A Choice Too Far: Transit Difficulty and Early High School Transfer*

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Abstract

The challenge of a long and difficult commute to school each day is likely to wear on students leading some to change schools. We use administrative data from approximately 3,900 students in the Baltimore City Public School System in 2014-15 to estimate the relationship between travel time on public transportation and school transfer during the 9th grade. We show that students who have relatively more difficult commutes are more likely to transfer than peers in the same school with less difficult commutes. Moreover, we find that when these students change schools, their newly enrolled school is substantially closer to home, requires fewer vehicle transfers, and is less likely to have been included among their initial set of school choices.

School transfer has been shown to have adverse effects on individual student achievement test scores (Reynolds, Chen, & Herbers, 2009), school discipline (Engel, 2006), and dropout (Rumberger & Larson, 1998). Schools and teachers find mobile students—especially those who change schools during the school year—to be challenging to integrate and instruct (Lash & Kirkpatrick, 1994). The consequences of mobility, however, may depend on when and why students change schools (Grigg, 2012).

Students change schools for a variety of reasons. The literature on why students transfer proposes three general types of school changes: structural moves, school-related moves, and home-related moves (Welsh, 2017). Structural moves are required by the organization of the school or the district—the school they are in offers a limited grade span, closes, or is re-zoned. School-related moves occur when a family decides that a different school would provide a better social or academic fit for their student. These moves may result in improvement in academic outcomes for students in the long run (Hanushek, Kain, & Rivkin, 2004; Schwartz, Stiefel, & Cordes, 2017). Home-related moves are thought to be made in reaction to some (often unmeasured) stressor that is unrelated to school quality or preference, such as an eviction, job loss, or family structure change.

In this study, we propose an additional reason that students may change schools mid-year: commuting stress. Among adults, a long and difficult commute can encourage an employee to reduce transit strain by seeking out a different workplace (Koslowsky, Kluger & Reich, 1995). The challenge of getting to school each day is likely to wear on students in much the same way, leading some to change schools. Using administrative data from approximately 3,900 students in the Baltimore City Public School System (BCPS) in 2014-15, we show that students who have relatively longer commutes to high school on public transportation are more likely to transfer

schools during their freshman year than peers in the same school with less difficult commutes. Moreover, we find that when these students change schools, their newly enrolled school is substantially closer to home, requires fewer vehicles/transfers, and is less likely to have been included among their initial set of school choices.

Background

School Choice and Transportation

Research on school choice describes enrollment preferences as embedded in complex, multi-dimensional, and potentially overwhelming decisions (Lareau & Goyette, 2014). On the one hand, parents repeatedly say that they want a “high quality” school for their children and that they place a high value on academic performance (Hastings & Weinstein, 2008; Holme, 2002; Stein, Goldring, & Cravens, 2011). On the other hand, parents and students prefer options that are convenient and easy to get to (see Bell, 2009; Glazerman & Dotter, 2016; Harris & Larsen, 2015). The highly segregated nature of our cities along with the uneven geographic distribution of school quality means that for some students, particularly those from disadvantaged neighborhoods, it can be difficult to satisfy both of these preferences simultaneously (Rhodes & Warkentien, 2017).

The exact trade-offs between transportation and quality likely depend on a number of district, school, and student-level factors. Cities and districts differ on the degree to which they provide free, direct transportation to and from schools for all students as well as the quality and reliability of their underlying public transportation systems (Blagg et al., 2018). In districts with more robust transportation systems and policies, parents report being more satisfied with their

available schooling options (Jochim et al., 2014) and students often use district-provided transportation to attend higher quality schools than their zoned school (Cordes & Schwartz, 2019). Charter schools are often less likely to provide transportation than traditional schools, despite drawing from larger geographic areas. In New Orleans, transportation and convenience were frequently stated reasons for choosing traditional public schools, while academic quality was more likely to be listed by charter attendees (Steele et al., 2011).

Most of the existing literature on choice preferences relies on ranked-preferences in unified enrollment systems and researchers' calculations of straight-line distance or travel time. It should be noted, however, that people are notoriously bad at estimating travel times, even on familiar routes (Parthasarathi, Levinson, & Hochmair, 2013). This means that at the time that students fill out their choice forms, they may not have properly accounted for the actual time it will take them to get to their different options. They may only fully understand the costs of traveling to a specific school after repeated experience with their daily commute. This study adds to what we know about the relationship between transportation and choice by examining when initial choices fail and students decide they would prefer a different option.

