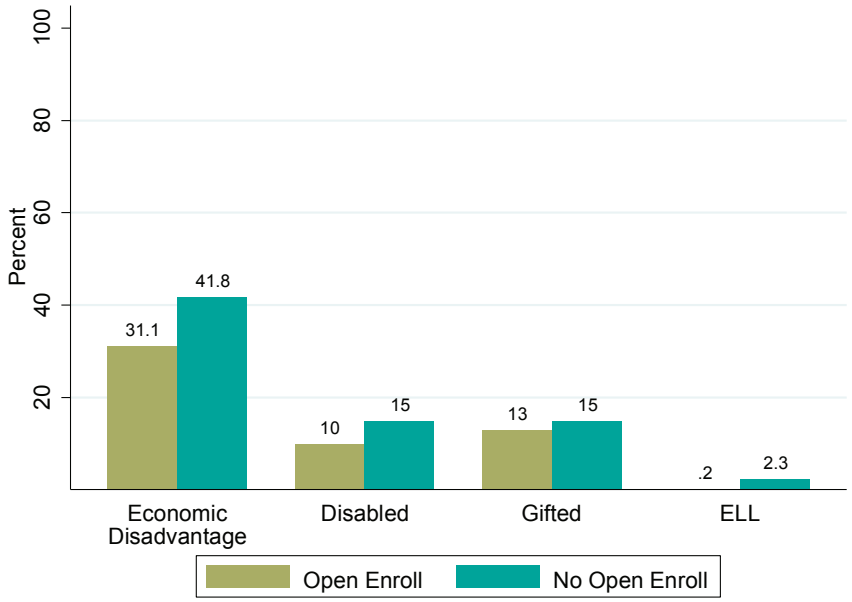
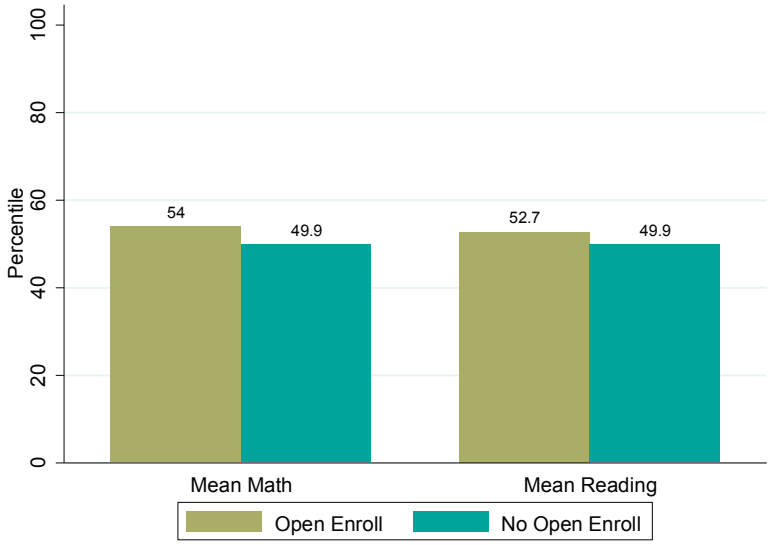


Figure 10 provides an achievement comparison between students who do and do not open enroll.[9] It shows that participants are disproportionately higher achieving, with the average participant scoring at approximately the fifty-fourth percentile in math and the fifty-third percentile in reading. On average, nonparticipants score at the fiftieth percentile. Although these achievement differences are small, they're generally considered meaningful by researchers. Considered together, the picture painted by figures 8–10 suggests that open-enrollment participants are disproportionately advantaged. This advantage is clear with respect to socioeconomic status, prior achievement, disability status, and ELL designation.

Figure 10. Average student achievement of open enrolling and non-open enrolling students, by subject



The conclusions above are based on a comparison of open-enrollment students with non-open-enrollment students across the whole state. A slightly different set of results emerge when only comparing open-enrolling students to nonparticipants within their districts of residence. Specifically, figure 11 demonstrates that racial differences in participation effectively disappear in our within-district comparison. This suggests that the differences seen in the cross-state analysis are completely a product of white students simply being more likely than black students to have participating districts nearby. When faced with the same choice options, students of each race participate at equal rates. On the other hand, figure 12 shows that participation disparities based on economic disadvantage and disability are more pronounced in the within-district comparison. And figure 13 illustrates that participation disparities based on achievement are largely similar in the cross-state and within-district comparisons.

Figure 11. Average racial composition of open enrolling and non-open enrolling students within districts

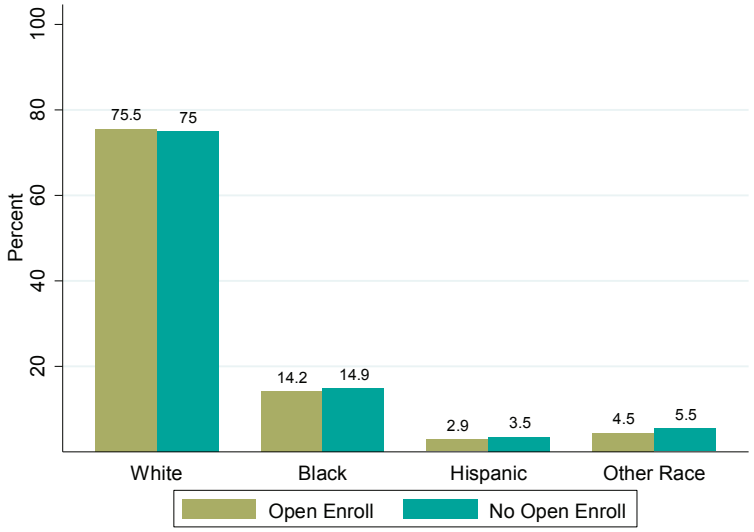


Figure 12. Average characteristics of open enrolling and non-open enrolling students within districts

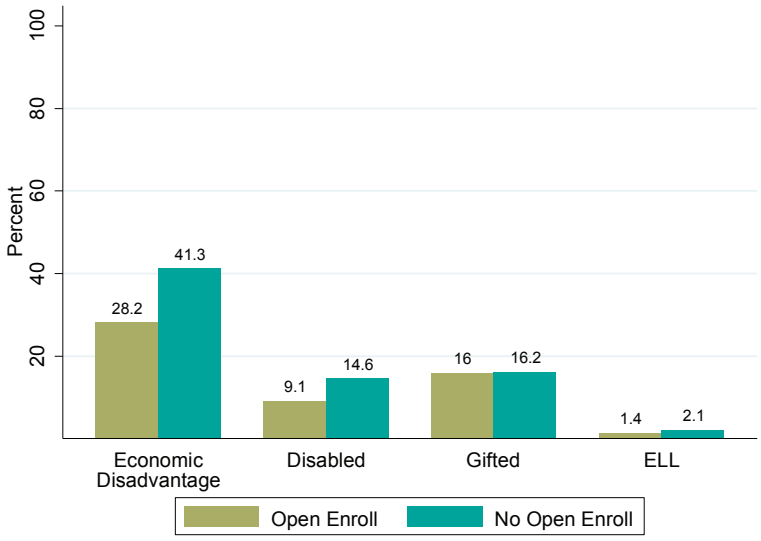
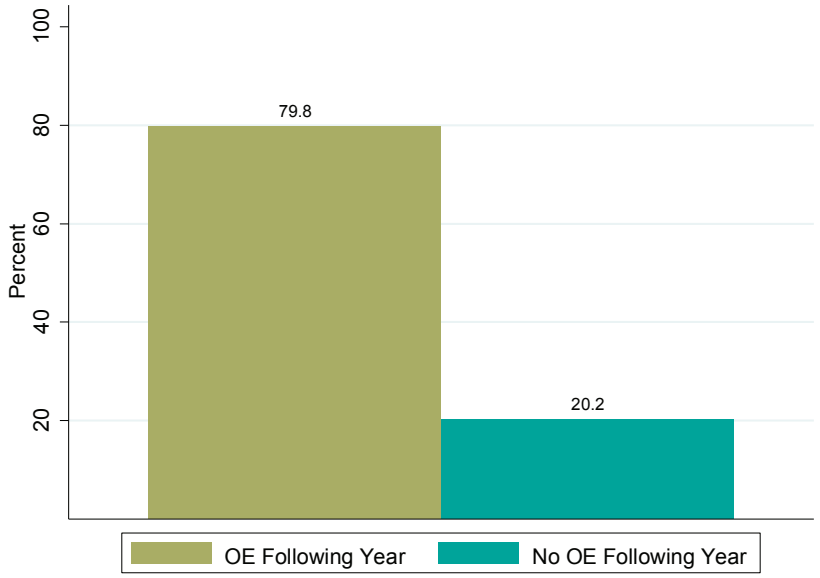


Figure 13. Average achievement levels of open enrolling and non-open enrolling students within districts by subject

DYNAMICS OF STUDENT PARTICIPATION

To what extent do students employ open enrollment as a consistent, long-term educational option, rather than a more transitory alternative? We probe this question using our multiyear data to see how many participants make each type of open-enrollment transition from one year to another.[10] Figure 14 indicates that approximately 80 percent of those who open enroll in a given year also open enroll the next year, while 20 percent return to their districts of residence.

Figure 14. Percentage of open enrollers who do and do not open enroll the following year



Figures 15–19 present this information separately for students with different characteristics. They show that the stability of open-enrollment participation varies substantially across different groups. For example, figure 15 reveals that 87 percent of those who are not economically disadvantaged maintain their open-enrollment status from one year to the next, while that proportion falls to 69 percent among disadvantaged students. Among racial and ethnic groups, figure 16 illustrates that white students are likeliest to maintain their open-enrollment status from one year to the next—just over 80 percent do so—and that black students are least likely, with about 70 percent doing so. The transition percentages for students of other races fall in between. Figure 17 shows that less than 75 percent of students with disabilities open enroll in two consecutive years, versus 80 percent of those without a disability classification. Figures 18 and 19 show comparable findings for ELL and gifted students, respectively. Appendix table 4 presents these data in tabular form.

Figure 15. Percentage of open enrollers who do and do not open enroll the following year, by economic disadvantage status

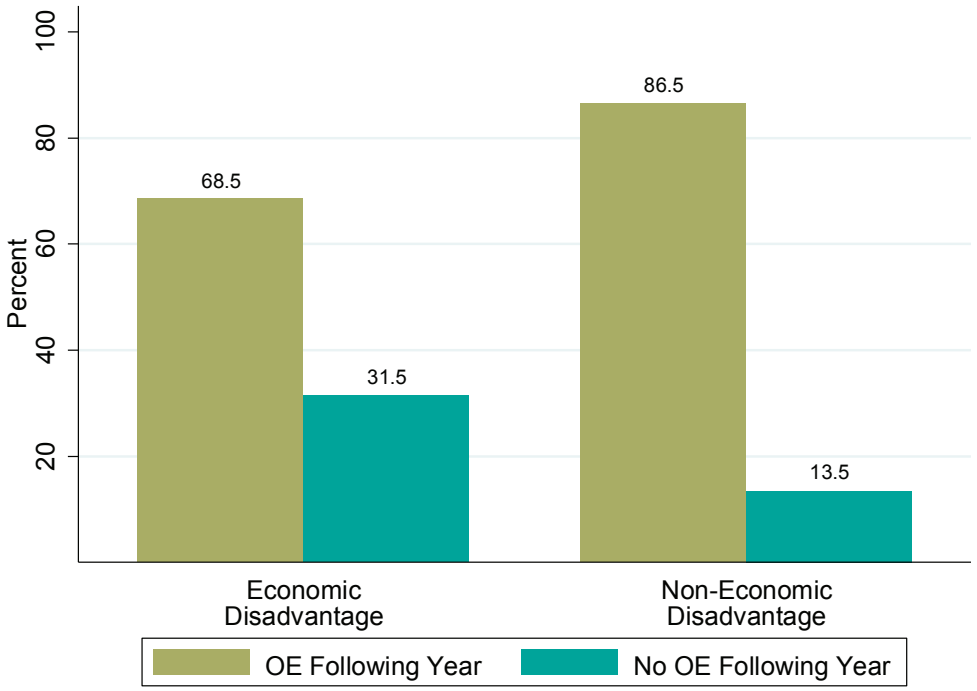


Figure 16. Percentage of open enrollers who do and do not open enroll the following year, by race/ethnicity

