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The Role of School-Based Transportation in School Choice: Evidence from Detroit

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Abstract

In school choice systems, many families face geographic constraints. Yet, there is limited evidence on the association between school-based transportation and students' school choice, especially in fragmented transportation contexts. Using unique data on Detroit kindergarten students' eligibility and access to school-based transportation, we find that students with access to a bus at a school—either a traditional or shuttle-style bus—were 4-5 percentage points more likely to enroll in that school. The association was greater for traditional buses in higher-crime neighborhoods and for shuttle-style buses for farther-away choices. We did not find that this association differed by block-group-level household car ownership. Our findings suggest that school-based transportation can increase school choice access, depending on policy design and contextual factors.

Keywords: school transportation, school choice, school bus, discrete choice model

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The Role of School-Based Transportation in School Choice: Evidence from Detroit

Despite the expansion of school choice throughout the U.S, where families live has continued to constrain their school choices. Distance to school options, availability of public and school-based transportation, and personal transportation resources like a car influence whether families consider schools of choice and their ultimate enrollment in those schools (Bell, 2007; Edwards, 2021; Mandic et al., 2023; Stein et al., 2021; Trajkovski et al., 2021; Valant & Lincove, 2023). Prior research demonstrates that distance is a strong and persistent factor in whether students enroll in a school (e.g., Altenhofen et al., 2016; Goldring & Hausman, 1999; Trajkovski et al., 2021). The availability of school transportation could moderate this relationship between distance and school choice (Sattin-Bajaj, 2022). However, the availability of school-sponsored transportation is not the same as student eligibility or accessibility to that transportation. For instance, if school bus stops are far from where a student lives, they may not reasonably see the bus as a viable transportation resource.

This paper examines the relationship between school transportation and school choice with a unique set of data on school-based transportation in Detroit. Detroit is a choice-intensive context, and school-based transportation policies differ among the Detroit Public Schools Community District (DPSCD), Detroit charter schools, and suburban schools that Detroit students attend (Lenhoff et al., 2022). We assembled a dataset of school-based transportation policies for nearly all schools attended by Detroit students in the 2021-22 school year, including whether they offer a school bus, their criteria for school bus eligibility, the type of transportation (i.e., traditional buses that pick students up near their homes or shuttle-style buses that run pre-set routes). For shuttle-style buses, we also collected the location of bus stops. We used these data to answer the following research questions:

1. What is the association between school-based transportation and Detroit kindergarten students' fall 2021 school choices?

2. To what extent does the association between school-based transportation and school choices differ based on car access, neighborhood safety, and distance-to-choice?

3. To what extent do these associations differ for traditional school buses versus shuttle-style school buses?

We combined the transportation policy data with student-level administrative data to identify where students were eligible for or had reasonable access to school transportation. We then construct choice sets for each student based on the schools attended by their neighbors and use a discrete choice model to estimate the association between school-based transportation and school choices.

We find when kindergarten students had access to a school bus at a school—either traditional or shuttle-style bus—they were 4-5 percentage points more likely to enroll in that school. The association was greater for traditional buses in higher-crime neighborhoods and for shuttle-style buses for farther-away choices. We did not find that this association differed by block-group-level household car ownership. These findings suggest that school-based transportation can modestly increase students' access to schools of choice, though this will depend to an extent on whether transportation policies are designed to address other barriers such as distance and neighborhood safety.

Literature Review

Although distance from school and enrollment in schools of choice has increased significantly in the last several decades, school transportation usage has not increased at the same rate. Nationally, about the same percentage of students ride the school bus today – 38% – as they did in the 1960s (Kontou et al., 2020). As students have enrolled in schools further from home, more have relied on their families to drive them rather than walk or bike. School transportation

availability can therefore create inequity in who has access to educational opportunity (Bierbaum et al., 2021; Lenhoff et al., 2022; Speroni & Lenhoff, 2023).

Families prefer schools close to home, but considerations of distance are not only about convenience; rather, families consider the impact of travel on family life and their children's developmental needs (Bell, 2007). Long or challenging commutes can have a negative effect on student academic and behavioral outcomes, like attendance and chronic absenteeism (Cordes et al., 2022; Stein et al., 2021; Stein & Grigg, 2019). Families balance their desire for proximity with other preferences and are sometimes willing to enroll in schools far from home if they are perceived as higher quality (He & Giuliano, 2018). However, the ability to enroll in faraway schools is strongly influenced by family socioeconomic conditions, with low-income families often being unable to travel longer distances due to lack of a personal car, lack of social resources to help with school transport, and lack of time (Gabay-Egozi, 2016; Lenhoff et al., 2022; Valant & Lincove, 2023).

School transportation can moderate the relationship between distance and enrollment by supplementing family and public transportation resources. Three key studies have examined the relationship between school transportation offerings and enrollment in schools of choice. Using data on New York City kindergarten students, Trajkovski et al. (2021) found that school bus eligibility increased the likelihood of enrollment, especially for zoned and charter schools. In a prior study on Detroit, Edwards (2021) found that students were more likely to enroll in their assigned school if they lived in areas with greater poverty and less car ownership. The study incorporates an indicator for transportation eligibility at a student's assigned DPSCD school but does not include transportation information for Detroit charter schools or suburban schools. Finally, Valant and Lincove (2023) use Census block-group data to proxy for family car access in

New Orleans and find that both distance and car access are associated with school preferences and choices.

Our study builds on these prior findings in two ways. First, we capture system-wide data on eligibility and reasonable access to school-based transportation in a fragmented policy context, broadening the existing evidence on the role of school-based transportation in school choice. This includes distinguishing between transportation availability and eligibility or access and examining two different approaches to school buses: traditional school bus routes and shuttle-style bus routes (discussed in greater detail below).

Second, we consider heterogeneity in the relationship between school-based transportation and school choice by factors that could mediate that relationship. In addition to the distance-to-choice (Trajkovski et al., 2021), we consider heterogeneity by car ownership (Valant & Lincove, 2023) and neighborhood crime (Burdick-Will et al., 2023). For car ownership, families who own cars may be less responsive to the availability of school-based transportation than those who do not. Yet, even if a family owns a car, they may not be able to use it regularly for bringing their children to and from school, or the availability of a school bus might help in the case of conflicting work and school schedules or serve a helpful backup transportation option (Lenhoff et al., 2022). For crime, families may be more interested in using a school bus if they feel comfortable with their children walking to or waiting at the bus stop, especially if the stop is far from home (Lenhoff et al., 2022). At the same time, farther-away stops could be appealing for families who view their immediate surroundings as unsafe (Burdick-Will et al., 2023). In the following section, we describe the data and methods we used for the study.

Methodology

Study Context

We focus on the public school choices of students who live in Detroit. Detroit has a fragmented school choice landscape, with Detroit students eligible to enroll in their zoned school with Detroit Public Schools Community District (DPSCD), a different neighborhood school in DPSCD through intradistrict choice, a DPSCD magnet school, a charter school within or outside the city borders, or a school in many suburban districts that choose to enroll nonresident students through interdistrict choice (Lenhoff, 2020; Singer, 2020). Kindergarten students are not enrolled in their residentially-assigned neighborhood school by default: whether families enroll their children in the neighborhood school or choose an alternative (i.e., through intradistrict choice, interdistrict choice, charter schools, or magnet schools), they are required to actively engage in a process that requires enrollment paperwork (Singer, 2022). Overall, only about a quarter of Detroit students attend their residentially-assigned neighborhood public school (Singer, 2020).