Commuting and School Transfer

Students are not the only ones to commute daily. There is a large body of literature that examines how adults respond to the stress of their daily travel to and from work. Commuting difficulty for adults (e.g. long commute time, multiple transfers, vehicle delays, crowding, poor ventilation) is related to increased physiological and psychological stress (Koslowsky, Kluger & Reich, 1995). The accumulation of commuting stressors can induce work and workplace

withdrawal behaviors that include lateness, absenteeism, and seeking different employment (Novaco, Stokols, & Milanesi, 1990; Steinmetz, Vries & Tijdens, 2014).

Recent work has begun to explore the extent to which student commuters and school disengagement is analogous to adult workers. Support for the hypothesized relationship between commuting difficulty and student disengagement from school in the form of increased absenteeism has been shown in the transition from middle to high school in Baltimore City (Stein & Grigg, 2019) and Washington DC (Blagg, Rosenboom, & Chingos, 2018). Absenteeism has also been shown to be related to commuting difficulty in the form of increased exposure to violent crime along the route to school (Burdick-Will, Stein, & Grigg, 2019; Einhorn, 2016). In this study we further this line of research by examining school transfer as the student analogue of adult workplace withdrawal through changing employment.

Baltimore Context

Baltimore City is a good place to study the relationship between commuting stress and school transfer for three reasons. First, Baltimore City public high schools are assigned via an open enrollment system. All potential ninth graders complete a choice form in which they rank their top five high school choices (out of 37). Most schools are filled by a lottery if oversubscribed, but there are seven selective enrollment schools—three Career and Technology Education (CTE) and four college-prep schools—that admit only the highest achieving applicants based on a combination of middle school grades, attendance, and standardized test scores. There is one arts-focused school that admits students based on an audition performance. Students may transfer high schools mid-year by petitioning the district. Homelessness, medical

or safety concerns are the only officially listed reasons for a transfer (BCPS 2020), but it is possible that a long commute might, in and of itself, pose a safety concern if it requires getting up before dark or traveling through dangerous neighborhoods (Einhorn, 2016).

Second, high school students are required to find their own way to school. Public transportation passes, subsidized by the state of Maryland, are available to any student who lives more than one and a half miles from their enrolled school and can be used on the Baltimore City bus, metro, and light rail systems (BCPS, 2018). The exact number of Baltimore students who walk or take public transportation is unknown, but a survey of BCPS students suggests that less than one third of high school students use a car as their primary mode of transportation (Stein et al., 2017).

Finally, both the public transportation and road network in Baltimore City contribute to long and unpredictable commutes. Despite its small size, average commute time in Baltimore is longer than Los Angeles and comparable to New York or Washington, DC (Campbell, 2018). Busses are notoriously unreliable and often pass stops with large numbers of waiting students when over-crowded during school commute times (Glenn, 2013; McKone, 2015). Given heavy traffic and unreliability, it is likely that the stressors involved in a particular route to school may not be fully appreciated by students during the school selection process. Many may find that their trip across town is more taxing than they anticipated.

Data and Measures

Student data comes from BCPS administrative records archived at the Baltimore Education Research Consortium. We focus on 9th graders in the 2014-15 academic year. Records include the student's address and schools attended as well as race, ethnicity, gender, and

participation in the Free and Reduced Meals (FARM), English language learner (EL), and special education programs. The vast majority of Baltimore public school students report their race as black or white and no students who report another race change schools. Therefore, we create a single dummy variable for black versus not black. We create a separate indicator for Hispanic regardless of reported race. We include a count of the days suspended at a student's first or only school of enrollment to capture student disciplinary problems and adjust for any informal counseling out that might lead students to transfer involuntarily.

These records also include codes that identify the type of withdrawal or entrance for every school that a student attends (e.g. within district transfer, transfer to a school in another district, withdrawal from school). We use these codes to identify students who transfer within BCPS in the middle of their freshman year. We focus on these early within-year moves because they are the most problematic for students and schools and because interdistrict transfers by definition require a residential move and these students are lost from our data.