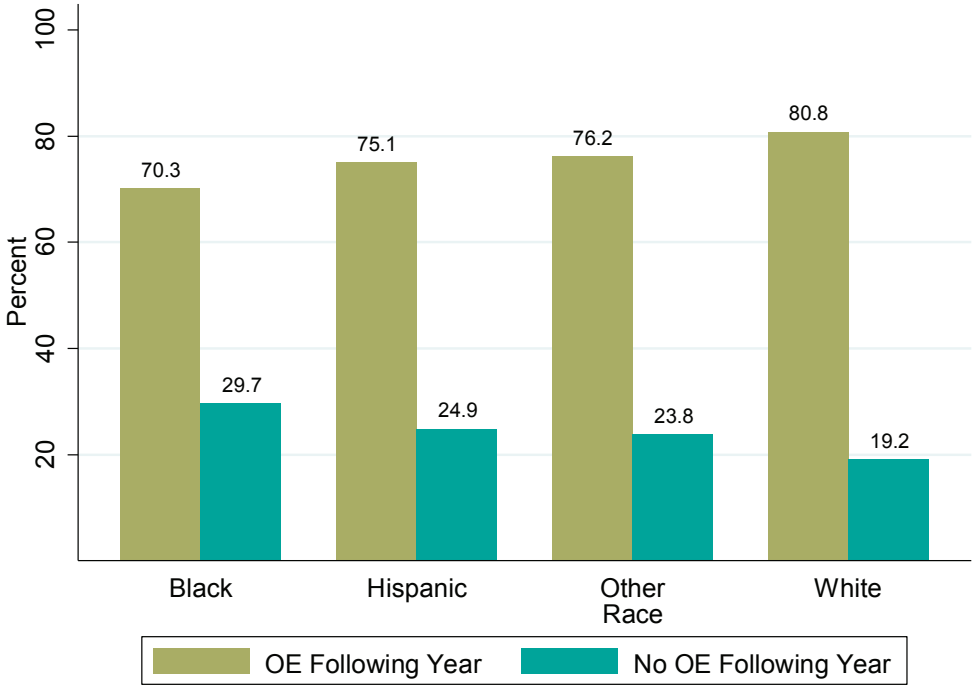


Figure 17. Percentage of open enrollers who do and do not open enroll the following year, by disability status

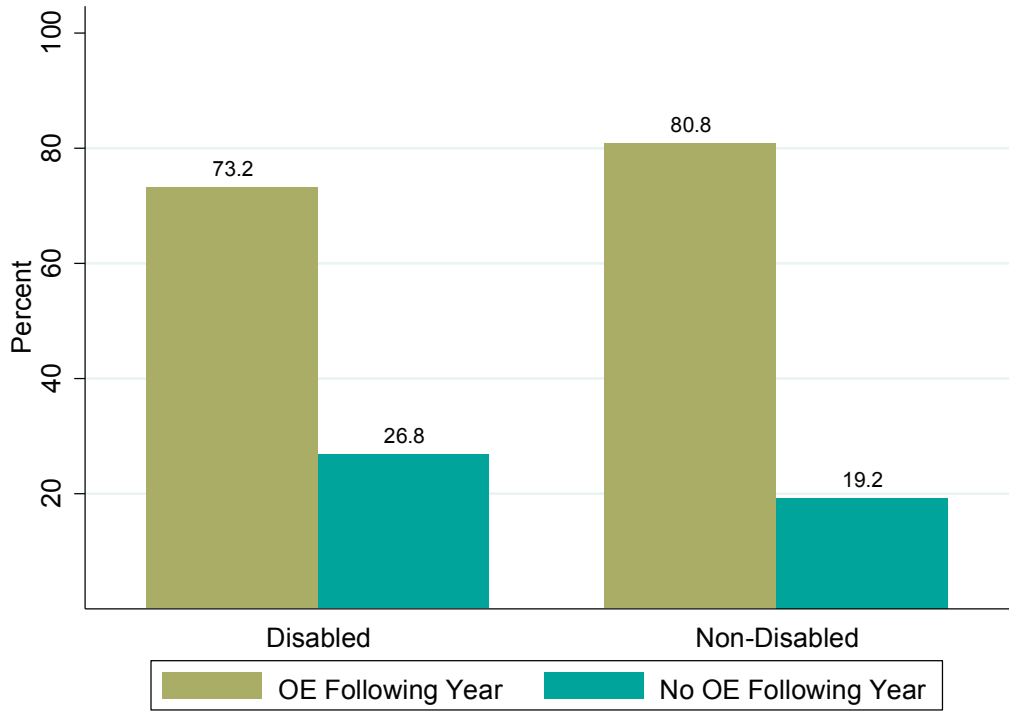


Figure 18. Percentage of open enrollers who do and do not open enroll the following year, by ELL status

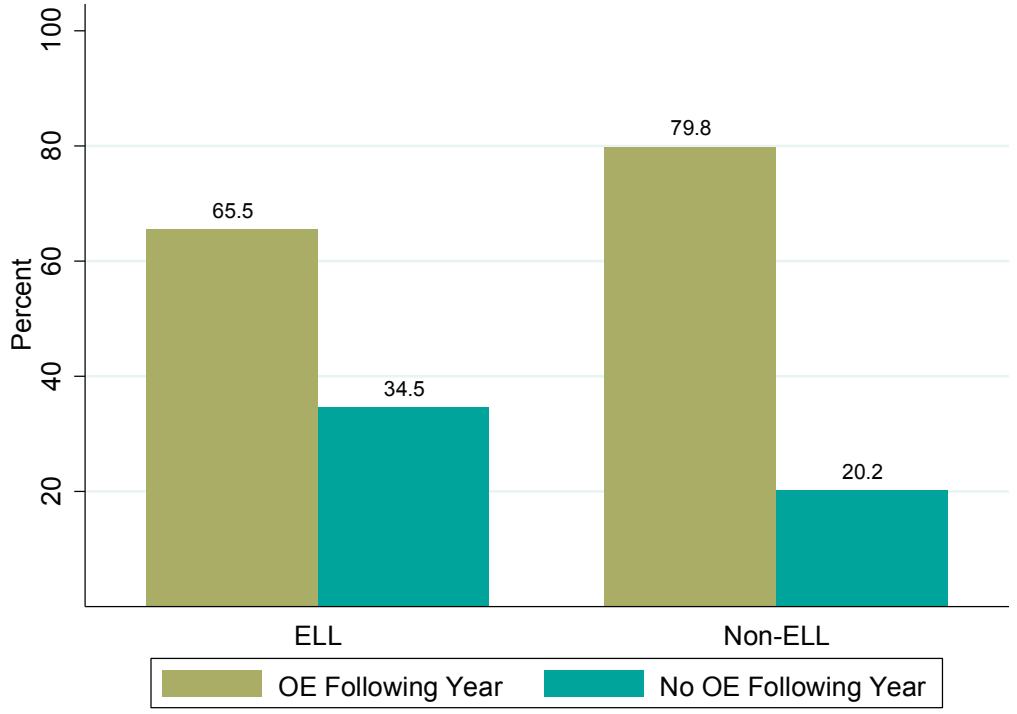
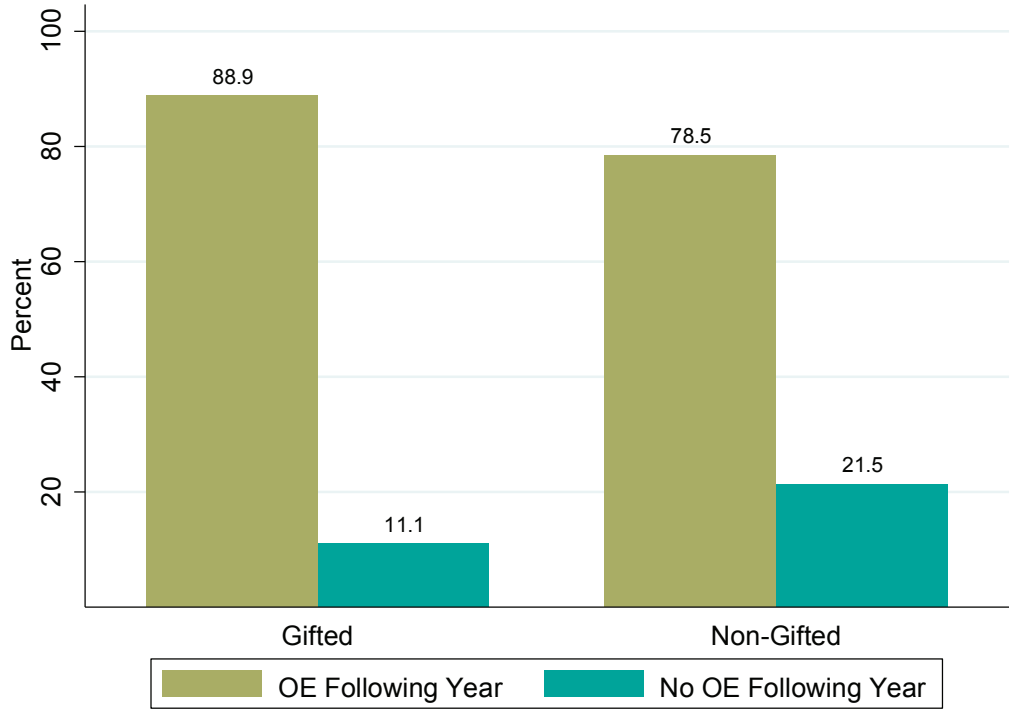


Figure 19. Percentage of open enrollers who do and do not open enroll the following year, by gifted status



Consistency of participation

Figures 15–19 show that some students are more likely than others to use open enrollment as a long-term educational option. To investigate further, we exploit the longitudinal nature of our data to define two classes of open enrollers. We use the term "consistent participants" to describe those who open enroll in all years for which we have data on the student. The term "transitory participants" refers to those who open enroll in one or more years but attend school in their home districts in another year, either before or after we observe them open enrolling.

Table 2 shows that about one-third of all students who ever open enrolled across the years 2008–09 to 2014–15 were consistent participants—that is, they open enrolled in every year for which we have data on the student. The other two-thirds open enrolled in some years but not in others. Table 2 presents characteristics on consistent and transitory participants in the year they first open enrolled. We see that consistent participants are significantly more likely to be white and, correspondingly, less likely to be black or Hispanic. They are also overwhelmingly less likely to be economically disadvantaged or disabled.

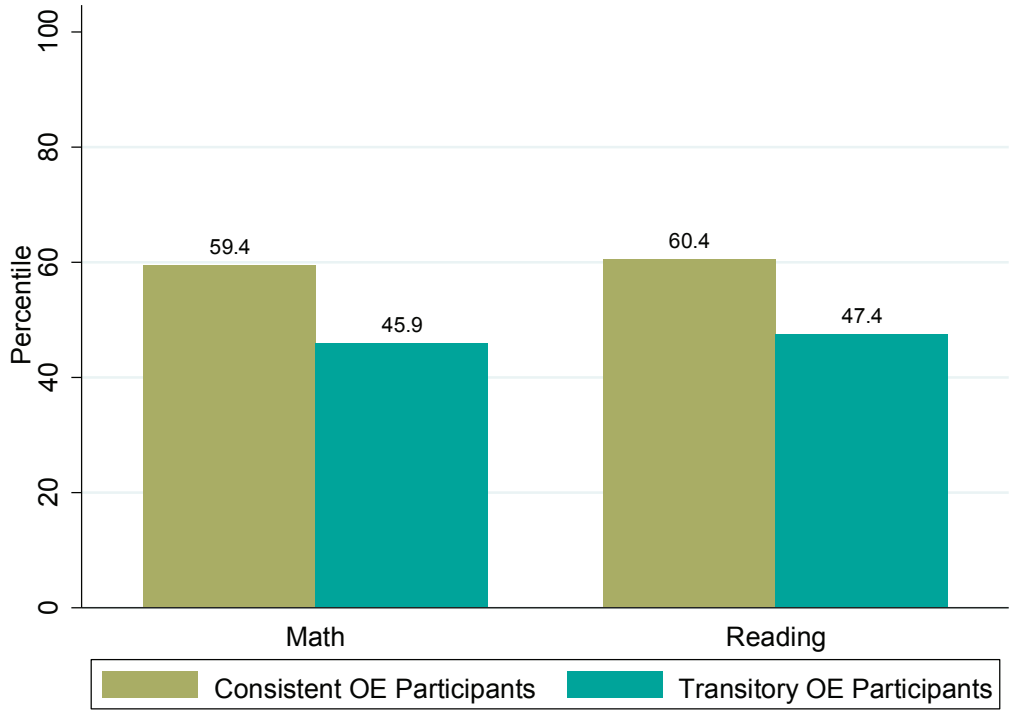
Table 2. Characteristics of open-enrolling students, by type of open-enrollment participation

Characteristic	Consistent participants	Transitory participants
Gender (%)		
Male	49.3	49.4
Female	50.7	50.6
Race (%)		
White	88.5	82.2
Black	4.6	8.6
Hispanic	2.0	2.5
Other race	4.9	6.6
Economic disadvantage (%)	23.4	43.5
Gifted (%)	9.4	8.9
Limited English proficiency (%)	0.3	0.4
Disability status (%)	6.6	12.6
N students	50,109	99,600

Together, this information demonstrates that consistent open enrollers are substantially more advantaged, relative to students whose participation in interdistrict choice is only temporary. It also suggests that the relatively advantaged nature of open enrollers demonstrated by figures 9 and 10 is mainly attributable to students who participate in the program year after year, as opposed to students whose participation is more transitory.

Figure 20 presents information on the academic achievement of participating students (see table A5 in the appendix for full results) and shows that consistent open enrollers have higher test scores. They score at about the sixtieth percentile, on average, whereas the mean achievement level of transitory participants falls below the statewide average.