There is little transparency or regulation in Detroit's school choice system, and the landscape for school transportation is equally fragmented. There is no centralized system for offering transportation or determining eligibility and no requirement for providing transportation. Schools are generally not required to offer school-sponsored transportation to students enrolling in schools of choice unless the student qualifies for transportation through special education services or McKinney-Vento designation for students experiencing homelessness.

Generally, there are two types of school-based transportation offered by Detroit schools: traditional school buses and shuttle-style school buses (Singer et al., 2020). Both types of school-based transportation make use of the classic yellow school buses; what differs is the way they design their routes. Table 1 provides an overview.

Table 1

School-Based Transportation for K-8 Students in Detroit

	Traditional School Bus	Shuttle-Style School Bus	No Transportation
Description	The school bus picks up students at bus stops that are based on Detroit students' residential address.	The school bus takes a prespecified route with stops where Detroit students can board the bus.	The school does not provide any form of school transportation for Detroit students.
Common Variations or Conditions	• Door-to-door pick up or stops within walking distance of a student's home (e.g., 0.25mi). • Limited to students living a certain distance away from the school, or within a certain geographic area. • Limited number of total spots offered.	• One route or multiple routes. • Citywide or regionally concentrated routes. • Transportation between campuses of schools in the same charter network. • Stops at specified cross-streets or at landmarks or businesses.	-

Traditional-style buses set routes according to students' home address and pick up students at a spot within 0.25 miles of their home. Some schools offering traditional-style buses impose eligibility requirements, such as attending one's assigned school or living a certain distance to or from the school. For example, DPSCD offers traditional-style school bus transportation to all K-8 students who attend their assigned neighborhood school and live 0.75 miles or farther away from the school within the assignment zone. For charter schools, traditional school bus eligibility was often restricted to students living relatively close to the school (e.g., within 3 miles).

In contrast, shuttle-style buses run routes with pre-set bus stops, like a public bus route. Students are welcome to board the bus at any of these pre-set stops, and while routes may be set to an extent in response to residential patterns, they are not specifically adjusted to pick up students close to their homes. Importantly, schools with shuttle-style school buses vary in the number of bus stops. Some schools offer one route while others offer many, and the number of total shuttles stops provided to students in Detroit ranges from a few as 4 to more than 250.

Table 2 shows the transportation modes provided by Detroit elementary schools overall and disaggregated by school type. All DPSCD neighborhood schools offer a school bus to students living in the assignment zone (and living at least 0.75 miles away from that school). Only a few DPSCD elementary/middle magnet schools provide transportation. For Detroit charter schools, 16% offer traditional school buses and 22% offer shuttle-style transportation, but most do not provide transportation. For suburban charter schools, 19% provide shuttle-style buses, 2% provide traditional buses, and the large majority provide no transportation. Finally, only 4% of all suburban traditional public schools attended by Detroit students provide them with school-based transportation.

Table 2
School-Based Transportation by School Type

	All	DPSCD Neighborhood	DPSCD App/Exam	Detroit Charter	Suburban Traditional Public	Suburban Charter
Traditional	75 (22%)	59 (100%)	3 (21%)	8 (16%)	3 (2%)	2 (3%)
Shuttle-Style	26 (8%)	-	-	11 (22%)	3 (2%)	13 (19%)
None	234 (70%)	-	11 (79%)	31 (62%)	139 (96%)	53 (78%)
Total	*336 (100%)*	*59 (100%)*	*14 (100%)*	*50 (100%)*	*145 (100%)*	*68 (100%)*

Sample and Data

Kindergarten Student Sample

We use student-level administrative records of all students who live in Detroit and attend any public school in Michigan. The data include student demographics, the school in which they are enrolled, and their residential census block. We included all kindergarten students who lived in

Detroit in 2021-22 and were enrolled in a public school.[1] Characteristics of these students can be found in Table 3.

Table 3
Characteristics of Detroit Kindergarten Students

Variable	N	Mean	Std. dev.	Min	Max
Economically Disadvantaged	6,544	0.92	-	0	1
Special Education Recipient	6,544	0.07	-	0	1
English Learner	6,544	0.09	-	0	1
Female	6,544	0.49	-	0	1
Black	6,544	0.83	-	0	1
Hispanic	6,544	0.09	-	0	1
Other Race/Ethnicity	6,544	0.07	-	0	1
Distance to School (mi)	6,544	4.13	4.50	0.07	43.18
DPSCD Neighborhood School	6,544	0.30	-	0	1
DPSCD App/Exam School	6,544	0.09	-	0	1
Detroit Charter	6,544	0.29	-	0	1
Suburban TPS	6,544	0.13	-	0	1
Suburban Charter	6,544	0.19	-	0	1
Number of Schools in Choice Set	6,544	76.93	24.94	9	135

Note: Summary statistics in this table are for the 6,544 Detroit kindergarten students included in the study.

Transportation Availability and Eligibility/Access

We conducted an audit of school transportation policies, calling each school enrolled by any Detroit student in 2021-22 to confirm the transportation offered (summarized in Table 1 above), any rules for eligibility, and specific bus stop locations for shuttle-style routes. We geo-coded the shuttle-style bus stop locations to determine each student's distance from all those schools' bus stops.

[1] We exclude students who attended a virtual school, alternative school, or special education center-based school, given that the dynamics of choice and role of transportation will differ for these schools. We also exclude any student who is missing their residential block data, because we are unable to construct a choice set or calculate distances for these students. See Appendix A for a comparison of the included and excluded students.

Based on DPSCD policy and the policies and bus stop data we collected from each other school or district that enrolls Detroit students, we differentiated between schools "offering" school-based transportation and students being "eligible" for or having "access" to that transportation. Schools offer school-sponsored transportation for all students if there is any kind of school bus at the school for general education students. Therefore, all DPSCD neighborhood schools offer transportation for all students, but no DPSCD magnet schools do. Similarly, all charter or suburban schools that offered any transportation to Detroit resident students offer transportation.

Our eligibility/access definition, however, goes beyond whether a bus is available, accounting for either students' formal eligibility for the bus or their reasonable ability to access it. For traditional school buses, eligibility rules (e.g., enrolling in one's assigned school, living the required distance to or from the school) determine whether students can ride the bus. For schools that offer shuttle-style buses, we considered students to have "access" to the bus if they live at most 1 mile from the nearest bus stop. This distance parameter is an important aspect of our research design, as it helps us categorize students as having access to the bus only if they live within a reasonable distance from a bus stop. Without this parameter, any student in Detroit would be technically "eligible" to ride the bus even though realistically they might be unable to easily get to a bus stop (e.g., if they lived ten miles away). We prefer the 1-mile definition based on a separate analysis of survey data showing that students who frequently ride shuttle-style buses to school live around 1 mile on average from the nearest stop (see Appendix B for additional details). However, we also analyze our data using more restricted definitions of shuttle-style bus access (i.e., 0.25 miles, 0.50 miles, and 0.75 miles to the nearest stop) and incorporate results related to these alternative definitions in the findings section.

We applied these definitions to create three transportation variables. First, we created a binary variable indicating whether students are offered transportation at a school. Second, we created a binary variable indicating whether students are eligible for or have access to transportation, using the definitions and parameters discussed above. Third, we create a categorical variable, differentiating whether students are eligible for a traditional school bus, have access to a shuttle-style bus (based on the parameters discussed above), or have no school bus eligibility/access.