We supplement these records with ones from the 2013-14 school year to create measures of percent days absent during 8th grade and an indicator for whether a student changed schools in the 8th grade. We use 2013-14 choice forms that identify the rank order of the schools that each student listed in their high school application and to create an indicator for whether the student submitted a choice ranking form. Highly disengaged students and late enrollees to the district may have been assigned a high school without submitting any preferences. These students would be limited to relatively unpopular schools that still had open slots after all other students were assigned. We also create a dummy variable for whether the student is enrolled at the beginning of the 9th grade in his or her first choice high school. While these variables cannot account for all

the unobserved heterogeneity between students with regards to school preferences and engagement, they likely reduce this bias if present.

Following the same methodology outlined in our previous research (see Stein & Grigg, 2019; Burdick-Will, Stein & Grigg, 2019) we estimate routes from home to school for each student in the dataset using the Network Analyst suite in ArcGIS (Esri, 2017). We calculate the most efficient route from the residential address of record to the enrolled school with an arrival time set to the start of school. *Travel time* is the total estimated time required for the commute and includes time spent walking, waiting and riding on transit vehicles. *Vehicles* is the estimated total number of transit vehicles required and captures a measure of the complexity of a given route as more vehicles would require more connections on the way to school.

It must be noted that these are estimated public transportation travel times and not measures of actual commuting behavior. It is possible that some students with long public transit travel times can shorten their commutes by using a private car. For others, the estimated times are going to be overly optimistic because they do not consider schedule reliability. Nevertheless, the estimated routes do provide our best guess at relative differences in commuting experiences across the district.

We create two peer measures to capture a student's social connections at school which may be related to decisions to transfer. First, we count the number of students from each neighborhood attending each school. This indicates how many co-commuters a student might have as well as their local social connections at school. Second, we calculate the percent of students from the ninth-grade class that attended the same middle school. This indicates the degree to which students' social worlds remain the same during the transition to high school (see Grigg, 2014).

Finally, we include measures of the academic quality at students' initial high school enrollment. We include indicators for whether the school was a CTE academy or a selective enrollment college-prep school. From the Maryland State Department of Education we use school average algebra score, the percent of students in special education, the percent of FARM students, and the percent of students who are chronically absent (MSDE, 2019).

Analytic Sample

We began building the analytic sample by identifying first time 9th grade students enrolled in regular, non-specialized population BCPS high schools in 2014-15. We then restricted the sample to students who also had a stable residential address record during the 9th grade. We do this to avoid confounding residential moves with school changes and to ensure that our estimates of travel time are accurate. Of the 5,934 9th graders enrolled in BCPS in 2014-15, 4,538 were first time freshmen and 3,989 of those had stable residential addresses. The analytic sample was further refined to include only those students who remained within BCPS for the entire school year. This step excluded 45 students who transferred out of the district or to an alternative school, students who were institutionalized, and those students who formally withdrew from the school system. The final analytic dataset includes 3,944 students.

Excluded students are somewhat more likely to be white, Hispanic, males, and be designated as English Learners. They are overwhelmingly more likely to not have participated in the 8th grade choice system (73% compared to 6%). They also have higher mobility rates in 8th and 9th grades and higher 8th grade absence rates. However, their travel times are slightly shorter

on average (33 versus 35 minutes and 1.95 versus 2.1 vehicles). (See Supplementary Table S1 for more detail.)

Method

To estimate the relationship between transit difficulty and early high school transfer we specify two logistic regression models. The first model predicts transfer as a function of our transit variables, student individual characteristics, 8th grade attendance, 8th grade school mobility, choice and peer measures, and school quality. However, the relationship between transit difficulty and decisions to transfer high-schools may be confounded by unobserved characteristics of specific schools, such as school climate, academic rigor, or safety. In order to adjust for any unobserved differences that are constant across students enrolled in the same high school our second model adds high school fixed effects for the initial high school to model 1.¹

The inclusion of school fixed effects in Model 2 resulted in the loss of 345 observations in four schools from which no students transferred during the school year. For comparability we have estimated Model 1 on the sample of students represented in the estimation of Model 2 (n = 3,530). Estimates on the full analytic sample for Model 1 are substantively equivalent and are available in Supplemental Table S2.