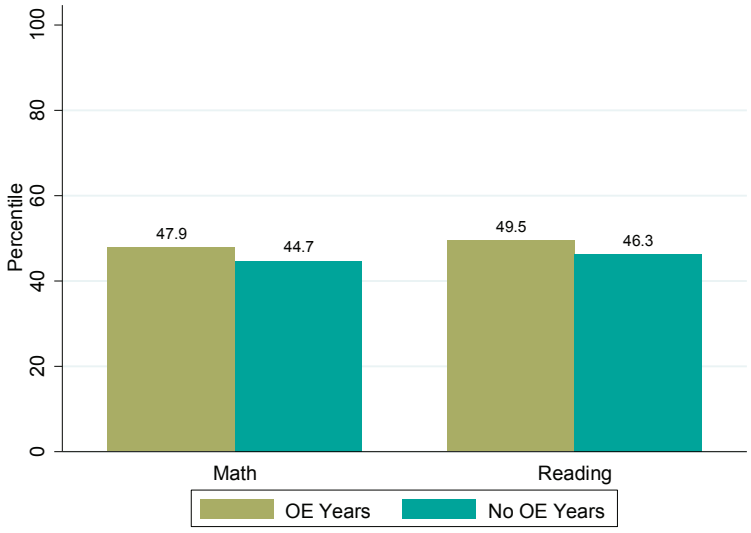
Figure 20. Average student achievement levels for consistent and transitory open enrollers, by subject



Note: Consistent open-enrollment participants are defined as those students observed open enrolling each year they are present in our data. Transitory open-enrollment participants are defined as those students who are observed open enrolling in at least one year and observed attending schools in their districts of residence in at least one year.

Figure 21 breaks down the achievement of transitory open enrollers by the years in which they do and do not open enroll. We see that transitory participants score noticeably worse in the years they attend school in their home district, compared to the years they open enroll. For example, in reading, students score at almost the state average in the years they participate in Ohio's interdistrict-transfer program but a few percentiles lower in the years they attend school in their home district. The math results reveal a similar disparity. This suggests that even transitory participants gain some benefit from open enrolling. We examine this possibility in more detail below.

Figure 21. Achievement levels of transitory open enrollers in years they do and do not open enroll, by subject



Takeaways

The data displayed in table 2 and figures 20 and 21 show that Ohio students use the state's open-enrollment program in different ways and that their academic results differ depending on their patterns of usage. Some students, whom we term consistent participants, use the program as a longer-term educational option. These students tend to be disproportionately advantaged from both a demographic and achievement standpoint compared to their counterparts who use interdistrict open enrollment less consistently. In some years, transitory participants attend school in their home district while in others they transfer out of their districts of residence. These students are noticeably less advantaged along multiple dimensions than their consistently participating peers. Together, these results indicate the importance of recognizing these two types of open-enrollment participants and the differences that distinguish them.

INTERDISTRICT TRANSFERS AND SCHOOL QUALITY

We turn now to exploring whether interdistrict open-enrollment participants in Ohio are gaining access to higher-quality educational options than they have available in their home districts. Table 3 presents the average characteristics of open enrollers' districts of residence and of their districts of attendance. It provides this information for all open enrollers and separately for white and black students who open enroll. We distinguish by race because, in Ohio as in many places, the average white student resides in a context that is different from that of the average black student, and these two groups may use open-enrollment programs in different ways.

Looking first at all open enrollers, we see that—compared to their districts of residence—the average open enroller's district of attendance is slightly higher performing, a distinction that holds on several common quality measures, including graduation rates, Ohio's Performance Index, ODE's estimate of district value added, and average student achievement. Specifically, compared to the district in which they live, the typical open enroller attends school in a district that scores about two points higher on Ohio's Performance Index, that has a slightly higher estimated value added, and in which the average student scores about three percentiles higher on state reading and math tests.

Table 3. Average district characteristics for open-enrollment participants

Characteristic	All students		White students		Black students	
	District of attendance	District of residence	District of attendance	District of residence	District of attendance	District of residence
Graduation rate	92.09	90.29	92.97	91.10	80.31	79.27
Performance Index	96.59	94.30	97.32	95.00	87.05	86.06
Value added	0.288	0.227	0.300	0.240	0.062	0.098
Reading achievement (percentile)	50.7	47.5	51.8	48.4	37.4	36.5
Math achievement (percentile)	50.6	47.2	51.7	48.2	36.7	35.8

Note: Author calculations from student-level data provided by ODE. The Performance Index is a continuous 0–120 scale measuring the district's overall student performance on math, reading, writing, science, and social studies assessments—see http://education.ohio.gov/getattachment/Topics/Data/Report-Card-Resources/Achievement-Measure/Technical-Documentation-PI-Score.pdf.aspx for details on the Performance Index. Ohio changed assessments during the time span covered by our data, which resulted in a statewide decline in the Performance Index. For the small number of observations that use data from both sides of that point—the vast majority of observations use data from a single side of that point—the difference in the Performance Index scores will slightly underestimate the true difference in the Performance Index score between students' districts of residence and attendance. District value-added estimates, which are publicly available on the ODE website, are calculated by SAS Institute Inc. for use in the state's accountability system. These are annual estimates of district contributions to student learning gains in math and reading from models that account for past student performance. The estimates are presented in Normal Curve Equivalent (NCE) units. See http://education.ohio.gov/getattachment/Topics/Data/Report-Card-Resources/Ohio-Report-Cards/Value-Added-Technical-Reports-1/Technical-Documentation-of-EVAAS-Analysis.pdf.aspx for comprehensive documentation of the value-added estimates. Average district achievement is calculated by the authors separately for each year using standardized student-level scale scores. Thus, the estimates are presented in student-level standard deviation units.

Differences in district quality by race

The results in the middle and right-hand columns of table 3—for white and black open enrollers, respectively—show that the quality differences between students' districts of residence and attendance are more pronounced for white students than they are for black students.[11] For example, black open enrollers experience smaller increases in average achievement levels between their districts of residence and districts of attendance than white students. Moreover, black students who participate in Ohio's interdistrict transfer program actually attend districts with slightly lower value added than their districts of residence, whereas white students attend districts with higher value added than the districts in which they reside.

Table 3 also shows that black open enrollers reside in districts that differ dramatically from the districts in which white open enrollers live. Compared to the resident district of the average white open enroller, the typical black student who open enrolls lives in a district with a substantially lower graduation rate, Performance Index score, district value added, and average achievement level. So, even on the measures with respect to which black students experience a quality increase via open enrollment, they still attend districts that rate far worse on these measures than those attended by white open enrollers. Our data cannot reveal the underlying source of these differences, but one potential explanation that the prior section suggests is that white and black students have different opportunities in terms of the districts into which they can plausibly transfer.

Changes in quality at the school level

It's important not only to compare districts but also individual schools—the schools that open enrollers leave behind and those into which they enroll. Unfortunately, our data do not identify the specific schools that students would have attended in their districts of residence had they not open enrolled. As a result, we cannot perform a school-level comparison that mirrors the district-level comparison in table 3. Instead, we take advantage of the fact that many open enrollers in our data do not move in one year but do move the following year, as the data specify the school they attended in each of these years. Thus, if we assume that open-enrolling students would have attended the same schools they did in the prior year had they remained in their districts of residence, we can gain some insight into whether open enrollment provides them with access to better schools. Of course, this approach means we're limited to analyzing transitory open-enrollment participants.

Table 4 presents the characteristics of the school that average students attend in the year they are first observed open enrolling alongside the schools they attended the prior year in their district of residence.[12] The left panel provides results for all open enrollers who meet the criteria for inclusion, while the middle and right panels show comparisons for white and black students. Looking at all open enrollers, we see that, on average, the schools that the students attend in the year they open enroll have a slightly higher Performance Index score and average achievement level than the school they attended the prior year, although the average student in both schools still performs below the state average. However, the schools that students open enroll into have lower value-added scores than those they attended the previous year, particularly in math. Considered together with the results in table 3, it appears that while students are open enrolling into higher-achieving districts, they are not gaining access to appreciably better schools. The value-added results indicate that students may actually be transferring into somewhat less effective schools.

Table 4. Average school characteristics for transitory open-enrollment participants, by open-enrollment status

School characteristic	All students		White students		Black students	
	OE school (current year)	Non-OE school (prior year)	OE school (current year)	Non-OE school (prior year)	OE school (current year)	Non-OE school (prior year)
Graduation rate	92.1	92.1	93.1	93.1	82.3	82.8
Performance Index	96.9	95.3	97.7	96.4	89.1	86.0
Value added, total	0.035	0.294	0.052	0.309	−0.192	0.182
Value added, reading	0.011	0.124	0.017	0.119	−0.101	0.130
Value added, math	0.059	0.465	0.088	0.499	−0.282	0.234
Reading achievement (percentile)	46.7	45.8	47.9	47.2	36.3	34.2
Math achievement (percentile)	46.1	45.0	47.4	46.5	35.1	32.7

Note: Author calculations from student-level data provided by ODE. For more on the school-performance measures please refer to the notes under table 3.

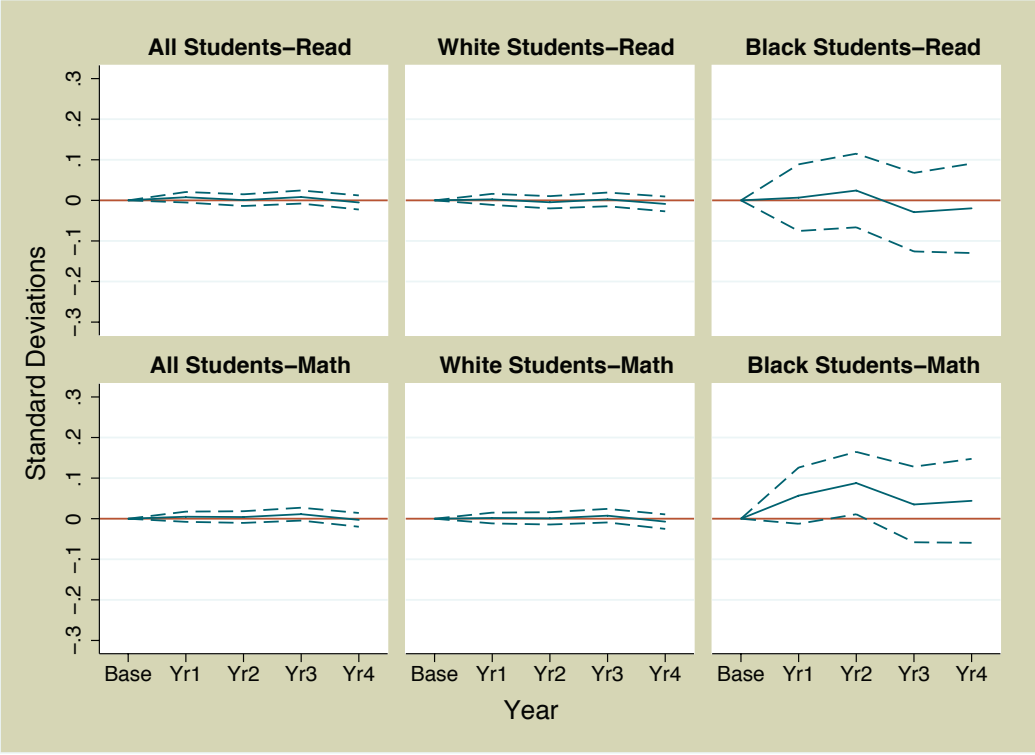
As for race, we see that in terms of the Performance Index and average achievement levels, black students fare better by changing schools than do white students. On the value-added metric, however, the (negative) difference between students' home-district school and the one they attend via open enrollment is larger for black than white students. Given that the value-added results are at odds with the other quality measures, it is difficult to state unequivocally whether families are using interdistrict open enrollment to gain access to higher-quality educational options. The results do, however, suggest that families are making decisions based on their perceptions of quality, and that those quality perceptions are informed by factors that are easier for families to observe or perceive, such as achievement levels, than is evidence of school effectiveness. Measures that are harder to understand—particularly value-added estimates—seem to play less of a role in these decisions, which is probably unfortunate, considering how many analysts believe that such measures are better indicators of school quality than average achievement levels.

OPEN-ENROLLMENT PARTICIPATION AND STUDENT ACHIEVEMENT

Given the wide variety of open-enrollment participants—and their participation patterns—no single analysis can fully depict the relationship between open enrollment and student achievement. Thus, we seek to examine this key relationship in several different ways. In doing so, however, we maintain our focus on consistent participants, as these individuals are likely to see the greatest benefit from interdistrict choice. We present achievement results for transitory open-enrollment participants in an appendix.

The first analysis explores whether consistent participants exhibit achievement gains throughout the period during which we observe them open enrolling. In particular, we compare their achievement scores in their first year to their own scores in each subsequent year.[13] Figure 22 presents the results separately for all students, white students, and black students for up to four years after a consistent open enroller was first observed open enrolling. The "all student" results indicate that, on average, students' scores do not appreciably change throughout the time they are observed open enrolling. The results for black students, however, provide some evidence of achievement growth over time, at least in math. Compared to the first year, their achievement in subsequent years is anywhere from 0.04 to 0.09 standard deviations higher, although only one estimate—the one for the third year—is statistically significant. Black students who consistently open enroll exhibit little change in their reading achievement, and white students show no meaningful change in either reading or math.