Other Variables

In addition to the transportation variable, we included a set of variables to use as covariates in our analysis. First, we created variables that capture school characteristics. We created dummy variables to indicate the school type for each school: neighborhood DPSCD school, DPSCD magnet school, Detroit charter school, suburban charter school, and suburban traditional public school. We also created variables to capture the racial and socioeconomic demographics of each school: the percentage of students designated by the state as "economically disadvantaged" (based on their eligibility for free school lunches or participation in other social services), the percentage of Black students and the percentage of Hispanic students. Finally, we used the Michigan School Index Score—which combines data on student proficiency, student growth, and other factors (e.g., attendance) to assign an overall quality score for accountability purposes—as a proxy for school quality.[2]

[2] The Michigan School Index score is a composite ranking of each school based on student proficiency, student growth, and other indicators. We use the 2018-19 Michigan School Index scores because we require prior scores rather than contemporaneous (i.e., 2021-22) scores to account for characteristics predating the school choice, and 2019-20 and 2020-21 scores were impacted by disruptions to regular assessment during the COVID-19 pandemic. See the Michigan School Index System guide for additional details.

Second, we created variables to account for the spatial and social factors that influence school choices. We used students' residential locations and the location of schools to calculate a distance-to-choice variable, measuring the as-the-crow-flies distance from student's homes to each school. We also calculated the share of students' neighbors who attended each of their choices, to account for the potential influence of peer choices.

Third, we included contextual data to account for factors that might mediate or moderate the relationship between school transportation and school choice. We collected block-group household car ownership rates from the Census Bureau as a proxy for the likelihood students might have access to a car in their neighborhood (Valant & Lincove, 2023). We also collected the total number of violent crimes in a student's neighborhood in 2021 from the Detroit Police Department to account for neighborhood safety (Burdick-Will et al., 2023).

We discuss our preferred and alternative definitions of a student's "neighborhood" below when describing the construction of choice sets. All neighborhood-level variables (e.g., share of neighbors attending each choice, neighborhood violent crime) are aligned to our definition of a neighborhood as used in the construction of choice sets.

Analysis

Student Choice Sets

To create student choice sets, we draw inspiration from Trajkovski et al.'s (2021) study as well as the broad literature suggesting that social networks influence school selection (Angelucci et al., 2010; Burdick-Will et al., 2020; Singer, 2022). We define a student's choice set as all schools offering kindergarten and attended by at least one student in their neighborhood (of any grade), plus their assigned school and chosen school. We define students' neighborhoods based on a 1-mile radius around their residential block. As shown previously in Table 2, the average

kindergarten student had about 77 schools in their choice set, though this varied from as few as 9 schools to as many as 135 schools.[3]

For robustness, we define students' choice sets two other ways. First, we used Census tracts as neighborhood boundaries instead of the 1-mile radius. Second, we created unbounded choice sets (i.e., any school attended by a Detroit kindergartener is a choice, as in Edwards [2021]). We reanalyzed the data using the resulting alternative choice sets and found similar results across these specifications (see Appendix C).[4]

Table 4 shows the characteristics of the 3,901 unique choice sets among Detroit kindergarteners in 2021-22. The values summarized in this table represent the average characteristics of schools in choice sets, so the mean shows the average of those averages, and the minimum and maximum highlight the range in average characteristics. In the average choice set, 48% of students' choices offered some form of transportation, though this varied among choice sets, from 20% of choices offering transportation to 68% offering transportation. Likewise, in the average choice set, students have transit eligibility/access at 8% of schools in their choice set, though this ranges from 0% to 26%.

[3] Students' neighbors are, on average, not highly concentrated in one school within a student's choice set. On average, the top-ranked choice for neighbor enrollment in a student's choice set (i.e., the school with the largest percentage of neighbors enrolled) enrolls only about 20% of their neighbors. For students with smaller choice sets, neighbors are more concentrated in fewer schools, but their enrollment patterns remain diffuse. For example, for students with choice set sizes two standard deviations below the mean (27 choices), 38% of neighbors attend the top-ranked choice for neighbor enrollment, and around 19% attend the second-ranked choice for neighbor enrollment.

[4] We find larger point estimates for marginal effects in the model that uses Census tracts instead of the 1-mile radius. Census tracts as the choice set narrows the number of choices: they are typically geographically smaller than 1-mile radii and which include fewer choices on average (Appendix X). A possible interpretation is that if parents are considering fewer schools and have more capacity to learn about transportation options for that smaller set of schools, transportation may be even more likely to influence the decision. That said, the estimates across choice set alternatives are not statistically significantly distinguishable from each other. Interpretations such as these are purely speculative.

Table 4

Characteristics of Detroit Kindergarten Choice Sets, 2021-22

Variable	N	Mean	Std. dev.	Min	Max
Distance-to-Choice (mi)	3,901	8.88	1.18	3.01	12.17
Pct. of Neighbors Attending Choice	3,901	0.015	0.007	0.007	0.111
MI School Index Score (2019)	3,901	43.84	3.43	34.81	62.14
DPSCD Neighborhood School	3,901	0.30	0.06	0.08	0.52
DPSCD App/Exam School	3,901	0.09	0.03	0.00	0.33
Detroit Charter	3,901	0.29	0.05	0.13	0.67
Suburban TPS	3,901	0.13	0.06	0.00	0.40
Suburban Charter	3,901	0.19	0.05	0.00	0.36
Transportation Offered	3,901	0.48	0.05	0.20	0.68
Transportation Eligible	3,901	0.08	0.03	0.00	0.26

Note: Summary statistics in this table are for the 3,901 unique choice sets for Detroit kindergarten students in 2021-22.

Discrete Choice Model

We employed a discrete choice model (McFadden, 1974) to estimate the likelihood that a student would enroll in a school within their choice set given the school's transportation resources. We estimated a model to estimate the probability that for a given student (*i),* their chosen school (*Y)* will be choice *k,* as a function of choice characteristics (*Z)*, based on the following equation:

$$\Pr(Y_{ik}=k) = e^{Z_{ik}\beta} / \Sigma_k e^{Z_{ik}\beta}$$

where

$$Z_{ik}\beta = \beta_1(\text{Transportation ity/Access}_{ik}) + \beta_2(\text{School Characteristics}_k) + \beta_3(\text{Distance to Choice}_{ik}) + \beta_4(\text{Pct. Neighbors at Choice}_{ik}) + \mu_i + \varepsilon_{ik}$$

Our coefficient of interest is β_1, which will indicate the association between school-based transportation and school choice. We estimate models with both the binary eligibility/access variable and the categorical eligibility/access variable by school transit type. In the model with the binary eligibility/access variable, we also include the transportation "offered" variable, to be sure that we are disentangling eligibility/access from simply offering transportation. As shown in the equation above, we also control for school characteristics of each choice (school type, racial and

socioeconomic demographics, and school quality), as well as the distance-to-choice and share of neighbors attending the choice. The model also includes student fixed effects (μ), allowing for a within-choice-set analysis.

Using the results from the models, we calculate the marginal effects of transportation eligibility/access, holding the other variables constant at their mean values. The marginal effects indicate the increase in the likelihood that a student will choose a school if they are eligible for or have access to school transportation, which provides a clearer interpretation of the results than logit coefficients or odds-ratios (Howell-Moroney, 2023).

We also estimate models that include interactions between the school transportation variable and three variables that represent potential moderators or mediators. We interact transportation eligibility with block-group household car ownership rate (a potential proxy for household car ownership), hypothesizing that the association between choice and transportation may be weaker for students who are more likely to have car access (Valant & Lincove, 2023). We also interact transportation eligibility with the number of neighborhood violent crimes, to assess the extent to which neighborhood safety could impact students' interest in a bus (Burdick-Will et al., 2023). For both car ownership and violent crime, we use standardized variables (i.e., looking at the association with a standardized one-unit increase in car ownership rates or the number of violent crimes). Finally, we interact transportation eligibility with the distance-to-choice variable, hypothesizing that access to a school bus could have a greater association for those who want to choose farther-away schools (Trajkovski et al., 2021).[5]

Findings

The Association Between School-Based Transportation and School Choice

[5] We also estimated a model that interacted transportation eligibility with distance and distance-squared, to consider a non-linear relationship, though we did not find substantially or statistically significantly different results.

