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EdWorkingPaper No. 23-784

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VERSION: June 2023

Suggested citation: Jiang, Haibin, Noman Khanani, Yan R. Leigh, and Mary E. Walsh. (2023). Integrated Student Support Intervention Mitigates the Adverse Impact of School Mobility on Middle School Students' Achievement and Behavior. (EdWorkingPaper: 23-784). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/k3qx-j697

Integrated Student Support Intervention Mitigates the Adverse Impact of School Mobility on Middle School Students' Achievement and Behavior*

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May 31, 2023

Abstract

School mobility, compounding economic and social inequities, can undermine academic achievement and behavior, particularly during middle school years. This study investigates the effect of a school-based integrated student support intervention – City Connects – on the achievement and behavior of middle school students who experience school mobility. Using administrative data from a large, urban, public school district in the U.S., we apply student fixed effects and event studies methods to analyze the academic and behavioral performance of students changing schools. The results indicate that students who moved to schools implementing the City Connects intervention performed better academically and behaviorally than other students.

Keywords: School Mobility, Middle School, Integrated Student Support, Academic Achievement, Absenteeism

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1 Introduction

In the United States, many K-12 students experience school mobility.[1] According to a report from the U.S. Government Accountability Office, from Kindergarten through the completion of 8th grade, 31% of the students made one school change, 34% of the students made two school changes, 18% of the students made three school changes, 13% made four or more changes, and only 7% of the students never changed school during grades K-8 (Ashby, 2010). The students who changed schools more frequently (four or more times) were more likely to belong to racial and ethnic minority groups, come from low-income households residing in urban areas, and have families that do not own their homes (Ashby, 2010). Many studies show that school mobility causes disruptions in learning and is associated with adverse academic outcomes, especially for marginalized student groups (Hanushek et al., 2004; Reynolds et al., 2009; Schwartz et al., 2009; Xu et al., 2009; Schwartz et al., 2009; Goldhaber et al., 2022).[2] Herbers et al. (2013) find that in addition to the adverse impact on long term educational attainment, frequent school mobility also affects occupational prestige, depression symptoms, and criminal arrests in young adulthood. Welsh (2017) thoroughly surveys the rich literature on school mobility, the reasons of school mobility, and the impact on different aspects of children and schools.

School mobility can be categorized into structural school mobility and non-structural school mobility.[3] Structural school changes refer to the school changes when a student reaches the maximum grade of the previous school and is naturally promoted to the school that serves the higher grade, for example, moving from a K-5 elementary school to a 6-8 middle school in a school district. Non-structural school changes refer to school changes unrelated to reaching the maximum grade of the initial school, for example, moving from one

[1] We use the terms school mobility, student mobility, and school changes interchangeably in this manuscript, referring to the same phenomena of the movement of students from one school to another.

[2] There is also evidence that frequent school mobility also affects the performance of non-mobile students, school environment, etc. (Rumberger et al., 1999; Hanushek et al., 2004)

[3] There are other ways of categorizing school changes, for example, according to the reasons of school changes.

K-5 elementary school to another K-5 elementary school. Both types of school mobility can cause disruption in learning; however, compared to structural school mobility, non-structural school mobility is more disruptive. When a student makes a non-structural school change, in addition to the challenge of adapting to the new school environment, instructional structure, and social network, the mobile student also needs to deal with social-emotional challenges. For example, a non-structural mobile student may experience the feelings of disconnection and disorientation when the student becomes the new student and enters a group of peers who have already built strong connections and are already familiar with the school structures. In this study, we focus on non-structural school mobility. Therefore, throughout the paper, when we refer to school mobility or school changes, we mean non-structural school mobility or non-structural school changes.