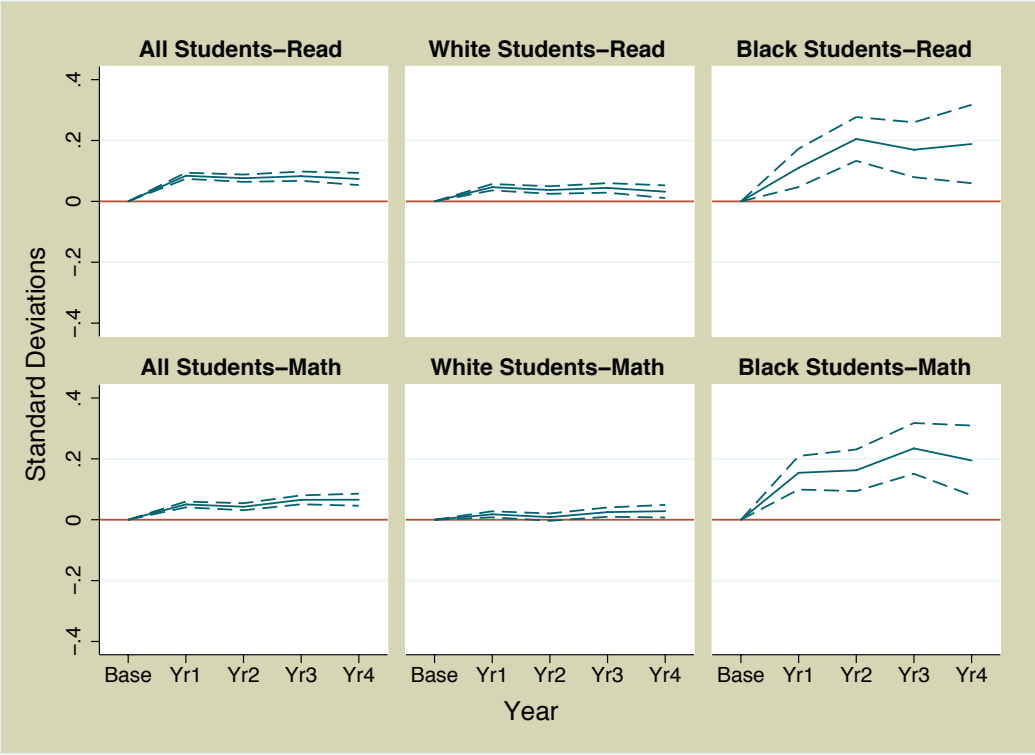
Figure 22. Over-time achievement changes for consistent open enrollers, by race and subject



Note: Figure presents estimated over-time achievement change (solid blue line) in standard deviation units from students' baseline year. The dashed blue lines represent the confidence interval for the estimated achievement changes. We can be confident that the estimated achievement changes are different from zero if both dashed lines are above (positive achievement change) or below (negative achievement change) the red horizontal line at zero. See the statistical appendix for full detail on specification of the model underlying this analysis.

Next, we compare the over-time achievement change of consistent open enrollers to the changes of students who never open enrolled.[14] The results are presented in figure 23. Using techniques that render open-enrollment participants and nonparticipants statistically indistinguishable in terms of baseline achievement levels, we see that consistent open enrollers score at substantially higher levels in subsequent years. In reading, the "all student" results demonstrate that the achievement gains of open enrollers are consistently 0.08 standard deviations—about three or four percentiles—greater than the gains of nonparticipants and all of these estimates are statistically significant. In math, the magnitude of the advantage for open enrollers is somewhat smaller—in the range of two or three percentiles—but all estimates are, again statistically significant.

Figure 23. Difference in over-time achievement changes between consistent open enrollers and non–open enrollers, by race and subject



Note: Figure presents estimated difference in over-time achievement change (solid blue line) between consistent open enrollers and non–open enrollers. Positive estimates indicate that consistent open enrollers exhibited greater gains than non–open enrollers, while negative estimates indicate the reverse. The dashed blue lines represent the confidence interval for the estimated achievement changes. We can be confident that the estimated achievement changes are different from zero if both dashed lines are above (positive achievement change) or below (negative achievement change) the red horizontal line at zero. See the statistical appendix for full detail on specification of the model underlying this analysis.

The results presented separately for white and black students demonstrate that the overall positive results are driven primarily by the large, positive estimates for black students who consistently open enroll. In both reading and math, black students who consistently open enroll exhibit achievement gains that are 0.11 to 0.23 standard deviations greater than the gains of black students who always attend school in their home district. These gains are not only statistically significant but also substantively large. The largest estimates are equivalent to moving from the fiftieth percentile to nearly the sixtieth percentile. Overall, our analysis of the

relationship between consistent open-enrollment participation and student achievement suggests that, at least for black students, transferring to a public school outside of one's district is associated with significant achievement gains.

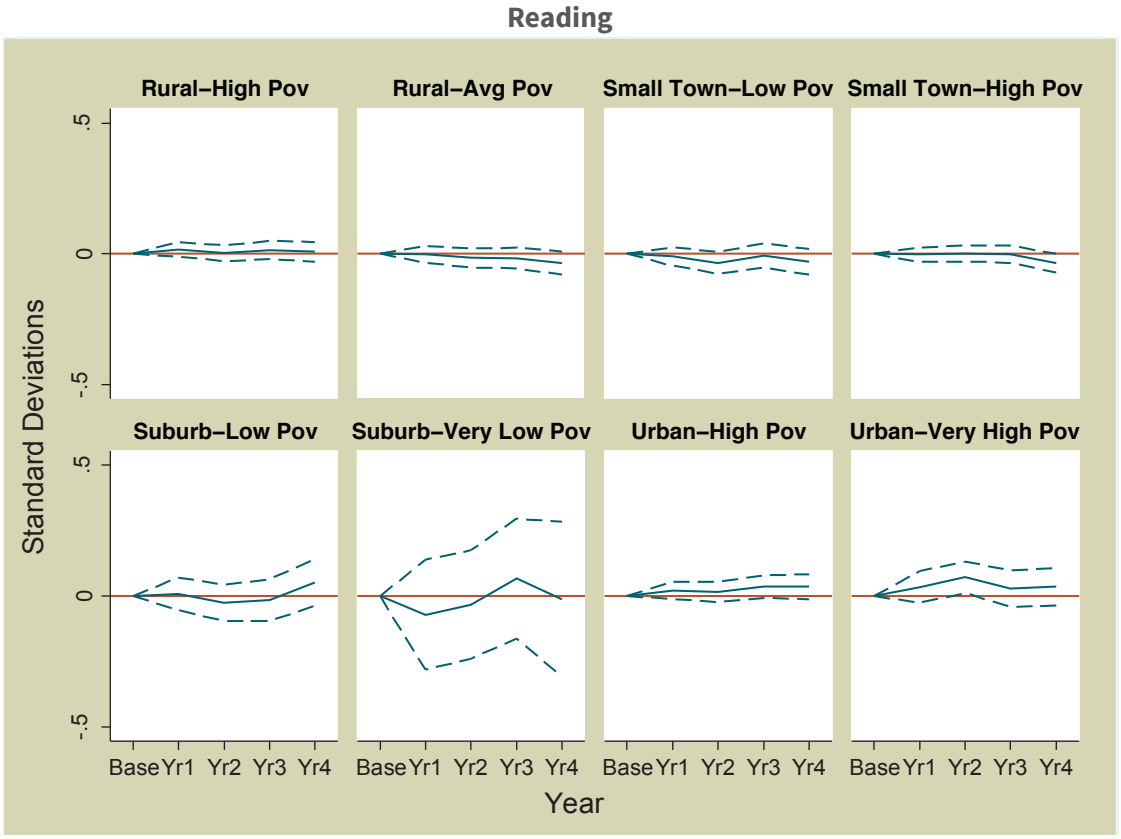
At first blush, the two sets of results we present in this section may seem contradictory. The results that compare consistent open enrollers' achievement to their own achievement in the first year show little appreciable achievement growth. Yet when we compare their achievement growth to that of students who never open enroll, we see substantial advantages for interdistrict transfer participants—particularly black students. Together, these results suggest that although consistent open enrollers do not exhibit large achievement gains relative to their own earlier achievement levels, they do not exhibit the relative achievement losses that our results suggest their nontransferring peers are likely experiencing.

Note that these results cannot be interpreted as the causal effect of open-enrollment participation on student achievement. We cannot rule out the possibility that unmeasured student characteristics, such as motivation or perseverance, lead students to have both higher achievement levels and an increased propensity to consistently open enroll. That said, the results are encouraging for proponents of interdistrict-choice policies and suggest the potential value of such programs.

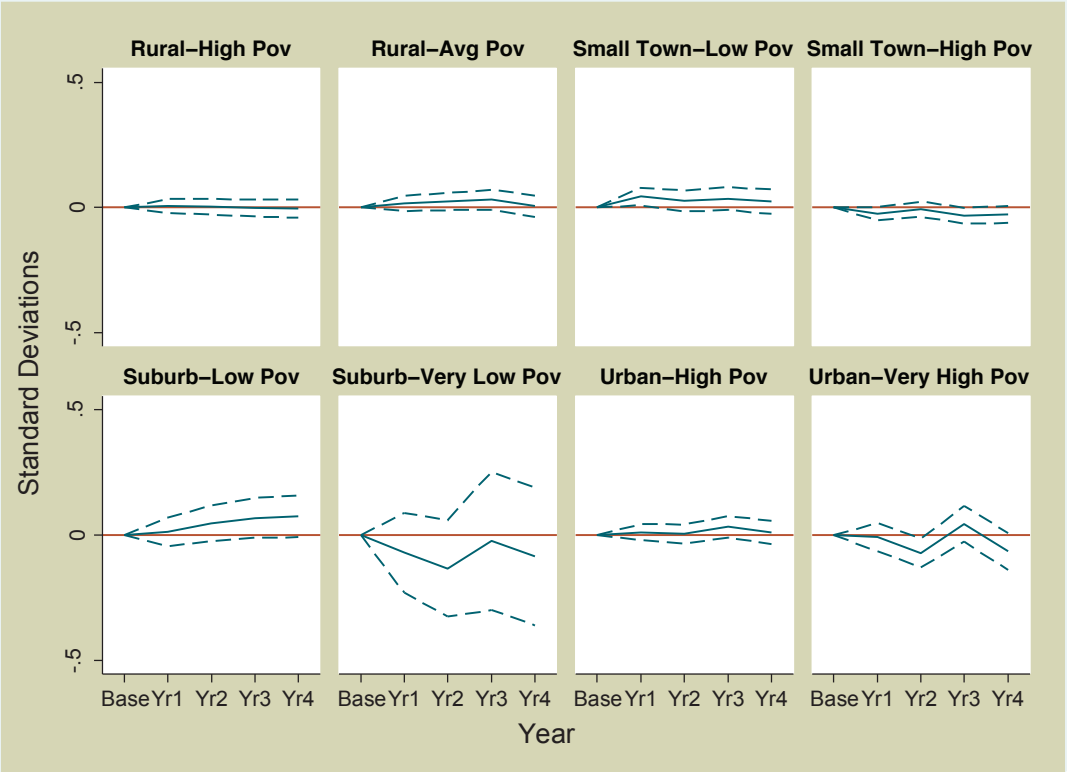
Results by region

There are reasons to think the relationship between consistent open-enrollment participation and student achievement could vary across different types of districts—urban, suburban, and rural. Figure 24 explores this possibility. In particular, it shows whether consistent participants exhibit achievement gains throughout the period of their open enrollment across ODE's eight district classifications.[15] The figure compares students' achievement scores in their first year to their own scores in each subsequent year. The figure shows that most estimates of average achievement in post-baseline years are not significantly different from zero.