Results

¹ Linear probability models yield almost identical marginal probabilities and suggest that the logistic regressions do not suffer from bias due to the incidental parameter problem. See Supplementary Table S2.

Table 1 presents descriptive statistics for the analytic sample. Approximately six percent of the analytic sample transferred from their original 9th grade high school to another BCPS high school during the 2014-15 school year. Compared to their non-transfer peers, transfer students were significantly more likely to be Black/African American, less likely to be White, more likely to be receiving special education services, and were suspended more often. They were also twice as likely to have transferred in 8th grade and were absent for a larger percent of school days in 8th grade. Transfer students also attended lower quality schools with fewer of their neighbors and middle school classmates. They were less likely to have been enrolled in their first-choice school and were more likely to not participate in the choice process at all. Students who transferred also had more difficult commutes than their peers who did not transfer (39.8 versus 35.4 minutes). The 4.7 minute longer travel time for subsequent transfer students is approximately 1/3 of a standard deviation. While the mean number of vehicles is similar for the two groups, a higher percentage of transfer students than non-transfer students required at least one transfer (76.4 versus 64.2).

Table 2 presents the results of our logistic regressions. Coefficients are presented in log-odds. The estimated coefficient on travel time in Model 1 is 0.16 (s.e. 0.07) indicating that a ten minute increase in travel time is associated with a 17% ($e^{.16} = 1.17$) increase in the odds of transfer, all else equal. The estimate on vehicles required is 0.09 (s.e. 0.08) and not statistically significant. The only other statistically significant predictors in the model of early high school transfer are being enrolled in the student's first choice school, attending high school with more middle school peers, school math achievement, and attending a CTE center.

The inclusion of high school fixed effects (Model 2, Table 2) produces a somewhat stronger relationship between commute time and transfer (0.21, s.e. 0.07). This indicates that the

bias from unobserved school characteristics was negative, perhaps because students who tend to go to closer schools attend schools with high overall transfer rates. Comparing only students who attend the same school and holding all else constant, a ten-minute increase in commute time predicts a 23% ($e^{.21} = 1.23$) increase in the odds of transfer.²

Figure 2 graphs the predicted probability of transfer from Model 2 across the range of travel times holding all other characteristics at their mean. The slope of the line increases rapidly as travel time increases with a short commute (10 minutes) predicting an approximately 3% chance of changing schools, versus an approximately 6% chance of transferring for students with an average commute (35 minutes) and around a 10% chance of transferring for students who commute for an hour or more.

Table 3 compares the characteristics of transfer students' first and second schools. Travel times for transfer students change from 39.6 minutes on average at their first school to 31.6 minutes on average at their second. The difference of 8 minutes represents a little more than one half of a standard deviation in travel times. They also reduce the average number of vehicles required from 2.4 to 1.8. Although there is no significant change in objective school quality after changing schools, students do end up in schools that they were less interested in during the choice lottery. Before they transferred 34.6% of these students attended their first-choice school compared to only 10.6% after they change schools. Students are substantially more likely to attend a school that they did not even consider in their top five during the initial high school selection process (70.0% post-transfer compared to 27.2% pre-transfer). Based on our

² There is no evidence of an interaction between travel distance and any of the other observed variables in either of these models.

calculations (not presented in Table 3), nearly half of transfer students end up in a school that was both closer and lower ranked than their initial enrollment. Only 16 percent transferred to a school that was farther and higher ranked. Twenty-two percent ended up in a school that was lower ranked, but farther and 13 percent in a school that was higher ranked and closer. This suggests that at least some students regret their initial trade-off between distance and preferred school characteristics and adjust their enrollments so that they are enrolled in closer, but less desirable schools.

Discussion & Conclusion

The results of this study show that travel time is a strong predictor of early high school transfer for students in Baltimore City. Holding all else constant, including the specific high school, students whose estimated travel time is around an hour are approximately three times as likely to transfer as those with very short commutes (10 minutes or less). Moreover, students who do change schools, on average, attend new schools that are closer to home, but less likely to have been ranked highly in their initial choice application. It is possible that these associations could be even stronger if we had measures of actual commuting behavior and not just travel estimates.