When a school change is due to parents' voluntary choosing to enroll their children in a better school or to move to a better neighborhood, students can benefit from such changes (Rumberger et al., 1999; Temple and Reynolds, 1999; Hanushek et al., 2004; De la Torre and Gwynne, 2009; Engberg et al., 2012). However, when a school change is an involuntary response to a family's life change, this type of school changes may add many challenges to a child's life. Examples of unstable life changes that drive involuntary school changes include parents losing their job, family formation or dissolution, and eviction or other housing instability (Kerbow, 1996; Kerbow et al., 2003; Rumberger and Larson, 1998).[4] This combination of out-of-school challenges leading to school changes and students' difficulty adapting to the new environment puts additional pressure on mobile students.

The disruption from school changes during middle school can be more challenging because the children are entering a new academic environment and during a unique stage of child development. First, middle school has a more competitive learning environment compared to elementary school. Additionally, students may have different teachers for different subjects, which can mean fewer opportunities to get to know a teacher and to receive specific

[4]School closure or student expulsion are other reasons for involuntary school changes.

guidance and support from teachers (Evans et al., 2018). Studies have shown that many students struggle transitioning from elementary to middle school (Alspaugh, 1998; Rockoff and Lockwood, 2010; Goldhaber and Theobald, 2022). Furthermore, during middle school, young adolescents reach a developmental stage in which they are more conscious of their self-concept and social acceptance (Robins and Trzesniewski, 2005). Therefore, a sudden breaking away from a social network and entering a group of students who have already developed connections with each other make the adjustment to a new school more difficult for middle school students. Herbers et al. (2013) find that frequent school changes in middle school grades best predict the adverse educational outcomes and other social-emotional issues in young adulthood.

Schools and education policymakers have realized the difficulties faced by mobile students and proposed policies to promote stability, for example, allowing students to stay in the same school when they change residency. However, when students change schools for involuntary reasons, many of the challenges they face are outside of school. Traditionally, schools have limited resources to address such challenges, which leaves mobile students' needs unmet. Student support programs serving the targeted students need to realize the challenges faced by mobile students and find ways to provide support to help those students adapt to the new school and deal with the out-of-school factors that put the students in the situation in the first place.

City Connects is an integrated student support intervention that aims to support students by addressing the out-of-school factors that affect in-school performance. Grounded in developmental theory, the intervention promotes student academic, social-emotional, and physical well-being by connecting each student with a tailored set of prevention, intervention, and enrichment services in the community and the school. Trained school counselors or social workers are placed in each school to serve as a coordinator, working with families, teachers, school administrators, and community agencies to provide students with targeted support tailored toward their strengths, interests, and needs. As of 2022, City Connects

has been implemented in 179 public, charter, and Catholic schools across five U.S. states and ten schools in Dublin, Ireland, serving over 45,000 students. The City Connects model has been adapted to serve elementary, middle, and high schools. Regarding serving mobile students, coordinators are usually the school personnel in City Connects schools to accommodate student transitions and to help them navigate the new school. Most importantly, the out-of-school challenges and the needs associated with school changes are identified and mitigated through the practice of the coordinator (the detail of the City Connects practice are discussed in Section 3).

This study seeks to understand how such integrated student support interventions help to mitigate the adverse impact of school changes in middle school. We first explore how school changes affect students' academic and behavioral performance. We then focus on students who made school changes in middle school and investigate the effect of receiving integrated student support on their academic and behavioral performance.

To examine these research questions, we acquired student-level administrative data from a large, urban, public school district in the United States, where the City Connects intervention gradually expanded over the years. We identify school changes during middle school grades using the school enrollment information in the administrative data. First, we compare students who made school changes in middle school with students who did not make school changes in middle school. We use student fixed effects and apply event studies method to examine the impact of school mobility on student performance. We find that students who made school changes in middle school experienced declines in the standardized math and English language arts (ELA) assessments. The students who made school changes in middle school also experienced a decline in attendance and had a higher probability of chronic absenteeism. These results are consistent with findings in the literature. For example, Reynolds et al. (2009) and Hanushek et al. (2004) find that school mobility has a negative impact on student achievement.[5]

[5]There are more studies that associate school mobility with negative student performance, but most of the earlier studies do not control for pre-mobility performance, which makes it difficult to claim the findings

We then focus on the students who made school changes in middle school and investigate whether an integrated student support intervention, like City Connects, can mitigate the adverse impact of school mobility. To do this, we restrict the sample of students to those who did not receive the City Connects intervention in elementary school. From there, we compare two groups of students who made school changes during middle school: those who moved to schools that implemented the City Connects model and those who moved to schools that did not implement the City Connects model.