Table 5 shows the results of our main estimates. Column 1 shows the results using the binary transportation eligibility/access variable, and Column 2 shows the results using the categorical variable for traditional bus eligibility versus shuttle-style bus access.

Table 5
Discrete Choice Model

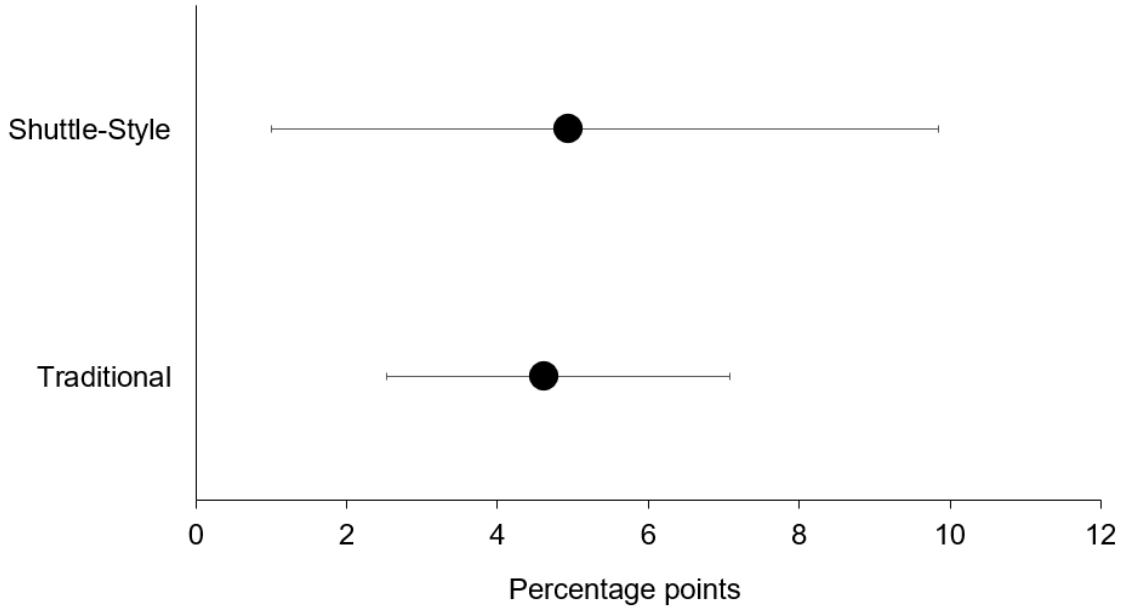
	(1) Transportation Eligibility/Access	(2) Eligibility/Access by Type
Choice Type (ref=DPSCD neighborhood)		
DPSCD app/exam	-0.16*	-0.15*
Detroit charter	0.07	0.08*
Suburban charter	0.30***	0.31***
Suburban TPS	-0.25**	-0.23***
Choice Demographics		
Pct. Economically Disadvantaged+	0.08**	0.07**
Pct. Black+	0.12***	0.12***
Pct. Hispanic+	0.09***	0.09***
Pct. of Neighbors Attending Choice+	0.36***	0.36***
Distance to Choice (mi)	-0.17***	-0.17***
MI School Index Score (2019)	0.01***	0.01***
Transp. Offered	-0.02	-
Transp. Eligible	0.25***	-
Transp. Eligibility Type (ref=none)		
Traditional school bus	-	0.23***
Shuttle-style bus	-	0.25***
N students	6,544	6,544
N student-observations	468,091	468,091

Note: The table displays logit coefficients from the discrete choice model. Average marginal effects for transportation eligibility variables (Column 2) are shown in Figure 1.

**p<0.05, **p<0.01, ***p<0.001*

The results show a positive and statistically significant association between transportation eligibility/access and school choice. The strength of this association is similar for both traditional buses and shuttle-style buses. As shown in Figure 1, this translates to a 4-5 percentage point (pp) increase in the likelihood that student will choose a school if they are eligible for the bus at that school. Importantly, the coefficient for transportation offered is statistically indistinguishable from zero, reinforcing that the positive association between transportation and choice is driven entirely by a student's actual eligibility/access (rather than the general availability of transportation).

***Figure 1**: Marginal Effects of Transportation Eligibility/Access by Transportation Type*



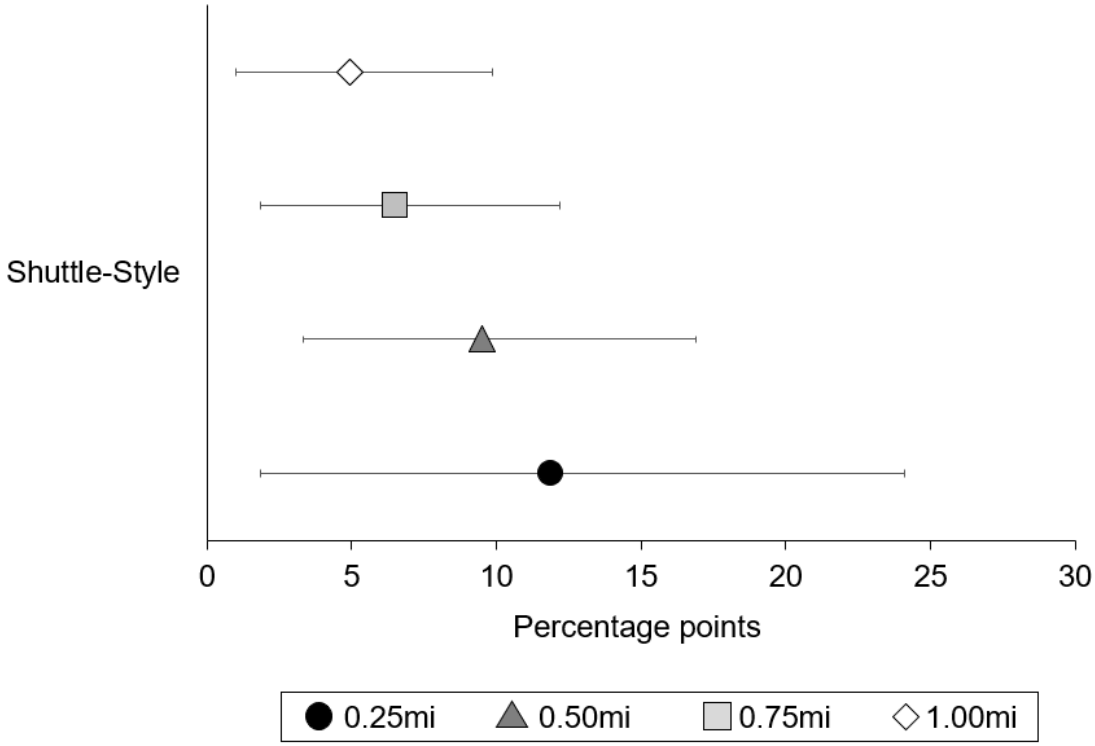
Though transportation eligibility/access is positively associated with choosing a school, other factors such as distance, peer choices, and school quality remain important. The results show that students are less likely to choose schools that are farther away, more likely to choose schools

attended by a greater share of their neighbors, and more likely to choose schools with higher index scores. Comparing the marginal effects of these variables to the marginal effects for transportation eligibility/access helps put the overall results in context. For example, for each additional mile students live from a school, they were also 4pp less likely to choose that school. Thus, on average, school-based transportation eligibility/access was roughly equivalent to living around 1 mile closer to a choice.