This suggests a real trade-off between distance and preferred school characteristics for at least some students. It also means that some students will get that calculation wrong and need to change schools mid-year, despite the potential academic costs of those moves. The findings, therefore, highlight the evolving preferences and information updating that naturally take place for students throughout their education careers, but are often considered constant by those who

design open enrollment programs (Abdulkadiroğlu & Sönmez, 2003). Given the limitations of administrative data further qualitative research examining these trade-offs is warranted and could provide deeper insights on preference formation and evolution.

The results also represent a substantial and as of yet unrecognized source of instability for urban students in open enrollment contexts. Overall, within-year mobility rates are relatively low in our analytic sample, but even a few new students can cause serious problems for instruction at the classroom level (Lash & Kirkpatrick, 1994). To date, most of the student mobility literature has focused on a relatively narrow set of acute stressors, such as eviction or job loss, to understand why students change school. These findings suggest that daily stressors, such as commuting stress, also weigh on students and can build over time and increase the likelihood of transfer. They also suggest that providing faster and more reliable transportation could be a way to keep students enrolled in their most preferred schools (i.e. Ely and Teske 2014).

Finally, students in areas that are poorly served by transportation and whose closest schools are not a good fit academically are at a real disadvantage in an open enrollment system. They may technically have access to any school in the district, but enrolling across town has a cost. First, they must endure the long commute and the potential stress that that entails. Second, they risk not optimizing their options if they initially stretch geographically for a better academic option only to find that situation unsustainable and subsequently transfer to a less optimal option. If and when they do decide to transfer, it may not be possible to get into any of their other preferred schools leaving them worse off academically than if they had stayed closer to home in the first place. In a broader sense, these findings remind us of the importance of the built environment and urban infrastructure in school inequality even when the enrollment system is explicitly designed to limit its influence.

While Baltimore as a focus of this study presents a specific case with regards to the details of its school choice and public transit system, it is not unique among other large urban school districts in that it allows for substantial out-of-neighborhood enrollment and relies on local public transit systems to transport high school students across the city to schools of choice (e.g. Chicago, DC, Philadelphia, Cleveland, Detroit). Given this we expect that our results would generally hold across other districts and cities. It is unknown however, the extent to which features of public transit systems that decrease unreliability and overall travel times that are not present in Baltimore, such as a fully developed mass rapid transit (e.g. subways, light rail) or bus rapid transit (BRT) system would have on early high school transfers. Similarly, features of school choice systems that improve students' ability to understand commuting costs as part of the school choice process prior to making choices or limit the extent to which students can choose options that are far from home may also affect early high school transfers. The next step in further understanding the effects of public transit commuting on student outcomes will be to field cross city studies that can leverage variation in public transit and school choice systems as well as qualitative studies that can more clearly explicate student school preference formation and change with respect to transit difficulty.

References

- Abdulkadiroğlu, A., & Sönmez, T. (2003). School choice: A mechanism design approach. *American economic review*, 93(3), 729-747.
- Baltimore City Public Schools (BCPS). 2020. Transfer Requests.
<https://www.baltimorecityschools.org/transfer-requests>
- Bell, C. (2009). Geography in Parental Choice. *American Journal of Education*, 115(4), 493-521.
- Blagg, K., Chingos, M., Corcoran, S. P., Cordes, S. A., Cowen, J., Denice, P., ... & Valant, J. (2018). The road to school: How far students travel to school in the choice-rich cities of Denver, Detroit, New Orleans, New York City, and Washington, DC. Research Report. *Urban Institute*.
- Blagg, K., Rosenboom, V., & Chingos, M. M. (2018). The Extra Mile: Time to School and Student Outcomes in Washington, DC. Research Report. *Urban Institute*.
- Burdick-Will, J., Stein, M. L., & Grigg, J. (2019). Danger on the Way to School: Exposure to Violent Crime, Public Transportation, and Absenteeism. *Sociological Science*, 6, 118-142.
- Campbell, C. (2018). 'The traffic is horrible: Baltimore commute ranks among nation's longest. *The Baltimore Sun*. <https://www.baltimoresun.com/maryland/baltimore-city/bs-md-commute-times-20180510-story.html>
- Cordes, S. A., & Schwartz, A. E. (2019). Does Pupil Transportation Close the School Quality Gap? Evidence from New York City. Research Report. Updated. *Urban Institute*.
- Einhorn, E. (April 8, 2016). Six hours, eight buses: The extreme sacrifice Detroit parents make to access better schools. Detroit: Chalkbeat. Available at: <https://detroit.chalkbeat.org/posts/>

detroit/2016/04/08/six-hours-eight-buses-the-extreme-sacrifice-detroit-parents-make-to-access-better-schools/