We face a couple of identification challenges in making such a comparison. First, the City Connects intervention is not implemented through randomization. Many factors influence whether a school chooses to implement City Connects, for example, the commitment of school leadership, funding, percentage of high-need students in the school, etc. Second, school choice is an endogenous decision of the family, and the administrative data do not provide the reasons underlying school changes.

Despite the challenges, the interaction between the timing of the City Connects implementation and the timing of a specific student making a school change provides the identification opportunity. First, most of the schools in this large, urban, public school district serve a high proportion of minority students and students from low-income families (with 83% of the students enrolled in free or reduced-price lunch). Parents seeking better school quality for their children usually turn to private schools, religious schools, or suburban schools. Factors that are external to the student and random in nature are more likely to be the reason for a school changes (e.g., preference in commute time, distance to the parent's work location, putting multiple siblings in the same school, etc.). Second, when parents make school choices for their children, they do not necessarily know whether the school has or has not implemented the City Connects intervention. Moreover, the timing of when a family is able to or decides to make a school change also happens at random and is dependent on seating availability within the desired school, introducing added randomness to the timing

as causal.

of a student move. Therefore, several factors contribute to when a student changes schools and to whether a student will receive the City Connects intervention, making it likely that a specific student's exposure to the City Connects intervention after school changes is indeed random.

Based on the above identification assumptions, we use individual fixed effects and apply difference-in-differences and event studies methods to explore the impact of the City Connects intervention on the academic and behavioral performance of students that made a school change in middle school. We use the estimation method based on Callaway and Sant'Anna (2021) to address the issue faced by staggered adoption in the two-way-fixed-effect (TWFE) model. Findings indicate that for a student who made school changes to a City Connects middle school, there is a significant improvement in the standardized math score, an estimated increase of 0.13 standard deviations (with a standard error equal to 0.05). The results for the standardized ELA assessment are not consistent across different estimation methods. Additionally, students who made a school change to a City Connects middle school were absent fewer days than students who made a school change to a non-City Connects school, a decrease of 2.62 day (with a standard error equal to 0.87). These students also have a lower probability of experiencing chronic absenteeism than students who made a school change to a non-City Connects school, a decrease of 9.90 percentage points (with a standard error equal to 2.70 percentage points).

This study contributes to the literature in different ways. First, the first part of the study (Section 2) provides new evidence about how school mobility adversely affects student performance. And the second part of the paper provides evidence on how an integrated student support program like City Connects mitigates the adverse impact of school mobility on student performance.

Second, it expands the research on the effectiveness of the City Connects intervention. Prior studies investigating the impact of receiving the City Connects intervention in elementary schools demonstrates its significant effects on student achievement (Walsh et al., 2014;

Dearing et al., 2016; Khanani et al., 2020). Given that middle school is a considerably later point of intervention for students with various academic and behavioral challenges brought about vis-à-vis poverty, this study extends the literature on the impact of City Connects by examining the effect of receiving the intervention for the first time in middle school on academic and behavioral performance. It shows that the intervention still provided meaningful benefits at a later stage of development.