Results for Different Shuttle-Style Bus Access Definitions

Notably, our results differed as we used different definitions of "access" for shuttle-style buses. Though the coefficients for traditional school bus eligibility and other control variables remained consistent, the coefficients for shuttle-style bus access increased as we use shorter definitions for access. (Full regression results are in Appendix D.) As shown in Figure 2, when we restrict the definition of access to 0.25 miles from a shuttle stop, the likelihood of a student choosing a school where they have access to a shuttle stop increases by about 12pp (compared to 4-5pp when using the 1-mile definition). The confidence intervals overlap for each estimate and are increasingly large, so there is some uncertainty. Still, the incrementally increasing marginal effect estimates suggest that the association between access to a shuttle-style bus and school choice was even stronger for students who lived closer to a stop.

Figure 2 - *Marginal Effects for Discrete Choice Model with Different Shuttle-Style Bus Access Definitions*



How should we interpret these results compared to the findings for traditional school buses? The greater estimated marginal effects for closer shuttle stops suggest that as you impose a stricter threshold for reasonable access to shuttle-style buses (i.e., with closer-to-home bus stops), shuttle-style bus access may have an even stronger association with school choices than traditional bus eligibility. This could be because most students who are eligible for traditional school buses are either attending their assigned DPSCD neighborhood school or a charter school that typically requires students to live close (e.g., within 3 miles) to be eligible for the bus, whereas the shuttle-style buses provide access to farther-away schools. Or, there could be something qualitatively different about the shuttle-style buses, such as their timeliness and reliability if they are running a pre-set route rather than making individual student stops (Pogodzinski et al., 2022). These

interpretations require some caution, since the large confidence intervals suggest a good deal of uncertainty for these estimates.

Given that the results differ based on the definition of shuttle access we use, we conduct our heterogeneity analyses with both the 1-mile and 0.25-mile definitions. The 0.25-mile definition is particularly useful as a robustness check because it mirrors the traditional school bus design, wherein stops are located within 0.25 miles of students' homes. We prioritize results using the 1-mile definition for shuttle-style bus access, but also discuss the results when using the alternative 0.25-mile definition. As we show below, our findings with the 0.25-mile definition help corroborate our interpretations of the heterogeneity analyses.

Heterogeneity By Car Ownership, Neighborhood Safety, and Distance-to-Choice

Finally, we found some evidence of heterogeneity in the association between school-based transportation and school choice in relationship to the contextual factors we examined. Abbreviated results for each model with an interaction, using both the 1-mile and 0.25-mile definitions for shuttle-style access, are presented in Table 6. (Full regression results are in Appendix E.) Interestingly, the interactions we tested differed in significance for the different types of school-based transportation: traditional bus eligibility had a significant interaction with neighborhood violent crime, whereas shuttle-based eligibility had a significant interaction with distance-to-choice. The results when using the alternative 0.25-mile definition for shuttle-style access seem to reinforce those findings. Finally, there was no significant interaction term for block-group-level household car ownership. We discuss the findings for neighborhood crime and distance-to-choice in greater detail below.

Table 6
Discrete Choice Model with Interaction Terms

	Block-Group Car Ownership		*Neighborhood Violent Crime*		*Distance-to-Choice*	
	1-mi Shuttle Access	0.25mi Shuttle Access	1-mi Shuttle Access	0.25mi Shuttle Access	1-mi Shuttle Access	0.25mi Shuttle Access
Transp. Eligibility Type (ref=none)						
Traditional school bus	0.23***	0.22***	0.20***	0.20***	0.20***	0.21**
Shuttle-style bus	0.28***	0.63**	0.25***	0.58**	0.04	0.72*
Interaction Term						
Traditional school bus	-0.04	-0.03	0.21***	0.21***	0.01	0.01
Shuttle-style bus	0.05	0.18	-0.09	0.34	0.04*	-0.04
N students	6,238	6,238	6,544	6,544	6,544	6,544
N student-observations	445,572	445,572	468,091	468,091	468,091	468,091

Note: See Appendix E for the full regression results. The block-group car ownership and neighborhood violent crime variables included in the regression are standardized. The table displays logit coefficients from the discrete choice model.
**p<0.05, **p<0.01, ***p<0.001*

Neighborhood Safety

The interaction of school-based transportation and neighborhood crime was statistically significant for traditional bus eligibility. The positive coefficient on the interaction term indicates that for students living in higher-crime neighborhoods, their eligibility for a traditional school bus at a school increases the likelihood that they will choose that school by an even greater amount than for students in lower-crime neighborhoods. Translated into a marginal effect, a one standard-deviation increase in the number of violent crimes corresponds with about a 4pp increase in the likelihood that a student eligible for a traditional school bus at school will choose that school.

The interaction of school-based transportation and neighborhood crime was not statistically significant for shuttle-style bus access when using the 1-mile access definition. Thus, the

association between shuttle-style bus access and choice did not differ for students living in lower- or higher-crime neighborhoods.

Notably, when using the 0.25-mile access definition, the results were more similar to the traditional bus eligibility results. Though not statistically significant, the coefficient on the interaction term is large and positive, similarly suggesting that students in higher-crime neighborhoods are even more likely to choose schools if a school offers a shuttle-style bus and has a stop within 0.25 miles of their home. The divergence in results for shuttle-style bus access seems to corroborate the findings for traditional bus eligibility: the association between transportation and choice is even greater for students in higher-crime neighborhoods if their bus stop would be close to their home. In other words, school-based transportation may be even more desirable for students in higher-crime areas when bus stops are close to home.

Distance-to-Choice

The interaction of school-based transportation and distance-to-choice was not statistically significant for traditional bus eligibility. Thus, the association between traditional bus eligibility and choice did not differ for students living closer or farther to a choice where they are eligible for a traditional school bus.

The interaction of school-based transportation and distance-to-choice was statistically significant for shuttle-style bus access (using the 1-mile access definition). The positive coefficient on the interaction term indicates that for students living farther from a choice, their access to a shuttle-style bus at a school increases the likelihood that they will choose that school by an even greater amount than for students who live closer to that choice. Translated into a marginal effect, if a student lives 1 mile farther from a choice where they have access to a shuttle-style bus, the likelihood that they will choose that school is 1pp greater.

Also notably, the main coefficient on shuttle-style access (with the 1-mile definition) decreased sharply and was no longer statistically significant, suggesting that the stronger association in prior models was primarily driven by those students choosing schools relatively farther away from home that provided access to a shuttle style bus. Indeed, students who chose a school where they had access to shuttle-style transportation within 1-mile of their home lived a median distance of 3.9 miles from school. By comparison, for students who chose a school where they were eligible for a traditional school bus, their median distance to school was only 1.5 miles. These results thus may indicate that families are more willing to use farther-away shuttle-style bus stops if they want to choose an even farther-away school.

Again, when using the 0.25-mile access definition, the results were more similar to the traditional bus eligibility results. The interaction term was not statistically significant, meaning that the association between shuttle-style access and choice did not differ for students living closer or farther to a choice when access is restricted to a bus stop within 0.25 miles of their homes. Thus, once again, the divergence in results for shuttle-style bus access seems to reinforce the overall findings: having access to a shuttle stop closer to home was not associated with a greater likelihood of choosing farther-away schools. Indeed, for students who chose schools where they had access to shuttle-style transportation within 0.25-miles of their home, their median distance to school was only 2.4 miles—longer than those choosing schools where they are eligible for a traditional bus, but shorter than when including students who have access to a shuttle-style bus within 1-mile of their home.