Ely, T., & Teske, P. (2014). Success Express: Transportation innovation in Denver Public Schools. *Center for Education Policy Analysis*.

Engel, N. (2006). Relationship between mobility and student performance and behavior. *The Journal of Educational Research*, 99(3), 167-178.

Esri. (2017). Add GTFS to a Network Dataset [Computer software]. Redlands, CA: Esri.

Glazerman, S., & Dotter, D. (2016). Market Signals: How Do DC Parents Rank Schools, and What Does It Mean for Policy? Policy Brief. *Mathematica Policy Research, Inc.*

Glenn, G. (May 17, 2013). "Getting to School is Harder Than You Think." WYPR.
<http://news.wypr.org/post/getting-school-harder-you-think#stream/0>

Grigg, J. (2012). School enrollment changes and student achievement growth: A case study in educational disruption and continuity. *Sociology of Education*, 85(4), 388-404.

Grigg, J. (2014). *Student mobility, identity, and attitudes: The social and academic consequences of changing schools* (Doctoral dissertation, The University of Wisconsin-Madison).

Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (2004). Disruption versus Tiebout improvement: The costs and benefits of switching schools. *Journal of public Economics*, 88(9-10), 1721-1746.

Harris, D. N., & Larsen, M. (2015). What schools do families want (and why). *Policy Brief (New Orleans, LA: Education Research Alliance for New Orleans)*.

- Hastings, J. S., & Weinstein, J. M. (2008). Information, school choice, and academic achievement: Evidence from two experiments. *The Quarterly journal of economics*, 123(4), 1373-1414.
- Holme, J. J. (2002). Buying homes, buying schools: School choice and the social construction of school quality. *Harvard Educational Review*, 72(2), 177-206.
- Jochim, A., DeArmond, M., Gross, B., & Lake, R. (2014). How parents experience public school choice. *Center for Reinventing Public Education*.
- Koslowsky, M., Kluger, A. N., & Reich, M. (1995). *Commuting stress: Causes, effects, and methods of coping*. Springer Science & Business Media.
- Lareau, A., & Goyette, K. (Eds.). (2014). *Choosing homes, choosing schools*. Russell Sage Foundation.
- Lash, A. A., & Kirkpatrick, S. L. (1994). Interrupted lessons: Teacher views of transfer student education. *American Educational Research Journal*, 31(4), 813-843.
- McKone, J. (August 24, 2015). "No Yellow Buses Here: One Student's MTA Commute." WYPR. <https://www.wypr.org/post/no-yellow-buses-here-one-students-mta-commute>
- Novaco, R. W., Stokols, D., & Milanesi, L. (1990). Objective and subjective dimensions of travel impedance as determinants of commuting stress. *American journal of community psychology*, 18(2), 231-257.
- Parthasarathi, P., Levinson, D., & Hochmair, H. (2013). Network structure and travel time perception. *PloS one*, 8(10), e77718.