Third, this paper also fits in with the rich strand of literature on the impact of poverty on academic achievement and inequality. In high-poverty urban school districts across the United States, many children face challenges outside of school that impede their success inside the school and in life. Research spanning half a century confirms that children's lives outside of school are critical determinants of their achievement in school, accounting for up to two-thirds of the variance in academic achievement (Coleman, 1968; Rothstein, 2010).The pernicious effects of poverty on out-of-school factors contribute to inequality in educational outcomes; Berliner (2013) has identified poverty as the single most critical factor to address in educational reform. The achievement gap related to income has grown as the divide between the income levels of affluent and low-income families has widened (Duncan and Murnane, 2016; Reardon, 2011). As discussed in this paper, school mobility is associated with poverty and is especially harmful to minority students. While much research has been dedicated to documenting the consequences of inequality, less has focused on what can be done to reduce the academic impact of inequality (Carter and Reardon, 2014). This work shows evidence that an integrated student support intervention with a systemic approach to addressing out-of-school disadvantages can help close the achievement gap (Bryk, 2010; Henig and Reville, 2011; Walsh et al., 2016).

2 The Impact of School Changes on Student Academic and Behavioral Performance

We first use administrative data and the student fixed effect method to examine the impact of school mobility on student academic and behavioral performance in middle school. We acquired administrative student-level data from a large, urban, public school district in the United States between 2001 and 2015. Using this sample of students, we first explore the demographic breakdown of the students according to whether they made school changes in middle school. We then examine how the academic and behavioral performance differ before and after students made school changes in middle school.

This study focuses on exploring the impact of school mobility and the effect of student support intervention in the middle school context. Exploring the effect of school mobility and the effect of student support in other school environments such as in elementary school or high school is not the focus of this study due to the fact that assessment data on math and ELA are limited to grades 3-8. As a result, we do not have enough pre-mobility observations of the students to examine the impact of school changes in elementary grades.[6] Focusing on school mobility in middle school provides outcome measurements from pre-mobility and post-mobility periods. Such outcome measurements validate the empirical methods we propose, i.e., the event studies and difference-in-differences method that we discuss in Section 5.

Out of the 89,146 students from the school district that we observe during middle school grades, 41.2% of the students experience at least one school change in grades 6-8. Among those who made school changes in middle school grades, 56% made the change in 6th grade, 31% made the change in 7th grade, and 13% made the change in 8th grade. Table 1 provides a breakdown of the racial and ethnic makeup of the students who made school changes. The table shows that students of racial and ethnic minority groups are more likely to make school changes in middle school grades. Specifically, around 36% of White students made

[6] We do not have the data to investigate the impact of school changes after middle school grades for the same reason.

school changes in middle school. The proportions are 40.77%, 42.9%, and 44.45% for Black, Hispanic, and Asian students, respectively. Male students are slightly more likely to make school changes in middle school than female students, a comparison of 41.66% for male and 40.77% for female students.

Table 1: Racial and Ethnic Breakdown of School Changes in middle school

	Changed School	N
All Students	41.23%	89,146
White	36.32%	13,094
Black	40.77%	34,547
Hispanic	42.90%	32,907
Asian	44.45%	7,410
Native American	40.00%	325
Other Races	43.11%	863
Male	41.66%	45,765
Female	40.77%	43,381

Notes: The table presents data on the number and proportion of students who made school changes in middle school grades. The data are from a large, urban, public school district in the United States between 2001 and 2015.

A further breakdown of the race and the grade when school changes happened reveals more nuanced information about the patterns of school changes. Table 2 shows that White and Asian students are more likely to make school changes in 6th or 7th grade and rarely change schools in 8th grade. Only around 6% of White and 5% of Asian students made school changes in 8th grade. Black, Hispanic, and students from other racial and ethnic groups are relatively more likely to have school changes in 8th grade than their white peers. Among our sample, 16% of Black and 14% of Hispanic students made school changes in 8th grade. School mobility can be disruptive when it happens in any grade. However, school

Table 2: Racial and Ethnic Breakdown of Grades of the School Change

Race		6th Grade	7th Grade	8th Grade	Total
White	N	2,314	2,144	298	4,769
	Freq.	48.65%	45.08%	6.27%	100%
Black	N	8,120	3,650	2,315	14,085
	Freq.	57.65%	25.91%	16.44%	100%
Hispanic	N	8,805	3,388	1,923	14,116
	Freq.	62.38%	24.00%	13.62%	100%
Asian	N	1,164	1,953	177	3,294
	Freq.	35.34%	59.29%	5.37%	100%
Other races	N	685	391	121	1,197
	Freq.	57.23%	32.66%	10.11%	100%