Figure 24. Over-time achievement changes for consistent open enrollers, by urbanicity and subject



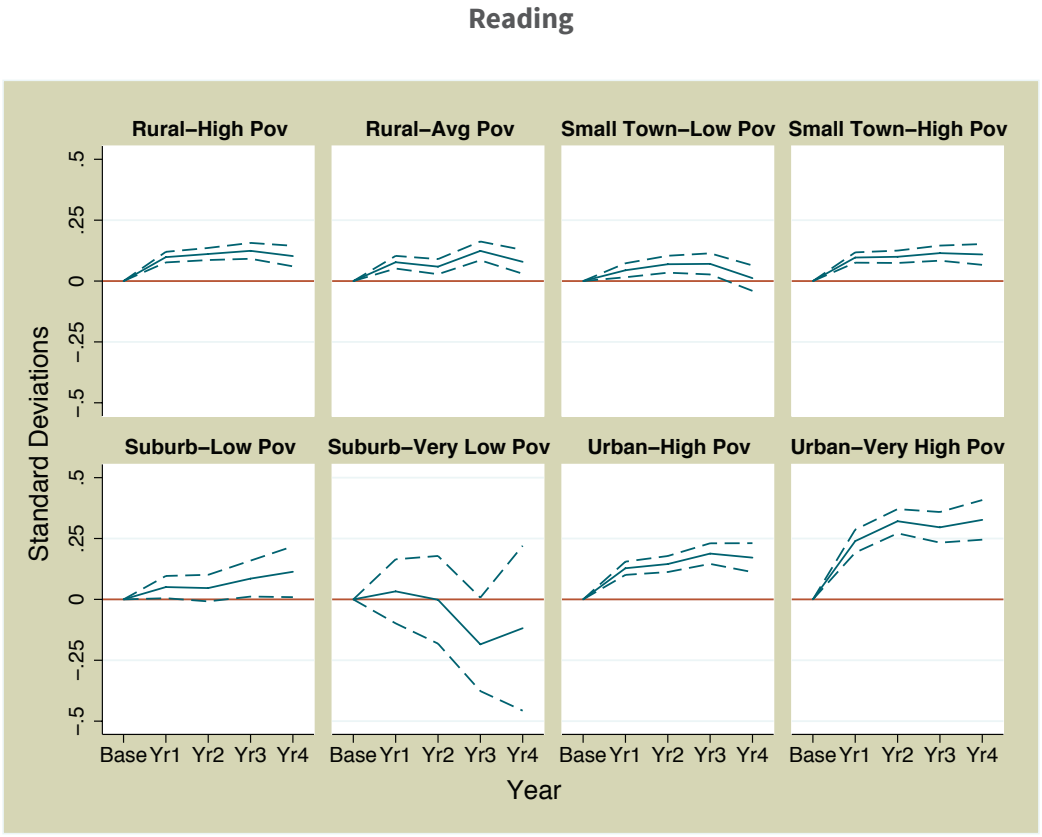
Math



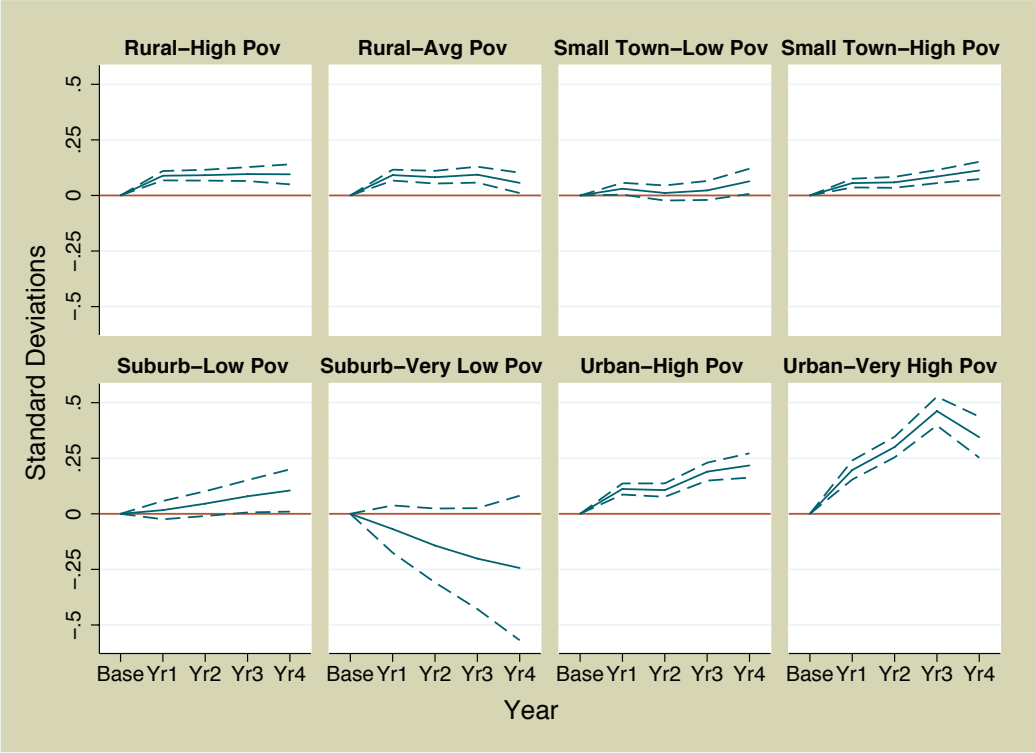
Note: Figure presents estimated over-time achievement change (solid blue line) in standard deviation units from students' baseline year. The dashed blue lines represent the confidence interval for the estimated achievement changes. We can be confident that the estimated achievement changes are different from zero if both dashed lines are above (positive achievement change) or below (negative achievement change) the red horizontal line at zero. See the statistical appendix for full detail on specification of the model underlying this analysis.

Figure 25 compares—separately for the same eight district types—the over-time achievement change of consistent open enrollers to the over-time changes of students who resided in the same district and never open enrolled.[16] We see that the open enrollers in urban districts show substantial achievement gains—on the order of 0.2 to nearly 0.5 standard deviations—compared to students who never exit such districts. The figure also presents suggestive evidence that students who open enroll out of low-poverty suburban districts may experience some achievement losses, compared to students who remain in those districts. Together, these results suggest that the urbanicity and poverty level of a student's district of residence are important factors in determining the achievement trajectory of an interdistrict-open-enrollment participant.

Figure 25. Difference in over-time achievement changes between consistent open enrollers and non–open enrollers, by urbanicity and subject



Math

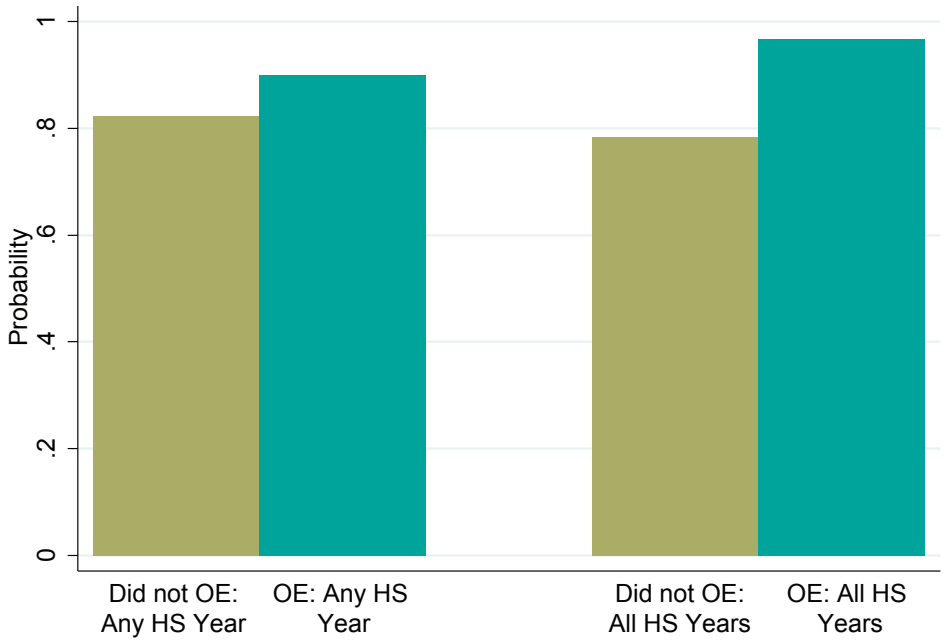


Note: Figure presents estimated difference in over-time achievement change (solid blue line) between consistent open enrollers and non–open enrollers. Positive estimates indicate that consistent open enrollers exhibited greater gains than non–open enrollers, while negative estimates indicate the reverse. The dashed blue lines represent the confidence interval for the estimated achievement changes. We can be confident that the estimated achievement changes are different from zero if both dashed lines are above (positive achievement change) or below (negative achievement change) the red horizontal line at zero. See the statistical appendix for full detail on specification of the model underlying this analysis.

OPEN-ENROLLMENT PARTICIPATION AND HIGH SCHOOL GRADUATION

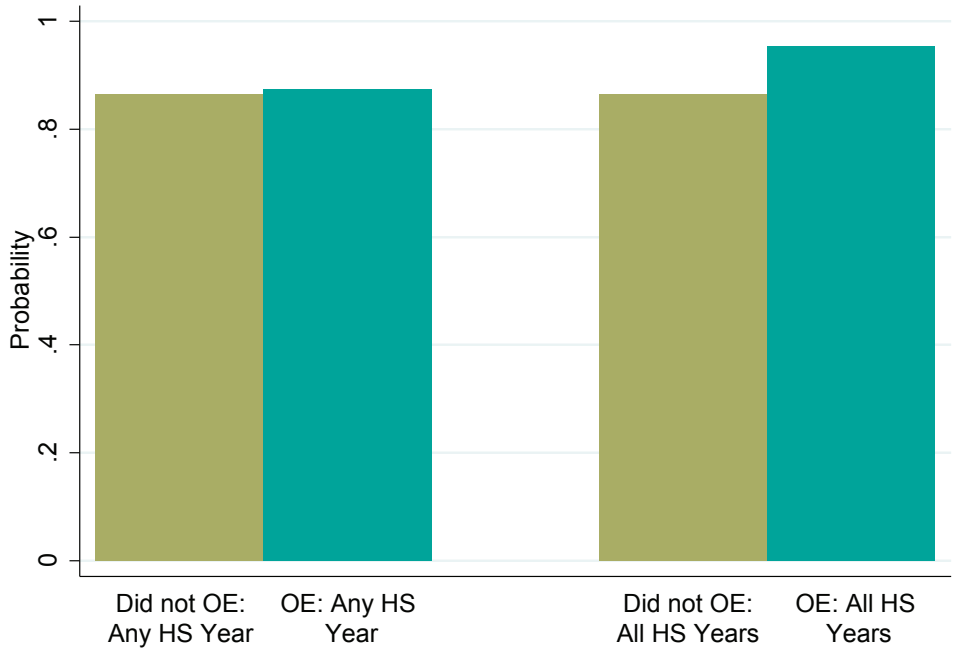
The final analysis examines the relationship between open-enrollment participation and high school graduation. Data availability constrains us to examining only a single cohort of high school entrants—those who entered ninth grade in 2010–11 and whose scheduled on-time graduation would have been the 2013–14 school year. For this cohort of students, we first isolate the set of individuals who open enrolled in eighth grade, as we want to analyze students who are familiar with and sufficiently motivated to participate in Ohio's open-enrollment program. Then, for these students, we compare the graduation rates of students who did and did not continue to open enroll throughout high school. In this analysis, we define two classes of high school open enrollers: (1) those who ever open enrolled during their high school years and (2) those who open enrolled throughout their entire high school careers. Figure 26 presents results separately for each of these groups.[17] See appendix table A14 for more detailed presentation of these results.

Figure 26. Probability of on-time graduation by open-enrollment status during high school (among students who open enrolled in eighth grade)



The results in the left panel of figure 26 show that—among students who open enrolled in eighth grade—students who open enroll at any point during high school are more likely to graduate on time than students who never open enroll. About 90 percent of students who ever open enroll during high school graduate on time, whereas approximately 82 percent of students who never open enroll (but did in eighth grade) do. The right panel shows an even bigger disparity when students who open enroll throughout their whole high school career are compared to students who open enrolled for only a portion or not at all. Nearly all students who open enrolled throughout high school—a full 97 percent—graduated on time; the analogous number for students who did not was about 80 percent.

Figure 27. Probability of on-time graduation by open-enrollment status during high school (among students who did not open enroll in eighth grade)



As a point of comparison, figure 27 presents a similar comparison for the set of students who did not open enroll in eighth grade. Mirroring the results discussed above, students who open enrolled throughout their high school years were about ten percentage points more likely to graduate on time than students who did not open enroll throughout the full period. However, students who open enrolled at some point during high school—but not throughout the full period—were similarly likely to graduate as students who never open enrolled.

Together, the results in figures 26 and 27 provide evidence of a positive relationship between open-enrollment participation and high school graduation, at least for the single cohort of students our data enabled us to examine.

CONCLUSION

These analyses produce three main conclusions. First, districts that choose not to accept open-enrolling students are very different, on average, from districts that do accept them. In general, districts that refuse interdistrict transfers are larger, more advantaged, and more racially and ethnically diverse than districts that accept open enrollers. These nonparticipating districts are disproportionately clustered in the suburbs surrounding Ohio's Big 8 urban areas, thus forming a series of "donuts" around the state that restrict the choices of students in urban areas.

Second, students who use interdistrict open enrollment are relatively advantaged on several dimensions, regardless of whether we compare them to the average student in the state or to pupils enrolled in their districts of residence. But the key difference is between those who use the program as a long-term educational option versus students who use it in a more transitory manner. The latter are much more similar to—even slightly less advantaged than—the average student in the state. For both consistent and transitory participants, our analyses provide evidence that students are using interdistrict choice to transfer to higher-achieving districts. However, our analyses suggest that transitory participants do not always realize substantial gains in actual school quality, particularly when school quality is defined in terms of value added. Unfortunately, data constraints prevent us from estimating school-level quality changes for consistent participants.

Finally, we see evidence that consistent open-enrollment participants experience achievement benefits from their cross-district transfers, compared to students who never open enroll. Further analysis shows that these gains are driven primarily by open enrollers who are black and/or residing in high-poverty urban areas. Additionally, our high school graduation analysis provides evidence of a positive relationship between open-enrollment participation and high school graduation for the single cohort of students that our data enabled us to examine.

Together, these findings create something of a paradox: those who are most likely to benefit from interdistrict choice are least likely to have access to the program. Policymakers should consider the implications of so many suburban districts surrounding Ohio's Big 8 districts opting out of the program and thus taking high-quality schooling options off the table for students who arguably need them most. That said, even in its current form, it is clear that Ohio's interdistrict open-enrollment program provides a valuable educational option for some students.