- Reynolds, A. J., Chen, C. C., & Herbers, J. E. (2009, June). School mobility and educational success: A research synthesis and evidence on prevention. In *Workshop on the Impact of Mobility and Change on the Lives of Young Children, Schools, and Neighborhoods, June* (pp. 29-30).
- Rhodes, A., & Warkentien, S. (2017). Unwrapping the Suburban “Package Deal” Race, Class, and School Access. *American Educational Research Journal*, 54(1), 168S-189S.
- Rumberger, R. W., & Larson, K. A. (1998). Student mobility and the increased risk of high school dropout. *American journal of Education*, 107(1), 1-35.
- Schwartz, A. E., Stiefel, L., & Cordes, S. A. (2017). Moving matters: The causal effect of moving schools on student performance. *Education Finance and Policy*, 12(4), 419-446.
- Steele, J. L., Vernez, G., Gottfried, M. A., & Schwam-Baird, M. (2011). The Transformation of a School System: Principal, Teacher, and Parent Perceptions of Charter and Traditional Schools in Post-Katrina New Orleans. Technical Report. *RAND Corporation*.
- 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*, 0002831219833917.
- Stein, M., Grigg, J., Cronister, C., Chavis, C., & Connolly, F. (2017). *Getting to High School in Baltimore: Student Commuting and Public Transportation*. Baltimore: Baltimore Education Research Consortium. <http://baltimore-berc.org/wp-content/uploads/2017/01/GettingtoHighSchoolinBaltimoreJanuary2017.pdf>
- Steinmetz, S., de Vries, D. H., & Tijdens, K. G. (2014). Should I stay or should I go? The impact of working time and wages on retention in the health workforce. *Human resources for health*, 12(1), 23.

Welsh, R. O. (2017). School Hopscotch: A Comprehensive Review of K–12 Student Mobility in the United States. *Review of Educational Research*, 87(3), 475-511.

Figure 1: Travel time density comparison between transfer and non-transfer students

Figure 2: Predicted probability of school transfer by travel time

Table 1: Descriptive statistics of transfer and non-transfer students in analytic sample

	Non-Transfer	Transfer
Black	87.9	94.5
White	10.1	5.5
Other	2.0	0.0
Hispanic	4.1	1.8
Male	48.7	54.4
FARMS	84.2	90.8
Special Education	21.3	29.5
EL	1.7	1.8
School Transfer 8th Grade	5.0	10.1
Not in choice data	5.5	10.1
HS is first choice	51.3	34.6
Career and Technical Academy	17.6	7.8
Selective Enrollment	28.7	5.1
Travel time	35.4 (14.6)	39.6 (15.7)
Vehicles	2.1 (1.2)	2.4 (1.3)
Percent Absent 8th Grade	6.3 (9.9)	10.6 (12.6)
Days Suspended	0.5 (3.4)	1.5 (9.3)
Number of Neighbors	5.3 (6.2)	4.0 (5.0)
Percent Middle School Peers	6.1 (5.3)	3.9 (4.3)
School Math Score (Standardized)	0.6 (1.2)	-0.2 (0.7)
Percent Special Education	15.1 (9.3)	21.5 (6.5)
Percent FARMS	76.0 (12.1)	82.0 (7.8)
Percent Chronic Absent	31.0 (17.6)	43.9 (17.1)
N	3727	217

Note: Standard deviation in parenthesis.

Table 2: Estimated log-odds of transfer by transit characteristics

	Model 1	Model 2
Travel Time	0.16*	0.21**
	(0.07)	(0.07)
Vehicles	0.07	0.03
	(0.08)	(0.08)
White	0.17	0.27
	(0.39)	(0.41)
Hispanic	-0.69	-0.56
	(0.67)	(0.69)
Male	0.02	-0.10
	(0.15)	(0.16)
FARMS	0.14	0.18
	(0.25)	(0.25)
Special Education	-0.08	-0.10
	(0.17)	(0.18)
EL	0.54	0.37
	(0.77)	(0.78)
Percent Absence 8th Grade	0.01	0.01
	(0.01)	(0.01)
School Transfer 8th Grade	0.03	0.02
	(0.31)	(0.32)
Days Suspended	0.02	0.02
	(0.01)	(0.01)
No Choice Data	0.14	0.20
	(0.27)	(0.28)
Not First Choice	-0.38*	-0.35*
	(0.17)	(0.18)
Neighbors in School	-0.02	-0.02
	(0.02)	(0.02)
Percent 8th Grade Peers	-0.05*	-0.06**
	(0.02)	(0.02)
School Average Math Score (Standardized)	-0.38**	
	(0.14)	
Percent Special Education	0.01	
	(0.02)	
Percent FARMS	0.02	
	(0.01)	
Percent Chronic Absent	0.01	
	(0.01)	
Career and Technical Academy	-0.84**	
	(0.30)	

Selective Enrollment	-0.15 (0.64)	
Constant	-4.33*** (1.23)	-3.09*** (0.91)
School FE	No	Yes
Observations	3,599	3,599
LR χ^2	175.5	242.7
Pseudo R ²	0.12	0.15

Note: *** p<0.001, ** p<0.01, * p<0.05 Robust standard errors in parentheses.