Discussion

School transportation matters for equitable access to schools of choice, especially in high poverty districts like Detroit. This study demonstrates that eligibility or access to school-sponsored

transportation can facilitate enrollment in schools that may have otherwise been out of reach. It also shows that the type of transportation offered may matter less than whether or not students are able to access it. The findings also suggest that providing bus stops closer to home can make school transportation even more useful for students in higher-crime areas, and that families may be willing to use bus stops farther from home if it enables them to access schools much farther away. School districts seeking to increase enrollment and more equitability serve students should therefore consider expanding transportation access (Bierbaum et al., 2021).

That said, districts will need to weigh the costs and tensions associated with providing school-based transportation. For example, if on average transportation access/eligibility is associated with a modest increase in the likelihood a student will choose that school, transportation could increase enrollment. Or districts that restrict traditional school bus eligibility to students who attend their assigned schools could expand eligibility or access for other schools, which might increase the association between eligibility and the likelihood of choosing schools farther away and again increase enrollment. Yet are these enrollment increases sure to offset additional transportation costs? Further, how should districts balance the goal of expanding access to schools of choice through a school system with the goal of providing transportation to ensure students can reliably attend a school? (Lenhoff et al., 2022) Ultimately, coordinated and centralized school-based transportation policies may help manage costs, achieve economies of scale, and reconcile competing logics and incentives (Hashim & Sattin-Bajaj, 2023; Sattin-Bajaj, 2022).

This study also demonstrated how challenging it is to study school transportation in expansive school choice contexts, especially those that are fragmented and have limited oversight and regulation. Without consistent transportation policies, and without a common clearinghouse of information on school transportation offerings and eligibility, it is difficult to make sense of the

large number of school and transportation options available. This suggests that parents may also struggle to access information on school transportation offerings and eligibility. While future research should explore parents' experiences navigating school transportation information sources, this study suggests that states or intermediate districts may have a role to play in coordinating or communicating about available school-transportation options and the rules that govern eligibility.

Though we did not find that the association between school-based transportation and choice varied by block-group-level household car ownership, school buses might still be especially helpful for families with transportation constraints. Prior qualitative and quantitative research suggests that car ownership does meaningfully increase families' ability to choose schools farther from home (e.g., Bell, 2007; Valant & Lincove, 2023). In addition, Detroit has a great degree of transportation insecurity, and even those families with access to a car can have precarious arrangements for getting their children to or from school (Lenhoff et al., 2022). Our findings could reflect inadequacy in our proxy for car ownership or the possibility that even families in Detroit with car access might find a school bus useful.

How likely is it that our findings generalize to other contexts? Detroit is a unique context in terms of its expansive geography and low density, limited public transportation availability, and fragmented school system (Lenhoff et al., 2022), so the findings may not apply in all districts. That said, our findings are similar to those in Trajkovski et al.'s (2021) study of transportation in New York City, which is on the other end of the spectrum in terms of density, public transportation availability, and school system coordination. Ultimately, additional studies from other school choice systems are necessary to strengthen our understanding of the relationship between school-based transportation and school choice.

It is also important to acknowledge that our results are based on bus eligibility/access rather than actual ridership. This leaves several unanswered questions about how families think about school-based transportation when making their school choices, and how they actually make use of it once enrolled. For example, families might choose schools where they can access a school bus because it helps get them to school in the morning, or they might make that choice so their children can ride the bus on the way home (Edwards et al., 2019), or just to have the bus as a back-up option in case of work conflicts or car issues (Lenhoff et al., 2022). The experiences that students and parents have with the bus—for example, its timeliness and reliability (Lenhoff et al., 2022), the duration of children's bus rides (Cordes et al., 2022), or their interactions with staff and peers on the bus (Galliger et al., 2009)—might also play a role. Future research opportunities include incorporating data on bus ridership or on individual-level data on household car access, and interviewing families to understand how they learn about school bus availability and how it factors into their choice-making process.

References

Altenhofen, S., Berends, M., & White, T. G. (2016). School choice decision making among suburban, high-income parents. *AERA Open*, *2*(1), 1–14. https://doi.org/10.1177/2332858415624098

Angelucci, M., De Giorgi, G., Rangel, M. A., & Rasul, I. (2010). Family networks and school enrolment: Evidence from a randomized social experiment. *Journal of Public Economics*, *94*(3), 197–221. https://doi.org/10.1016/j.jpubeco.2009.12.002

Bell, C. A. (2007). Space and place: Urban parents' geographical preferences for schools. *The Urban Review*, *39*(4), 375–404. https://doi.org/10.1007/s11256-007-0059-5

Bierbaum, A. H., Karner, A., & Barajas, J. M. (2021). Toward mobility justice: Linking transportation and education equity in the context of school choice. *Journal of the American Planning Association*, *87*(2), 197–210. https://doi.org/10.1080/01944363.2020.1803104

Burdick-Will, J., Gebo, L., & Williams, A. D. (2023). Anywhere but Here: Neighborhood Violence and Local School Preferences in Baltimore City. *Sociology of Education*, 00380407231197394. https://doi.org/10.1177/00380407231197394

Burdick-Will, J., Grigg, J. A., Nerenberg, K. M., & Connolly, F. (2020). Socially-structured mobility networks and school segregation dynamics: The role of emergent consideration sets. *American Sociological Review*, *85*(4), 675–708. https://doi.org/10.1177/0003122420934739

Cordes, S. A., Rick, C., & Schwartz, A. E. (2022). Do Long Bus Rides Drive Down Academic Outcomes? *Educational Evaluation and Policy Analysis*, *44*(4), 689–716. https://doi.org/10.3102/01623737221092450

Edwards, D. S. (2021). Just out of reach? Unrestrained supply, constrained demand, and access to effective schools in and around Detroit. *Educational Evaluation and Policy Analysis*, *43*(3), 391–418. https://doi.org/10.3102/0162373721996738

Edwards, D. S., Anderson, K., & Mohr, E. (2019). *Transportation, Choice and Parental Priorities: An Analysis of Detroit's GOAL Line Program* (p. 18). Education Policy Innovation Collaborative.

Gabay-Egozi, L. (2016). School choice in a stratified geography: Class, geography, otherness, and moral boundaries. *Journal of Education Policy*, *31*(1), 1–27. https://doi.org/10.1080/02680939.2015.1047410

Galliger, C. C., Tisak, M. S., & Tisak, J. (2009). When the wheels on the bus go round: Social interactions on the school bus. *Social Psychology of Education*, *12*(1), 43–62. https://doi.org/10.1007/s11218-008-9072-0

Goldring, E. B., & Hausman, C. S. (1999). Reasons for parental choice of urban schools. *Journal of Education Policy*, *14*(5), 469–490. https://doi.org/10.1080/026809399286161

Hashim, A., & Sattin-Bajaj, C. (2023). Transportation Logics: How Charter School Leaders Make Choices about Student Transportation. *American Journal of Education*, 000–000. https://doi.org/10.1086/725549

He, S. Y., & Giuliano, G. (2018). School choice: Understanding the trade-off between travel distance and school quality. *Transportation*, *45*(5), 1475–1498. https://doi.org/10.1007/s11116-017-9773-3

Howell-Moroney, M. (2023). Inconvenient truths about logistic regression and the remedy of marginal effects. *Public Administration Review*, 1–19. https://doi.org/10.1111/puar.13786

Kontou, E., McDonald, N. C., Brookshire, K., Pullen-Seufert, N. C., & LaJeunesse, S. (2020). U.S. active school travel in 2017: Prevalence and correlates. *Preventive Medicine Reports*, *17*, 101024. https://doi.org/10.1016/j.pmedr.2019.101024

Lenhoff, S. W. (2020). Unregulated open enrollment and inequitable access to schools of choice. *Peabody Journal of Education*, *95*(3), 248–271. https://doi.org/10.1080/0161956X.2020.1776072