Notes:The table presents data on school changes among students in a large, urban, public school district in the United States between 2001 and 2015. The sample is divided according to race/ethnicity and grade when the school change happened. It shows the number and proportion of students in each group across the grade of the school change.

mobility is likely associated with more challenges when they happen in later grades. School changes in 6th and 7th grade are more likely caused by intentional school choices.[7] Since 8th grade is the final grade of a school with a K-8 or 6-8 structure, school changes in 8th grade is more likely to be reactive school changes (Rumberger et al., 1999). As a result, students who changed schools in 8th grade are more likely to experience learning disruptions and social-emotional difficulties from a combination of out-of-school and in-school factors. The breakdown by race and timing of school changes shows that students from different racial and ethnic groups make school changes for different reasons. The students who experience school changes for different reasons may have different learning trajectories after they make school changes.

Though it would be helpful to distinguish the reasons for school changes, we cannot

[7]A majority of White and Asian students make the school changes in 7th grade, probably because the school district holds entrance exams for a few selective schools in 7th grade.

identify the reasons for school changes based on the administrative data. Therefore, we group the sample students who made school changes and investigate the effect of such school changes on academic and behavioral performance for the grouped sample. Not separating the sample according to whether the school changes are voluntary might lead to a conservative estimate of the impact of school change. For students who intentionally move to a school that is more suitable for them, the gains from moving to a more suitable school offset some of the negative impacts during the transition period. Therefore, we may obtain an attenuated result for school changes. However, voluntarily moving to a more competitive school can increase the challenge and competition of the coursework, which adds pressure on the student. In the latter case, we might estimate a result of school changes that is confounded with the effect of being around more competitive peers.

The endogenous nature of school mobility makes it difficult to claim its effects on student performance as causal. We do not intend to tackle this issue in this study. Instead, we use the administrative data and a standard student fixed effect method to model the trajectory of student performance before and after school changes. This study contributes to the rich literature by providing new evidence on how school mobility affects student performance in the context of a large, urban, public district in the United States. Furthermore, it paves the way for analyzing how an integrated student support intervention helps students who experienced school changes.

The empirical method we adopt here is a student individual fixed effect method and event study. The panel structure of the student-level administrative data allows us to track students using pseudo-identification numbers. By controlling students' fixed effects and comparing the changes in the outcomes within a student, we explore how students' performance change before and after school mobility during middle school grades. The specification used for the event study is:

$$Y_{itsgz} = \beta_0 + \sum_{r=-4}^{2} \beta_r \cdot I(t - t_i^{Mobile} = r) + \delta_i + \eta_t + \sigma_s + \gamma_g + \rho_z + \gamma X_{it} + \epsilon_{itsgz}, \quad (1)$$

where Y_{itsgz} represents the academic or behavioral performance of a student i in year t, school s, grade g, and living in an area with zip code z. The academic performance is measured using state standardized math and ELA assessments, which is adjusted to have a mean of zero and a standard deviation of one. Behavioral performance is measured using days of absence and an indicator of chronic absenteeism. $I(t - t_i^{Mobile} = r)$ is an indicator function representing whether the event time equal to r relative to the first school change during middle school, with r equal to zero indicating the exact year when the first school change happened; r equal to 1 indicating the year after the first school change; and r equal to -1 indicating the year before the first school change. Depending on the year we first observe the student and the time they exit the data set, we have at most four years before the first school change and three years after the change, which allows us to observe at most seven years of outcomes, including the year when the school change occurred.