Table 3: First and second school comparison for transfer students

	First School	Second School
First Choice	34.6	10.6
Not in Choice Set	27.2	70.0
Career and Technical Academy	7.8	7.8
Selective Enrollment	5.1	4.6
Travel Time	39.6 (15.7)	31.6 (15.8)
Vehicles	2.4 (1.3)	1.8 (1.3)
School Math Score	-0.2 (0.7)	-0.2 (0.7)
Percent Special Education	21.5 (6.5)	21.7 (7.0)
Percent FARMS	82.0 (7.8)	82.3 (7.0)
Percent Chronic Absent	43.9 (17.1)	43.4 (16.3)

Note: Standard deviation in parenthesis.

Table S1: Descriptive statistics of analytic sample and excluded students

	Analytic Sample	Excluded
Transfer	5.5	10.6
Black	88.2	81.8
White	9.9	16.8
Other	1.9	1.5
Hispanic	4.0	10.4
Male	49.0	54.2
FARMS	84.5	84.9
Special Education	21.8	22.0
EL	1.7	8.7
School Transfer 8th Grade	5.3	7.9
Not in choice data	5.8	72.7
HS is first choice	50.4	13.2
Career and Technical Academy	17.1	15.2
Selective Enrollment	27.4	14.7
Travel time	33.2 (15.0)	35.7 (14.7)
Vehicles	2.0 (1.3)	2.1 (1.2)
Percent Absent 8th Grade	9.1 (13.0)	6.5 (10.1)
Days Suspended	0.4 (4.2)	0.5 (4.0)
Number of Neighbors	6.2 (8.1)	5.2 (6.2)
Percent Middle School Peers	1.9 (2.5)	6.0 (5.3)
School Math Score (Standardized)	0.1 (1.0)	0.5 (1.2)
Percent Special Education	18.6 (8.5)	15.5 (9.3)
Percent FARMS	79.5 (11.0)	76.4 (12.0)
Percent Chronic Absent	40.2 (40.2)	31.7 (17.8)
N	3944	1990

Note: Standard deviation in parenthesis.

Table S2: Specification checks

	Model 1	Model 2
Travel Time	0.159* (0.066)	0.012* (0.004)
Vehicles	0.093 (0.074)	0.003 (0.006)
White	0.167 (0.389)	0.003 (0.012)
Hispanic	-0.661 (0.673)	-0.029 (0.015)
Male	-0.000 (0.151)	-0.005 (0.008)
FARMS	0.171 (0.248)	0.001 (0.008)
Special Education	-0.093 (0.172)	-0.006 (0.011)
EL	0.547 (0.775)	-0.002 (0.046)
Percent Absence 8th Grade	0.012 (0.006)	0.001 (0.001)
School Transfer 8th Grade	0.017 (0.309)	0.002 (0.024)
Days Suspended	0.021 (0.011)	0.003 (0.002)
No Choice Data	0.189 (0.273)	0.014 (0.018)
First Choice	-0.297 (0.165)	-0.019* (0.009)
Neighbors in School	-0.019 (0.018)	-0.001 (0.001)
Percent 8th Grade Peers	-0.053* (0.022)	-0.003** (0.001)
School Average Math Score (Standardized)	-0.331* (0.154)	
Percent Special Education	0.025 (0.017)	
Percent FARMS	0.020 (0.014)	
Percent Chronic Absent	0.013* (0.006)	
Career and Technical Academy	-0.635* (0.290)	

Selective Enrollment	-0.111 (0.546)	
Constant	-5.979*** (1.174)	0.034 (0.020)
Observations	3,944	3,599
R-Squared	0.13	0.02

Note: *** p<0.001, ** p<0.01, * p<0.05 Robust standard errors in parentheses. Model 1: logistic regression, no school fixed-effects, full sample (estimates in log odds, pseudo R-squared). Model 2: Linear probability model with school fixed-eff