Lenhoff, S. W., & Singer, J. (2024). COVID-19, online learning, and absenteeism in Detroit. *Journal of Education for Students Placed at Risk (JESPAR)*, *0*, 1–28. https://doi.org/10.1080/10824669.2024.2304306

Lenhoff, S. W., Singer, J., Stokes, K., Mahowald, J. B., & Khawaja, S. (2022). Beyond the bus: Reconceptualizing school transportation for mobility justice. *Harvard Educational Review*, *92*(3), 336–360. https://doi.org/10.17763/1943-5045-92.3.336

Mandic, S., Sandretto, S., Hopkins, D., Wilson, G., Kidd, G., & García Bengoechea, E. (2023). School choice, distance to school and travel to school patterns among adolescents. *Journal of Transport & Health*, *33*, 101704. https://doi.org/10.1016/j.jth.2023.101704

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In P. Zarembka (Ed.), *Frontiers in econometrics* (pp. 105–142). Academic Press. https://eml.berkeley.edu/reprints/mcfadden/zarembka.pdf

Pogodzinski, B., Lenhoff, S. W., Cook, W., & Singer, J. (2022). School Transit and Accessing Public School in Detroit. *Education and Urban Society*, *54*(6), 695–713. https://doi.org/10.1177/00131245211027369

Sattin-Bajaj, C. (2022). Student Transportation in Choice-Rich Districts: Implementation Challenges and Responses. *Education Finance and Policy*, 1–29. https://doi.org/10.1162/edfp_a_00377

Singer, J. (2020). Student Stratification among a Combination of School Choice Policies in Detroit. *Journal of School Choice*, *14*(1), 122–153. https://doi.org/10.1080/15582159.2019.1689467

Singer, J. (2022). *School choice, socioeconomic status, and stratified enrollment in Detroit* [Wayne State University]. https://digitalcommons.wayne.edu/oa_dissertations/3696

Singer, J., Pogodzinski, B., Lenhoff, S. W., & Cook, W. (2020). *School transportation policies in Detroit*. Detroit Education Research Partnership. https://detroitpeer.org/research

Speroni, S., & Lenhoff, S. W. (2023). School transportation and educational equity. *Regulatory Review*. https://www.theregreview.org/2023/03/30/speroni-school-transportation-and-educational-equity/

Stein, M. L., Burdick-Will, J., & Grigg, J. (2021). A choice too far: Transit difficulty and early high school transfer. *Educational Researcher*, *50*(3), 137–144. https://doi.org/10.3102/0013189X20949504

Stein, M. L., & Grigg, J. A. (2019). Missing bus, missing school: Establishing the relationship between public transit use and student absenteeism. *American Educational Research Journal*, *56*(5), 1834–1860. https://doi.org/10.3102/0002831219833917

Trajkovski, S., Zabel, J., & Schwartz, A. E. (2021). Do school buses make school choice work? *Regional Science and Urban Economics*, *86*, 103607. https://doi.org/10.1016/j.regsciurbeco.2020.103607

Valant, J., & Lincove, J. A. (2023). Transportation inequities and school choice: How car, public transit, and school bus access affect families' options. *Educational Researcher*, 0013189X231189465. https://doi.org/10.3102/0013189X231189465

Appendix

Appendix A

Comparison of Included vs. Excluded Detroit Kindergarten Students, 2021-22

	Included (N=6,544)	Excluded (N=457)
Student Demographics		
Economically Disadvantaged	0.92	0.87***
Special Education	0.07	0.04*
English Language Learner	0.09	0.26***
Female	0.49	0.53
Black	0.83	0.67***
Hispanic	0.09	0.23***
Distance to School (mi)	4.13	4.04
School Type		
DPSCD Neighborhood	0.40	0.05***
DPSCD Application/Exam	0.05	0.25***
Detroit Charter	0.34	0.41***
Suburban Traditional Public	0.06	0.01***
Suburban Charter	0.15	0.27***

**p<0.05, **p<0.01, ***p<0.001*

Appendix B

Details about Survey Data that Informed Shuttle-Style Bus Access Definition

In January 2022, our research team conducted a representative survey of students in the Detroit Public Schools Community District and 40% of charter schools in the city. More details on the survey administration and methodology are available in previously published work (e.g., Lenhoff & Singer, 2024). We returned to this data to inform our definition of shuttle-style bus access. The survey data included questions about the mode of transportation that students take to school (e.g., car, school bus, public bus, walking) and the frequency with which they use it (e.g., daily, weekly, monthly). We merged those responses with the data we collected on transportation offered and shuttle-style bus stop locations. From there, we identify students whose parents reported that they rode a school bus frequently (i.e., daily or weekly) and whose school provided access to a shuttle-style bus. For those students who rode a shuttle-style bus frequently, their median distance to a shuttle stop was 0.83 miles from home and the mean distance to a shuttle stop was 1.44 miles from home. The distance-to-stop for shuttle bus riders in our survey ranges from 0.26 miles at the 25th percentile to 1.61 miles at the 75th percentile. Based on these figures, we settled on the 1-mile shuttle access definition and decided to test alternative definitions based on shorter distances than 1-mile (e.g., 0.25 miles).

Appendix C

Discrete Choice Model with Alternative Choice Set Specifications

Table C1

Average Choice Set Characteristics for Alternative Choice Set Specifications

Variable	1-mile radius (N=3,091)	Census tract (N=287)	All schools (N=1)
Distance-to-Choice (mi)	8.88	7.26	17.8
Pct. of Neighbors Attending Choice	0.015	0.032	0.003
MI School Index Score (2019)	43.84	43.64	54.58
DPSCD Neighborhood School	0.30	0.30	0.18
DPSCD App/Exam School	0.09	0.10	0.04
Detroit Charter	0.29	0.34	0.15
Suburban TPS	0.13	0.09	0.43
Suburban Charter	0.19	0.17	0.20
Transportation Offered	0.48	0.49	0.34
Transportation Eligible	0.08	0.10	0.04

Note: The summary statistics for the "1-mi radius" and "Census tract" alternatives are the average characteristics of choice sets based on each approach. There is only one choice set in the "all schools" alternative, as all schools are considered an option for all students.