APPENDIX A: STATISTICAL METHODS

Relationship between open-enrollment participation and student achievement for transitory open-enrollment participants

We use the annual, student-level data described in the main body of the report to estimate the relationship between open-enrollment participation and student achievement via the following statistical model:

$$Y_{it} = \alpha + \delta O_{it} + \gamma_i + \varepsilon_{it} \quad \text{(S1)}$$

In this model, Y represents a measure of standardized achievement for student i at time t. This is modeled as a function of an overall intercept , an indicator for open-enrollment participation O, a student fixed effect , and an error term . We estimate this model separately for reading and math. We also estimate it separately for all transitory open-enrollment participants, white transitory open-enrollment participants, and black transitory open-enrollment participants.

Results from this model are presented in table A6 in the appendix. Finally, we estimate this model separately by geographic region, the results of which are presented table A11 in the appendix. In all cases, standard errors are clustered at the student level.

Analysis of temporal heterogeneity in the relationship between open-enrollment participation and student achievement for transitory open-enrollment participants

The model described above provides a single estimate of the relationship between open-enrollment participation and student achievement. That single estimate, however, could be masking important differences in achievement trends across time. To examine such possibilities, we take a year-by-year approach to analyzing the relationship between open-enrollment participation and student-achievement outcomes. Specifically, we estimate

$$Y_{it} = \alpha + \delta O_{it} + R_{it}\eta + (O_{it} * R_{it})\psi + \gamma_i + \varepsilon_{it} \quad \text{(S2)}$$

where Y represents a measure of standardized achievement for student i at time t. This is modeled as a function of an overall intercept , an indicator for open-enrollment participation O, a vector of dummies indicating years relative to initial open-enrollment participation R, an interaction between O and R, a student fixed effect , and an error term . We restrict the sample to observations no more than two years prior to initial open-enrollment participation and three years after initial open-enrollment participation. Standard errors are clustered by student.

Combining the estimated main effects of O and R with the estimated coefficients on the interaction between those terms allows us to construct over-time achievement trajectories for sample members. Moreover, we can construct those trajectories for years in which transitory open enrollers did and did not open enroll. We estimate this model separately for reading and math, and the results are presented in table A7 in the appendix. Separate results for white and black students are presented in table A8 in the appendix.

Analysis of over-time achievement gains for consistent open enrollers

To gain insight into the relationship between open-enrollment participation and student achievement for those students always observed open enrolling—we term them consistent participants—we estimate a model that compares their first observed achievement score to their scores in each subsequent year, up to six years after initial observation. Specifically, we estimate

$$Y_{it} = \alpha + A_{it}\pi + \gamma_i + \varepsilon_{it} \quad \text{(S3)}$$

where Y represents a measure of standardized achievement for student i at time t. This is modeled as a function of an overall intercept , a vector of indicators measuring the year relative to initial observation A, a student fixed effect , and an error term . As noted above, we restrict the sample to consistent open-enrollment participants, and we cluster standard errors at the student level.

We estimate this model separately for reading and math. We also estimate it separately for all consistent open-enrollment participants, white consistent open-enrollment participants, and black consistent open-enrollment participants. Results from this model are presented in figure 22 in the main body of the report. They are also presented in tabular format in table A9 in the appendix. Finally, we estimate this model separately by geographic region, the results of which are presented in figure 24 and table A12 in the appendix.

Comparison of achievement gains for consistent open enrollers to gains for students who never open enroll

In addition to comparing the over-time achievement scores of consistent open enrollers to their own baseline, we also perform an analysis in which we compare the over-time achievement change of consistent open enrollers to the over-time changes of students who never open enrolled. This provides a complementary view of the achievement trajectories of consistent open enrollers. In this analysis, we estimate

$$Y_{it} = \alpha + \delta O_i + A_{it}\pi + (O_i * A_{it})\psi + \omega Y_{it=0} + (Y_{it=0} * A_{it})\theta + \varepsilon_{it} \quad \text{(S4)}$$

where Y represents a measure of standardized achievement for student i at time t. This is modeled as a function of an overall intercept , an indicator that a student was a consistent open-enrollment participant O, a vector of indicators measuring the year relative to initial observation A, an interaction between O and A, a baseline measure of achievement , an interaction between and A to allow for heterogeneity in predictive power, and an error term . We cluster standard errors by student. Combining the estimated main effect of O with the estimated coefficients on the interaction between O and A estimates the differential achievement trajectories of consistent open enrollers, relative to students who never open enrolled.

We estimate this model separately for reading and math. We also estimate it separately for all students, white students, and black students. Results from this model are presented in figure 23 in the main body of the report. They are also presented in tabular format in table A10 in the appendix. Finally, we estimate this model separately by geographic region, the results of which are presented in figure 25 and table A13 in the appendix.

Open-enrollment participation and the probability of graduation from high school

Our analysis of the relationship between open-enrollment participation and high school graduation is based on a design that has been used to estimate the effect of charter high school attendance on high school graduation and postsecondary entry (for example, Sass et al. 2016). In our application, we limit the sample of students included in the analysis to those who open enrolled in eighth grade and then estimate the differential likelihood of high school graduation for those who did and did not open enroll in their high school years. The logic of this design is that by conditioning our sample to those students who open enrolled in

eighth grade, we are hopefully accounting for potential unobserved differences between students who do and do not open enroll. With this in mind, we estimate a model of the general form

$$G_i = \alpha + \delta O_i + X_i \beta + \varepsilon_i \quad \text{(S5)}$$

where on-time high school graduation G for student i is modeled as a function of an overall intercept , an indicator of open-enrollment participation during high school O, a vector of observable characteristics X from student i's eighth-grade year, and an error term . As the main body of the report makes clear, we estimate several variations of this general model. In particular, we estimate the following eight specifications:

1. O is defined as any open enrollment during high school, X contains eighth-grade school fixed effects, and students must be observed in our sample in tenth grade.
2. O is defined as any open enrollment during high school, X does not contain eighth-grade school fixed effects, and students must be observed in our sample in tenth grade.
3. O is defined as any open enrollment during high school, X contains eighth-grade school fixed effects, and students must be observed in our sample in twelfth grade.
4. O is defined as any open enrollment during high school, X does not contain eighth-grade school fixed effects, and students must be observed in our sample in twelfth grade.
5. O is defined as open enrollment during all high school years, X contains eighth-grade school fixed effects, and students must be observed in our sample in tenth grade.
6. O is defined as open enrollment during all high school years, X does not contain eighth-grade school fixed effects, and students must be observed in our sample in tenth grade.
7. O is defined as open enrollment during all high school years, X contains eighth-grade school fixed effects, and students must be observed in our sample in twelfth grade.
8. O is defined as open enrollment during all high school years, X does not contain eighth-grade school fixed effects, and students must be observed in our sample in twelfth grade.

The fact that our data on open-enrollment participation only go back to 2009–10 and that we only have high school graduation data through the 2013–14 school year constrains us to examining only a single cohort of high school entrants: those who entered ninth grade in 2010–11 and whose scheduled on-time graduation would have been the 2013–14 school year. Results from this analysis are presented in figure 26 in the main body of the report. As a point of comparison, figure 27 presents results from estimating the model presented in equation S5 over the set of students who did not open enroll in eighth grade. Results from this analysis are also presented in table A14 in the appendix.

APPENDIX B: TRANSITORY PARTICIPANT ACHIEVEMENT OUTCOMES

We begin by comparing the achievement scores of inconsistent participants in the years they open enroll to their own scores in the years they do not open enroll, and then we calculate the average of those within-student comparisons.[18] This analysis illumines whether students whose participation in open enrollment is transitory exhibit higher achievement in the years they open enroll, versus the years they remain in their resident district.

Table A6 in the appendix shows the results for all students, white students, and black students. The "all student" results indicate that, on average, students score slightly higher in the years they open enroll. The differences are very small, but it's somewhat reassuring that the estimates are not negative, given the potential disruptions that can come with changing schools under interdistrict open enrollment. The results in table A6 further illustrate that there are no systematic differences by race. Overall, these results are consistent with what we would expect, given the lack of meaningful differences in school quality for inconsistent open enrollers.

Table A6 provides a single estimate of the relationship between open-enrollment participation and student achievement, but that could mask important differences in achievement trends over time. For example, open enrolling students could do very poorly in the first year or two after they open enroll, but as they become accustomed to their new surroundings, they might exhibit substantial improvement. To examine such possibilities, we conduct an analysis that builds on the comparison in table A6. We take a year-by-year approach to analyzing the relationship between open-enrollment participation and student achievement.[19] For the years after initial open enrollment, we break down the results by students who do and do not continue to open enroll. This analysis is again restricted to inconsistent open-enrollment participants, as these are the only students for whom we have years in which they did and did not open enroll.[20] The results are presented in table A7 in the appendix.

There are two main takeaways from table A7. First, relative to the last year before open enrolling, students who maintain open enrollment participation generally exhibit slight achievement gains in math, but no meaningful changes in reading. Second, students who initially open enroll but subsequently return to their home district demonstrate achievement losses, compared to their final year before open enrolling. Together, these results suggest that the small positive relationship between open-enrollment participation and student achievement shown in table A6 are not entirely driven by achievement gains in the years that students open enroll. They are often driven by achievement losses exhibited by students who return to their districts of residence after open enrolling.[21]

Taken together, the results in tables A6 and A7 suggest that there is little meaningful relationship between open-enrollment participation and student achievement for inconsistent participants. These students exhibit slightly higher scores in the years they do open enroll versus those they do not, but the size of the difference is insignificant. In short, open enrollment seems to do inconsistent participants neither any good nor any harm.

Table A11 in the appendix compares—separately by urbanicity—the achievement scores of inconsistent participants in the years they open enroll to their own scores in the years they do not open enroll and then calculates the average of those within-student comparisons. The figure provides strong evidence that students who open enroll out of very high-poverty urban areas exhibit significantly higher achievement levels in the years they open enroll, compared to the years they attend school in their home district. The figure also

provides evidence that students exhibit increased achievement when they open enroll out of small towns (reading) and rural areas (math). The magnitude of these effects, however, is quite small.

Table A12 in the appendix explores whether consistent participants exhibit achievement gains throughout the period of their open enrollment. We compare their achievement scores in their first year to their own scores in each subsequent year. The figure shows that most estimates of average achievement in post-baseline years are not significantly different from zero.

APPENDIX C: TABLES

Table A1. District open-enrollment participation, by year

Year	Total districts N (%)	No OE N (%)	OE from adjacent districts N (%)	OE from any district N (%)
2012–13	613 (100.0)	139 (22.7)	70 (11.4)	404 (65.9)
2013–14	613 (100.0)	118 (19.2)	63 (10.3)	432 (70.5)
2014–15	613 (100.0)	115 (18.8)	57 (9.3)	441 (71.9)
2015–16	615 (100.0)	116 (18.9)	50 (8.1)	449 (73.0)

Source: ODE

Table A2. District characteristics, by open-enrollment participation and year

Characteristic	No OE	OE from adjacent districts	OE from any district	Big 8
	2012–13			
Mean enrollment	4,577	1,885	2,058	23,708
% Economically disadvantaged	30.1	44.7	46.0	88.0
% White	75.4	89.2	90.0	29.3
% Black	14.4	5.3	3.2	55.2
% Hispanic	3.2	2.6	2.8	7.4
% Other race	7.0	3.0	3.9	8.1
% Disabled	12.8	14.2	14.7	19.5
% ELL	2.1	0.9	0.7	4.9
Mean reading score	0.478	−0.162	−0.137	−2.387
Mean math score	0.517	−0.131	−0.155	−2.142
	2013–14			
Mean enrollment	4,440	1,648	2,208	23,542
% Economically disadvantaged	31.2	43.5	46.4	88.9
% White	74.1	91.4	88.8	28.9
% Black	14.8	3.9	4.0	54.7
% Hispanic	3.7	2.0	3.2	8.0
% Other race	7.4	2.7	4.1	8.5
% Disabled	12.8	14.1	14.8	19.5
% ELL	2.3	0.4	0.9	5.5
Mean reading score	0.546	−0.018	−0.148	−2.240
Mean math score	0.497	0.027	−0.142	−2.133
	2014–15			
Mean enrollment	4,479	1,643	2,186	24,168
% Economically disadvantaged	30.8	45.5	46.5	92.0
% White	73.4	90.9	88.3	28.3
% Black	14.9	4.2	4.0	54.2
% Hispanic	3.9	1.9	3.4	8.5
% Other race	7.7	2.9	4.2	8.9
% Disabled	12.5	12.7	13.9	18.8
% ELL	2.4	0.5	1.0	5.9
Mean reading score	NA	NA	NA	NA
Mean math score	NA	NA	NA	NA

Note: Author calculations using data from ODE.