We control for multiple fixed effects: δ_i represents the student fixed effects that absorb the time-invariant factors of the student, for example, the innate ability, motivation, attitude, etc.; η_t is the calendar year fixed effect, which captures the common factors that affect all students in a given year; σ_s represents school fixed effect that captures the common factors that affect all students attending the same school, for example, school environment, administrative characteristics, etc.; γ_g controls for the factors that are common in a given grade; and ρ_z controls for common factors that affect students living in the same residential zip code. X_{it} controls for time-variant student characteristics, such as free or reduced-price lunch status (a proxy for family incomes) and special education status. And ϵ_{itsgz} is the disturbance term.

The coefficient of interest is β_r. Conditional on the multiple fixed effects and other independent variables, β_r estimates the difference in academic or behavioral performance between the students who made school changes relative to students who did not make such changes in the relative event year r.

The sample used for event studies includes students observed in the school district ad-

ministrative data between 2001 and 2015. Table 1 reports some descriptive statistics of the sample used for this analysis. Figure 1 shows the estimation results of the impact of school changes on academic performance, using the empirical method specified in equation 1. The horizontal axis shows the event time relative to the year when the first school change happened. Event year zero represents the year when the change happens. Event year negative one is the year before the change and is used as the reference time. The height of the red dots represents the estimated coefficients for standardized math and ELA assessments at a relative event time, and the vertical capped lines that go through the red dots represent 95 percent confidence intervals.

The upper panel of Figure 1 shows the result of standardized math assessment. Prior to the first school change, the math scores of mobile students are mostly similar with those of the non-mobile students, except for the math score three year prior to the event. Right after the first school change, the math score of the mobile students declines compared to their non-mobile peers, and the gap between the two groups continues to widen in subsequent event years. On average, mobile students experienced a clear drop of around 0.04 standard deviation in math scores compared to their non-mobile peers.

The lower panel of Figure 1 shows the result of standardized ELA assessment. Different from the relatively balanced pre-mobility time in math, the mobile students seem to achieve better in ELA before the school change happen. However, after the school change, the mobile students perform worse than the comparison students and there is a continuously widening gap between the two. On average, there is a 0.04 standard deviation decline in ELA after the school change. It suggests that students who made school changes face academic challenges entering new middle schools.

We further explore the patterns in behavioral performance represented by absenteeism. The upper panel of Figure 2 shows the difference in days of absence between students who made school changes in middle school and those who did not. The mobile students seem to have slightly fewer absences before the school change, an average of 0.5 fewer days. Right

after the school change, the mobile students experienced a jump in absenteeism compared to their peers: they missed an average of 1.2 more days than their peers, which exhibits a clear break from the previous trend. And the increase in days of absence persists in the following years. The lower panel of Figure 2 shows the estimated results for chronic absenteeism, defined as missing 10% of the 180 school days. The break in the trend is more salient in chronic absenteeism such that the pre-mobility performance is more balanced between the two groups. There is a clear jump in chronic absence after the school change, an increase of around two percentage points.

Exploiting the panel structure of the administrative data and comparing the within-student variation before and after the school change provides more identification power. However, it is still difficult to claim the above results as causal because of the endogeneity embedded in the school changes. Nonetheless, the trajectory in the academic and behavioral performance before and after the school change shows suggestive evidence that students who made such changes in middle school experience difficulties. Educators, education policy-makers, and student support programs need to be aware of the challenges faced by mobile students and provide appropriate assistance and support to mitigate the adverse impact during the transition period.

3 City Connects as an Integrated Student Support

City Connects is an integrated student support intervention that implements theoretically guided practices for student support in high-poverty, urban schools. It is designed in response to the recognition that social and behavioral factors in the context of academic learning may seriously impede student ability to benefit from instruction (Walsh and Backe, 2013). Its mission is to help children succeed and thrive and promote their academic, social-emotional, and physical well-being by helping the student address the out-of-school factors that hinder their learning in school. The City Connects intervention focuses on connecting each student