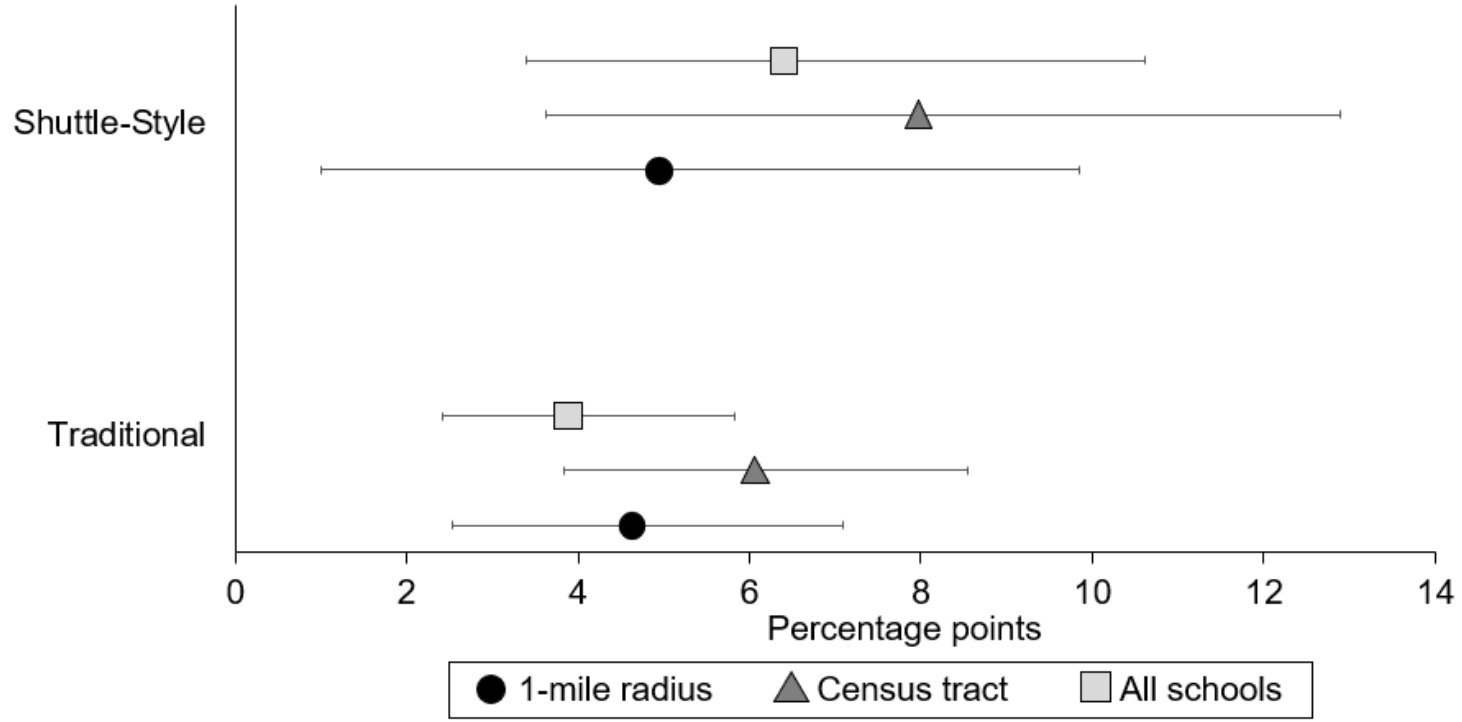
Table C2

Abbreviated Discrete Choice Model Results

	1-mile radius	Census tract	All schools
Transp. Eligibility/Access Type (ref=none)			
Traditional school bus	0.23***	0.29***	0.37***
Shuttle-style bus	0.25***	0.37***	0.57***
N students	6,544	6,538	6,538
N student-observations	468,091	300,487	2,066,008

Note: The full model included school characteristics, the percentage of neighbors attending the school, and distance-to-choice.
**p<0.05, **p<0.01, ***p<0.001*

Figure C1
Marginal Effects of Transportation Eligibility/Access with Alternative Choice Set Specifications



Appendix D

Discrete Choice Model Results with Alternative Shuttle-Style Bus Access Definitions

	(1) 0.25mi to shuttle stop	(2) 0.50mi to shuttle stop	(3) 0.75mi to shuttle stop	(4) 1.00mi to shuttle stop
Choice Type (ref=DPSCD neighborhood)				
DPSCD app/exam	-0.14*	-0.15*	-0.15*	-0.15*
Detroit charter	0.09*	0.09*	0.08*	0.08*
Suburban charter	0.32***	0.32***	0.31***	0.31***
Suburban TPS	-0.22***	-0.23***	-0.23***	-0.23***
Choice Demographics				
Pct. economically disadvantaged+	0.08***	0.07**	0.07**	0.07**
Pct. Black+	0.12***	0.12***	0.12***	0.12***
Pct. Hispanic+	0.09***	0.09***	0.09***	0.09***
Pct. of neighbors attending choice+	0.36***	0.36***	0.36***	0.36***
Distance to choice (mi)	-0.17***	-0.17***	-0.17***	-0.17***
Michigan School Index score (2019)	0.01***	0.01***	0.01***	0.01***
Transp. Eligibility/Access Type (ref=none)				
Traditional school bus	0.23***	0.23***	0.23***	0.23***
Shuttle-style bus	0.56*	0.46**	0.32**	0.25***
N students	6,544	6,544	6,544	6,544
N student-observations	468,091	468,091	468,091	468,091

**p<0.05, **p<0.01, ***p<0.001*

+Variables are standardized.

Appendix E

Discrete Choice Model Results with Interactions

Table E1

Block-Group Household Car Ownership

	1-mi Shuttle-Style Access Definition	0.25-mi Shuttle-Style Access Definition
Choice Type (ref=DPSCD neighborhood)		
DPSCD app/exam	-0.14*	-0.13*
Detroit charter	0.06	0.07
Suburban charter	0.30***	0.31***
Suburban TPS	-0.25***	-0.25***
Choice Demographics		
Pct. Economically Disadvantaged+	0.07**	0.07**
Pct. Black+	0.12***	0.12***
Pct. Hispanic+	0.09**	0.09***
Pct. of Neighbors Attending Choice+	0.36***	0.36***
Distance to Choice (mi)	-0.18***	-0.18***
MI School Index Score (2019)	0.01***	0.01***
Transp. Eligibility Type (ref=none)		
Traditional school bus	0.23***	0.22***
Shuttle-style bus	0.28***	0.63**
Interaction Term		
Traditional school bus x Car ownership	-0.04	-0.03
Shuttle-style bus x Car ownership	0.05	0.18
N students	6,238	6,238
N student-observations	445,572	445,572

**p<0.05, **p<0.01, ***p<0.001*

+Variables are standardized.

Table E2
Neighborhood Violent Crime

	1-mi Shuttle-Style Access Definition	0.25-mi Shuttle-Style Access Definition
Choice Type (ref=DPSCD neighborhood)		
DPSCD app/exam	-0.14*	-0.14*
Detroit charter	0.09*	0.09*
Suburban charter	0.32***	0.33***
Suburban TPS	-0.24***	-0.23***
Choice Demographics		
Pct. Economically Disadvantaged+	0.07**	0.07**
Pct. Black+	0.12***	0.12***
Pct. Hispanic+	0.09**	0.09***
Pct. of Neighbors Attending Choice+	0.36***	0.36***
Distance to Choice (mi)	-0.17***	-0.17***
MI School Index Score (2019)	0.01***	0.01***
Transp. Eligibility Type (ref=none)	0.20***	0.20***
Traditional school bus	0.25***	0.58**
Shuttle-style bus		
Interaction Term	0.21***	0.21***
Traditional school bus x Violent crime	-0.09	0.34
Shuttle-style bus x Violent crime		
N students	6,544	6,544
N student-observations	468,091	468,091

**p<0.05, **p<0.01, ***p<0.001*
+Variables are standardized.

Table E3
Distance-to-Choice

	1-mi Shuttle-Style Access Definition	0.25-mi Shuttle-Style Access Definition
Choice Type (ref=DPSCD neighborhood)		
DPSCD app/exam	-0.15*	-0.15*
Detroit charter	0.09*	0.09*
Suburban charter	0.31***	0.32***
Suburban TPS	-0.25***	-0.22***
Choice Demographics		
Pct. Economically Disadvantaged+	0.07**	0.07**
Pct. Black+	0.12***	0.12***
Pct. Hispanic+	0.09**	0.09***
Pct. of Neighbors Attending Choice+	0.36***	0.36***
Distance to Choice (mi)	-0.18***	-0.17***
MI School Index Score (2019)	0.01***	0.01***
Transp. Eligibility Type (ref=none)		
Traditional school bus	0.20***	0.21**
Shuttle-style bus	0.04	0.72*
Interaction Term		
Traditional school bus x Dist-to-choice	0.01	0.01
Shuttle-style bus x Dist-to-choice	0.04*	-0.04
N students		
N student-observations	6,544	6,544

**p<0.05, **p<0.01, ***p<0.001*
+Variables are standardized.