Table A3. Student characteristics, by open-enrollment status and year

Characteristic	All years		2008–09		2011–12		2013–14	
	OE	Non-OE	OE	Non-OE	OE	Non-OE	OE	Non-OE
Gender (%)								
Male	49.9	51.6	49.6	51.6	49.9	51.5	50.0	51.5
Female	50.1	48.4	50.4	48.4	50.1	48.5	50.0	48.5
Race (%)								
White	86.2	72.6	87.4	73.6	86.1	72.5	85.2	71.4
Black	5.9	16.7	5.8	17.0	5.9	16.6	6.4	16.6
Hispanic	2.1	3.8	1.7	3.2	2.1	3.9	2.5	4.5
Other race	5.8	6.9	5.1	6.3	6.0	7.1	5.9	7.5
Grade (%)								
K–5	43.4	45.1	42.8	44.6	43.1	45.1	44.1	45.3
6–8	21.4	22.9	21.5	22.5	21.4	23.1	21.4	23.2
9–12	35.2	32.1	35.8	32.9	35.4	31.8	34.5	31.6
Economic disadvantage (%)	31.1	41.9	35.2	40.4	23.7	39.9	26.8	42.1
Gifted (%)	13.0	15.0	12.8	14.8	13.4	15.3	13.1	15.0
Limited English proficiency (%)	0.2	2.3	0.2	2.1	0.3	2.3	0.2	2.6
Disability status (%)	10.0	15.0	10.6	14.9	10.0	15.0	9.6	15.1
Achievement (SD units)								
Reading	0.101	−0.003	0.080	−0.002	0.098	−0.003	0.111	−0.004
Math	0.067	−0.002	0.043	−0.001	0.069	−0.002	0.079	−0.003

Note: Author calculations from student-level data provided by ODE.

Table A4. Open-enrollment transition percentages, by transition type

Characteristic	Open enrollers		Non–open enrollers	
	Continue open enrolling	Return to district of residence	Begin open enrolling	Stay in district of residence
All students	79.8	20.2	0.9	99.1
Gender (%)				
Male	79.8	20.3	0.9	99.1
Female	79.8	20.2	1.0	99.0
Race (%)				
White	80.8	19.2	1.1	99.0
Black	70.3	29.7	0.5	99.5
Hispanic	75.1	24.9	0.7	99.3
Other race	76.2	23.8	0.9	99.1
Economic disadvantage (%)				
Yes	68.5	31.5	0.9	99.1
No	86.5	13.5	0.7	99.3
Gifted (%)				
Yes	88.9	11.1	0.5	99.5
No	78.5	21.5	1.0	99.0
Limited English proficiency (%)				
Yes	65.5	34.5	0.2	99.8
No	79.8	20.2	1.0	99.0
Disability status (%)				
Yes	73.2	26.8	0.8	99.2
No	80.8	19.2	1.0	99.0

Note: Author calculations from student-level data provided by ODE.

Table A5. Mean achievement levels, by open-enrollment participation type, year, and subject

Participation type	N	Reading	Math
Consistent participants	*59,685*	*0.263*	*0.237*
Year 1	11,652	0.241	0.205
Year 2	10,216	0.262	0.236
Year 3	9,897	0.266	0.242
Year 4	12,720	0.282	0.256
Year 5	9,327	0.267	0.246
Year 6	5,873	0.257	0.243
Transitory participants	*240,389*	*−0.065*	*−0.104*
OE Years	85,186	−0.013	−0.052
No OE years	155,203	−0.094	−0.132

Note: Author calculations from student-level data provided by ODE. Achievement levels presented in student-level standard deviation units.

Table A6. Coefficient and standard error from OLS model containing student fixed effect predicting student achievement, by race and subject

	Reading	Math
	All students	
Open enroll	0.007**	0.010***
	(0.003)	(0.003)
N	240,389	240,258
N students	76,098	76,073
	White students	
Open enroll	0.007**	0.007**
	(0.003)	(0.003)
N	199,229	199,136
N students	62,711	62,690
	Black students	
Open enroll	0.007	0.024**
	(0.011)	(0.010)
N	19,137	19,113
N students	6,273	6,269

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model, student achievement is specified as the dependent variable and modeled as a function of a student fixed effect and an indicator of the year(s) that students open enrolled. The model is estimated over all observations of transitory open-enrollment participants, who are defined as those students who are observed open enrolling in at least one year and observed attending schools in their districts of residence in at least one year. See the statistical appendix for full detail on specification of the model underlying this analysis.

Table A7. Coefficient and standard error for year relative to one year prior to initial open enrollment from OLS model containing student fixed effect predicting student achievement, by continued open-enrollment status and subject

Year	OE years		Non-OE years		Difference	
	Reading	Math	Reading	Math	Reading	Math
	All students					
Two years prior to initial OE	NA	NA	−0.008	0.000	NA	NA
			(0.009)	(0.009)		
One year prior to initial OE	Omitted	Omitted	Omitted	Omitted	NA	NA
Year of initial OE	0.007	0.027***	NA	NA	NA	NA
	(0.009)	(0.010)				
One year after initial OE	0.009	0.029**	−0.020	−0.001	0.029*	0.030**
	(0.011)	(0.011)	(0.015)	(0.013)	(0.015)	(0.014)
Two years after initial OE	0.000	0.015	−0.045***	−0.027**	0.045***	0.042***
	(0.013)	(0.014)	(0.014)	(0.013)	(0.016)	(0.015)
Three years after initial OE	−0.042**	−0.026	−0.042***	−0.047***	0.001	0.021
	(0.017)	(0.017)	(0.015)	(0.016)	(0.020)	(0.019)
N	43,199	43,170	43,199	43,170	43,199	43,170
N students	17,985	17,973	17,985	17,973	17,985	17,973

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model student achievement is specified as the dependent variable and modeled as a function of a student fixed effect and an interaction term between an indicator of open-enrollment participation and a vector of dummies indicating the year relative to initial open enrollment. The model is estimated over all observations of transitory open-enrollment participants, who are defined as those students who are observed open enrolling in at least one year and observed attending schools in their districts of residence in at least one year. See the statistical appendix for full detail on specification of the model underlying this analysis.

Table A8. Coefficient and standard error for year relative to one year prior to initial open enrollment from OLS model containing student fixed effect predicting student achievement, by continued open-enrollment status, race, and subject

Year	OE years		Non-OE years		Difference	
	Reading	Math	Reading	Math	Reading	Math
	White students					
Two years prior to initial OE	NA	NA	−0.001	−0.004	NA	NA
			(0.010)	(0.010)		
One year prior to initial OE	Omitted	Omitted	Omitted	Omitted	NA	NA
Year of initial OE	0.011	0.027**	NA	NA	NA	NA
	(0.009)	(0.011)				
One year after initial OE	0.018	0.029**	−0.023	−0.005	0.041**	0.034**
	(0.012)	(0.013)	(0.016)	(0.015)	(0.017)	(0.015)
Two years after initial OE	0.004	0.008	−0.035**	−0.031**	0.039**	0.039**
	(0.014)	(0.015)	(0.015)	(0.015)	(0.017)	(0.016)
Three years after initial OE	−0.044**	−0.033*	−0.049***	−0.058***	0.005	0.025
	(0.018)	(0.019)	(0.017)	(0.018)	(0.022)	(0.021)
N	35,715	35,690	35,715	35,690	35,715	35,690
N students	14,770	14,758	14,770	14,758	14,770	14,758
	Black students					
Two years prior to initial OE	NA	NA	−0.037	0.043	NA	NA
			(0.032)	(0.032)		
One year prior to initial OE	Omitted	Omitted	Omitted	Omitted	NA	NA
Year of initial OE	−0.002	0.051*	NA	NA	NA	NA
	(0.034)	(0.030)				
One year after initial OE	−0.038	0.021	0.014	0.018	−0.053	0.003
	(0.044)	(0.038)	(0.055)	(0.047)	(0.057)	(0.049)
Two years after initial OE	−0.072	0.028	−0.104**	0.011	0.032	0.017
	(0.055)	(0.048)	(0.048)	(0.048)	(0.059)	(0.056)
Three years after initial OE	−0.056	0.035	−0.061	−0.010	0.005	0.045
	(0.071)	(0.062)	(0.050)	(0.053)	(0.076)	(0.072)
N	3,196	3,190	3,196	3,190	3,196	3,190
N students	1,415	1,413	1,415	1,413	1,415	1,413

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model, student achievement is specified as the dependent variable and modeled as a function of a student fixed effect and an interaction term between an indicator of open-enrollment participation and a vector of dummies indicating the year relative to initial open enrollment. The model is estimated over all observations of transitory open-enrollment participants, who are defined as those students who are observed open enrolling in at least one year and observed attending schools in their districts of residence in at least one year. See the statistical appendix for full detail on specification of the model underlying this analysis.

Table A9. Coefficient and standard error on year relative to initial observation for consistent open enrollers from OLS model containing student fixed effect predicting student achievement, by race and subject

Year	All students		White students		Black students	
	Reading	Math	Reading	Math	Reading	Math
Year 1	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Year 2	0.008	0.005	0.002	0.002	0.011	0.057
	(0.007)	(0.006)	(0.007)	(0.007)	(0.042)	(0.035)
Year 3	0.001	0.004	−0.005	0.001	0.024	0.088**
	(0.007)	(0.007)	(0.008)	(0.008)	(0.046)	(0.039)
Year 4	0.008	0.011	0.002	0.008	−0.029	0.035
	(0.008)	(0.008)	(0.009)	(0.009)	(0.049)	(0.047)
Year 5	−0.005	−0.003	−0.009	−0.007	−0.020	0.044
	(0.009)	(0.009)	(0.009)	(0.009)	(0.056)	(0.053)
Year 6	−0.023**	−0.012	−0.032***	−0.019*	0.017	0.036
	(0.010)	(0.010)	(0.011)	(0.011)	(0.065)	(0.059)
N	59,685	59,662	54,254	54,235	1,656	1,655
N students	20,585	20,584	18,581	18,583	655	653

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model, student achievement is specified as the dependent variable and modeled as a function of a student fixed effect and a series of dummies indicating the year relative to the first observation for the student. The model is estimated over all observations of consistent open-enrollment participants, who are defined as those students observed open enrolling each year they are present in our data. See the statistical appendix for full detail on specification of the model underlying this analysis.

Table A10. Coefficient and standard error on interaction between open-enrollment participation and year relative to initial observation from OLS model containing baseline test score predicting student achievement, by race and subject

Year	All students		White students		Black students	
	Reading	Math	Reading	Math	Reading	Math
OE x Year 1	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
OE x Year 2	0.084***	0.050***	0.047***	0.018***	0.110***	0.154***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.032)	(0.028)
OE x Year 3	0.076***	0.043***	0.037***	0.009	0.205***	0.163***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.037)	(0.035)
OE x Year 4	0.083***	0.065***	0.044***	0.025***	0.170***	0.234***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.046)	(0.043)
OE x Year 5	0.074***	0.066***	0.032***	0.028***	0.189***	0.195***
	(0.010)	(0.010)	(0.011)	(0.011)	(0.066)	(0.058)
OE x Year 6	0.077***	0.058***	0.037*	0.016	0.040	0.048
	(0.021)	(0.019)	(0.021)	(0.020)	(0.129)	(0.091)
N	2,866,855	2,864,310	2,131,251	2,129,530	439,146	438,532
N students	1,104,694	1,104,165	812,726	812,350	173,627	173,478

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model, student achievement is specified as the dependent variable and modeled as a function of an indicator for open-enrollment participation, a baseline test score, a series of variables indicating the year relative to the baseline year, and a series of interactions between the open-enrollment indicator and the variables indicating the year relative to baseline. The model also contains a series of interactions between the baseline test score and the variables indicating the year relative to baseline in order to allow the predictive power of the baseline test score to vary across years. The model is estimated over observations from consistent open-enrollment participants—defined as those students observed open enrolling each year they are present in our data—and students never observed open enrolling. See the statistical appendix for full detail on specification of the model underlying this analysis.

Table A11. Coefficient and standard error for open-enrollment indicator from OLS model containing student fixed effect predicting student achievement, by urbanicity and subject

	Rural: high poverty	Rural: average poverty	Small town: low poverty	Small town: high poverty	Suburban: low poverty	Suburban: very low poverty	Urban: high poverty	Urban: very high poverty
	Reading achievement							
Open enroll	0.010	0.018*	0.028***	0.006	0.019	−0.010	0.001	0.051***
	(0.009)	(0.010)	(0.010)	(0.008)	(0.013)	(0.028)	(0.011)	(0.014)
N	45,270	29,481	36,512	50,372	20,714	4,783	34,626	18,562
N students	17,807	11,995	15,583	20,851	8,744	2,092	14,363	7,883
	Math achievement							
Open enroll	0.006	0.024**	0.014	−0.001	−0.005	0.005	0.018*	0.089***
	(0.009)	(0.010)	(0.011)	(0.007)	(0.012)	(0.029)	(0.010)	(0.013)
N	45,262	29,471	36,500	50,344	20,700	4,777	34,605	18,530
N students	17,798	11,992	15,578	20,839	8,740	2,089	14,356	7,879

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model, student achievement is specified as the dependent variable and modeled as a function of a student fixed effect and an indicator of the year(s) that students open enrolled. The model is estimated over all observations of transitory open-enrollment participants, who are defined as those students who are observed open enrolling in at least one year and observed attending schools in their districts of residence in at least one year. See the statistical appendix for full detail on specification of the model underlying this analysis.

Table A12. Coefficient and standard error on interaction between open-enrollment participation and year relative to initial observation from OLS model containing baseline test score predicting student achievement, by urbanicity and subject

	Rural: high poverty	Rural: average poverty	Small town: low poverty	Small town: high poverty	Suburban: low poverty	Suburban: very low poverty	Urban: high poverty	Urban: very high poverty
	Reading achievement							
Year 1	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Year 2	0.017	−0.001	−0.010	−0.003	0.009	−0.071	0.022	0.035
	(0.014)	(0.017)	(0.018)	(0.014)	(0.032)	(0.106)	(0.017)	(0.031)
Year 3	0.003	−0.016	−0.034	0.002	−0.026	−0.032	0.016	0.072**
	(0.015)	(0.018)	(0.021)	(0.015)	(0.035)	(0.105)	(0.020)	(0.030)
Year 4	0.015	−0.016	−0.006	−0.001	−0.015	0.067	0.036*	0.028
	(0.018)	(0.020)	(0.024)	(0.017)	(0.041)	(0.116)	(0.022)	(0.036)
Year 5	0.008	−0.035	−0.030	−0.036*	0.053	−0.013	0.035	0.036
	(0.019)	(0.022)	(0.025)	(0.018)	(0.045)	(0.150)	(0.024)	(0.037)
Year 6	−0.014	−0.029	−0.038	−0.056***	0.005	0.233	−0.017	0.043
	(0.022)	(0.025)	(0.031)	(0.021)	(0.053)	(0.183)	(0.028)	(0.048)
N	13,187	9,531	7,213	15,027	2,738	299	8,365	3,316
N students	4,545	3,223	2,603	5,199	1,072	140	2,998	1,284
	Math achievement							
Year 1	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Year 2	0.006	0.016	0.044**	−0.024*	0.014	−0.070	0.012	−0.008
	(0.014)	(0.016)	(0.018)	(0.014)	(0.029)	(0.081)	(0.016)	(0.028)
Year 3	0.003	0.024	0.026	−0.007	0.047	−0.133	0.005	−0.071**
	(0.016)	(0.018)	(0.021)	(0.016)	(0.036)	(0.098)	(0.019)	(0.029)
Year 4	−0.001	0.031	0.035	−0.032**	0.069*	−0.023	0.033	0.045
	(0.017)	(0.020)	(0.023)	(0.016)	(0.041)	(0.139)	(0.022)	(0.036)
Year 5	−0.005	0.006	0.024	−0.028	0.075*	−0.085	0.010	−0.065
	(0.018)	(0.022)	(0.025)	(0.018)	(0.042)	(0.139)	(0.024)	(0.038)
Year 6	−0.043	0.000	−0.004	−0.025	0.067	0.168	−0.002	0.019
	(0.023)	(0.024)	(0.029)	(0.020)	(0.051)	(0.207)	(0.027)	(0.044)
N	13,184	9,526	7,207	15,023	2,737	298	8,364	3,314
N students	4,544	3,225	2,601	5,199	1,071	140	2,998	1,285

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model, student achievement is specified as the dependent variable and modeled as a function of a student fixed effect and a series of dummies indicating the year relative to the first observation for the student. The model is estimated over all observations of consistent open-enrollment participants, who are defined as those students observed open enrolling each year they are present in our data. See the statistical appendix for full detail on specification of the model underlying this analysis.

Table A13. Coefficient and standard error on interaction between open-enrollment participation and year relative to initial observation from OLS model containing baseline test score predicting student achievement, by urbanicity and subject

	Rural: high poverty	Rural: average poverty	Small town: low poverty	Small town: high poverty	Suburban: low poverty	Suburban: very low poverty	Urban: high poverty	Urban: very high poverty
	Reading achievement							
OE x Year 1	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
OE x Year 2	0.098***	0.077***	0.044***	0.097***	0.051**	0.033	0.128***	0.239***
	(0.011)	(0.013)	(0.015)	(0.011)	(0.023)	(0.067)	(0.014)	(0.024)
OE x Year 3	0.111***	0.059***	0.069***	0.100***	0.046*	−0.002	0.145***	0.321***
	(0.013)	(0.016)	(0.018)	(0.013)	(0.028)	(0.092)	(0.017)	(0.025)
OE x Year 4	0.124***	0.124***	0.071***	0.115***	0.085**	−0.185*	0.188***	0.296***
	(0.017)	(0.020)	(0.022)	(0.016)	(0.038)	(0.098)	(0.022)	(0.032)
OE x Year 5	0.103***	0.079***	0.012	0.109***	0.114**	−0.118	0.172***	0.327***
	(0.022)	(0.025)	(0.027)	(0.022)	(0.053)	(0.173)	(0.030)	(0.042)
OE x Year 6	0.138***	0.127**	0.087	0.170***	0.024	0.060	0.162***	0.380***
	(0.044)	(0.050)	(0.056)	(0.043)	(0.106)	(0.330)	(0.055)	(0.100)
N	275,138	177,397	303,997	332,146	555,086	430,633	377,460	414,565
N students	107,312	69,160	120,343	133,004	225,897	173,691	158,456	177,102
	Math achievement							
OE x Year 1	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
OE x Year 2	0.089***	0.092***	0.030**	0.056***	0.017	−0.069	0.112***	0.197***
	(0.011)	(0.012)	(0.014)	(0.010)	(0.021)	(0.054)	(0.013)	(0.022)
OE x Year 3	0.091***	0.082***	0.011	0.059***	0.046	−0.143*	0.107***	0.300***
	(0.012)	(0.015)	(0.017)	(0.013)	(0.028)	(0.085)	(0.015)	(0.024)
OE x Year 4	0.096***	0.094***	0.023	0.085***	0.079**	−0.201*	0.190***	0.462***
	(0.016)	(0.018)	(0.022)	(0.015)	(0.037)	(0.116)	(0.021)	(0.033)
OE x Year 5	0.095***	0.057**	0.064**	0.113***	0.105**	−0.244	0.218***	0.345***
	(0.023)	(0.023)	(0.029)	(0.020)	(0.049)	(0.166)	(0.028)	(0.047)
OE x Year 6	0.148***	0.113**	0.078	0.111***	−0.009	0.091	0.189***	0.487***
	(0.023)	(0.023)	(0.029)	(0.020)	(0.049)	(0.166)	(0.028)	(0.047)
N	275,017	177,298	303,830	332,007	554,733	430,283	376,861	413,850
N students	107,275	69,131	120,288	132,947	225,800	173,638	158,312	176,889

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model, student achievement is specified as the dependent variable and modeled as a function of an indicator for open-enrollment participation, a baseline test score, a series of variables indicating the year relative to the baseline year, and a series of interactions between the open-enrollment indicator and the variables indicating the year relative to baseline. The model also contains a series of interactions between the baseline test score and the variables indicating the year relative to baseline in order to allow the predictive power of the baseline test score to vary across years. The model is estimated over observations from consistent open-enrollment participants—defined as those students observed open enrolling each year they are present in our data—and students never observed open enrolling. See the statistical appendix for full detail on specification of the model underlying this analysis.

Table A14. Point estimate and standard error of relationship between high school open-enrollment participation and high school graduation, by eighth-grade open-enrollment status and extent of high school open-enrollment participation

	Any HS OE				All HS OE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Open enrolled in eighth grade							
Open enroll	0.110***	0.078***	0.066***	0.054***	0.177***	0.183***	0.094***	0.104***
	(0.015)	(0.018)	(0.012)	(0.015)	(0.011)	(0.012)	(0.009)	(0.010)
N	3,399	3,250	3,186	3,059	3,399	3,250	3,186	3,059
	Did not open enroll in eighth grade							
Open enroll	0.022***	0.010*	−0.008*	−0.009**	0.105***	0.088***	0.044***	0.038***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.015)	(0.015)	(0.012)	(0.012)
N	115,662	111,126	107,778	104,494	115,662	111,126	107,778	104,494
Observables	X	X	X	X	X	X	X	X
School FE		X		X		X		X
Observed tenth grade	X	X			X	X		
Observed twelfth grade			X	X			X	X

Note: *p<0.10; **p<0.05; ***p<0.01. Results of model estimated using student-level data provided by ODE. In the regression model, on-time high school graduation is specified as the dependent variable and modeled as a function of an indicator of open-enrollment participation during high school and a vector of observable characteristics from the student's eighth-grade year. Results in top panel obtained when sample is restricted to students who open enrolled in eighth grade. Results in bottom panel obtained when sample is restricted to students who did not open enroll in eighth grade.

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ENDNOTES

1 Studies have also examined the relationship between interdistrict open enrollment and racial or socioeconomic segregation levels (Carlson 2014; Powers, Topper, and Silver 2012; and Institute of Metropolitan Opportunity 2013), as well as residential location decisions and housing prices (Brunner, Cho, and Reback 2012).

2 In addition to the studies examining the effect of interdistrict open enrollment on participants, work by Welsch and Zimmer (2012) examines the systemic effects—also referred to as competitive effects—of interdistrict open enrollment in Wisconsin. This analysis finds districts that lose large numbers of students to open enrollment in a given year exhibit increased test scores the following year, which the authors interpret as evidence of positive competitive effects of interdistrict choice.

3 In 2003, the state added a mandatory open-enrollment policy requiring districts to allow nonresident students to enroll in alternative schools in the district. Thus, Ohio is considered to have both voluntary and mandatory open-enrollment programs. This report focuses on the voluntary one.

4 See http://education.ohio.gov/getattachment/Topics/Finance-and-Funding/Finance-Related-Data/Tuition-Letters-and-Rates/TUITION_RATE_FY17.xlsx.aspx for district tuition rates in 2016–17.

5 The constitutionality of this requirement is unclear, however, because the United States Supreme Court decision in *Parents Involved in Community Schools v. Seattle School District No. 1* struck down school-assignment policies that considered the race of individual students. There is little indication, however, that this factor is enforced in any way.

6 Our analysis of district participation is based on annual records maintained by ODE from the 2012–13 school year through the 2015–16 school year. ODE also collects and makes publicly available data on a wide range of district characteristics, such as enrollment levels, racial and ethnic composition, socioeconomic composition, and measures of student achievement. We merged these data on district characteristics with the data on district participation in Ohio's open-enrollment program to conduct the analyses presented in this section.

7 In terms of ODE's district classifications, approximately 70 percent of districts classified as suburban—and nearly 90 percent of very-low-poverty suburban districts—do not accept interdistrict transfers. And about 40 percent of districts classified as urban with high student poverty refuse out-of-district transfers. In contrast, only 2 percent of districts classified as rural or small town do not accept open-enrolling students.

8 Analyses of economic disadvantage are potentially limited by the Community Eligibility Provision (CEP), which provides broad eligibility for subsidized lunch—the primary measure of economic disadvantage—in districts and schools with large proportions of economically disadvantaged students. This broad eligibility can threaten the validity of district- and, especially, student-level measures of economic disadvantage in CEP districts. In response to this validity threat, we replicated all analyses incorporating economic-disadvantage measures using a sample excluding students from CEP districts. The results are nearly identical to those using the full sample of students and are available upon request.

9 All achievement analyses are based on students in grades 3–8.

10 This series of analyses only includes students who discontinue open enrollment and return to their home district; students who discontinue open enrollment and enroll in a community school are excluded from the analysis.

11 We break out results for only white and black students because too few students of other races and ethnicities open enroll in order to draw meaningful conclusions.

12 This approach could result in a comparison of students' home-district elementary schools with their middle schools in the districts into which they open enroll. Data indicate that the number of comparisons are relatively small compared to "elementary-to-elementary" or "middle-to-middle" comparisons. Furthermore, such comparisons are only problematic if middle schools are systematically different from elementary schools on the characteristics included in our analysis.

13 We perform this comparison by estimating an OLS model predicting student achievement that contains student fixed effects and a series of dummies indicating the year relative to the first observation for the student. These results are presented in table A9 in the appendix. See the statistical appendix for full detail on specification of the model underlying this analysis.

14 We perform this comparison by estimating an OLS regression model predicting student achievement that contains an indicator for open-enrollment participation, a baseline test score, a series of variables indicating the year relative to the baseline year, and a series of interactions between the open-enrollment indicator and the variables indicating the year relative to baseline. The model also contains a series of interactions between the baseline test score and the variables indicating the year relative to baseline in order to allow the predictive power of the baseline test score to vary across years. See the statistical appendix for full detail on specification of the model underlying this analysis. Tabular presentation of these results can be found in table A10 in the appendix.

15 Tabular presentation of these results can be found in table A12 in the appendix.

16 Tabular presentation of these results can be found in table A13 in the appendix.

17 The results in figure 26 are based on a regression model that accounts for the school that a student attended in eighth grade and requires the student to be observed in our data in tenth grade. This requirement is intended to account for students who, instead of open enrolling in high school, may have chosen to attend private school and thus exit our data. In such cases students are not necessarily nongraduates because they may have graduated from private schools. Additional results are presented in table A14.

18 Technically, we do this by estimating a regression model containing a student fixed effect and an indicator of the year(s) that students open enrolled. See the statistical appendix for full detail on specification of the model underlying this analysis.

19 Technically, we estimate an OLS model predicting student achievement that contains a student fixed effect and an interaction term between an indicator of open-enrollment participation and a vector of dummies indicating the year relative to initial open enrollment. See the statistical appendix for full detail on specification of the model underlying this analysis.

20 Specifically, the sample is restricted to students who have data in the years surrounding initial open-enrollment participation.

21 We also examined whether these patterns meaningfully differ for white and black students. These results, which are presented in table A8 in the appendix, show no systematic differences in results across races.

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