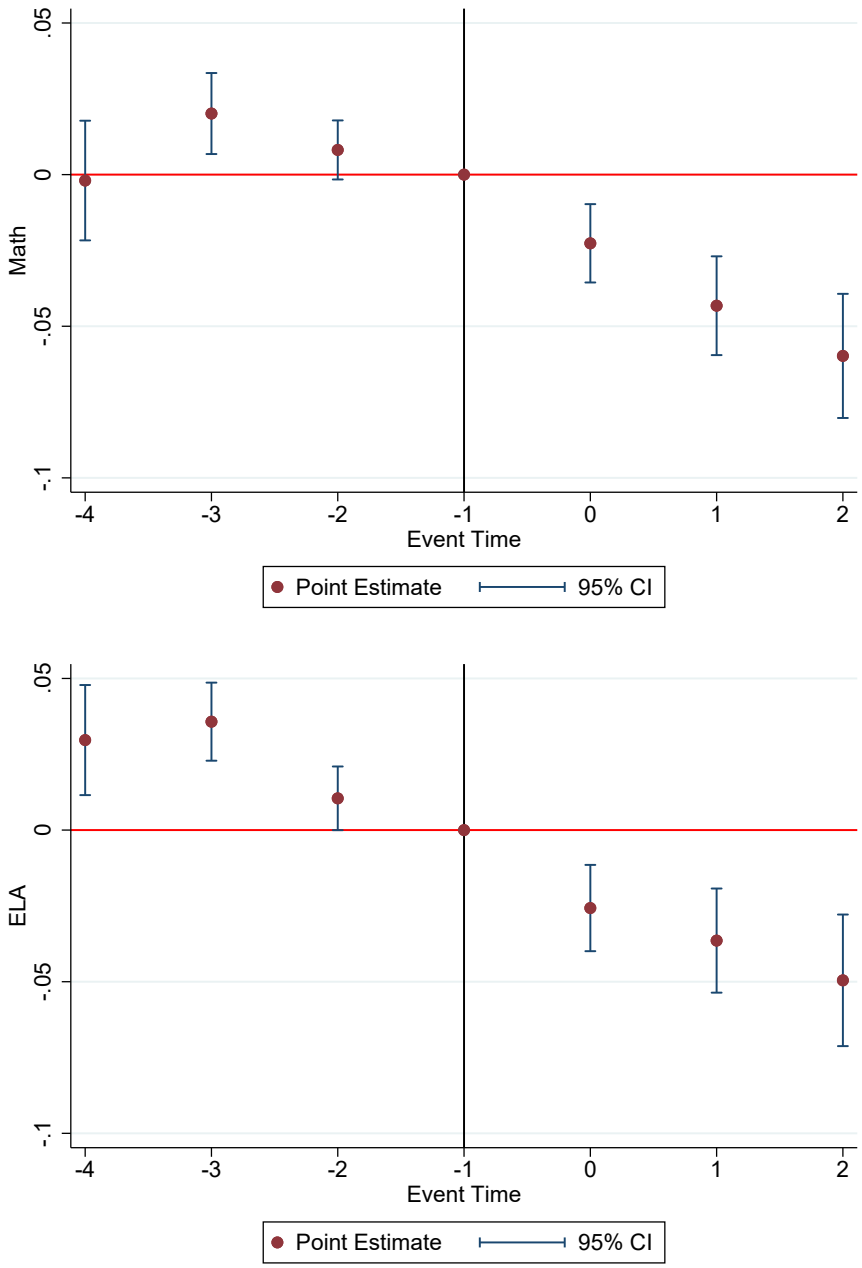

Figure 1: Event Study: The Impact of Transfer in Middle School on Standardized Exam Scores

Notes: The graphs show results from the event study about changes in academic performances before and after the first school change in middle school. The upper panel shows the results of standardized math scores, and the lower panel shows the results of English language arts. The sample consists of all students in the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. The treated group includes students who made school changes in middle school, and the comparison group includes students who either stayed in the same school or made structural school change. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Math and ELA achievement are standardized by grade-subject-year within the sample. Robust standard errors are clustered at the student level to correct for correlations in the errors among repeated student observations.

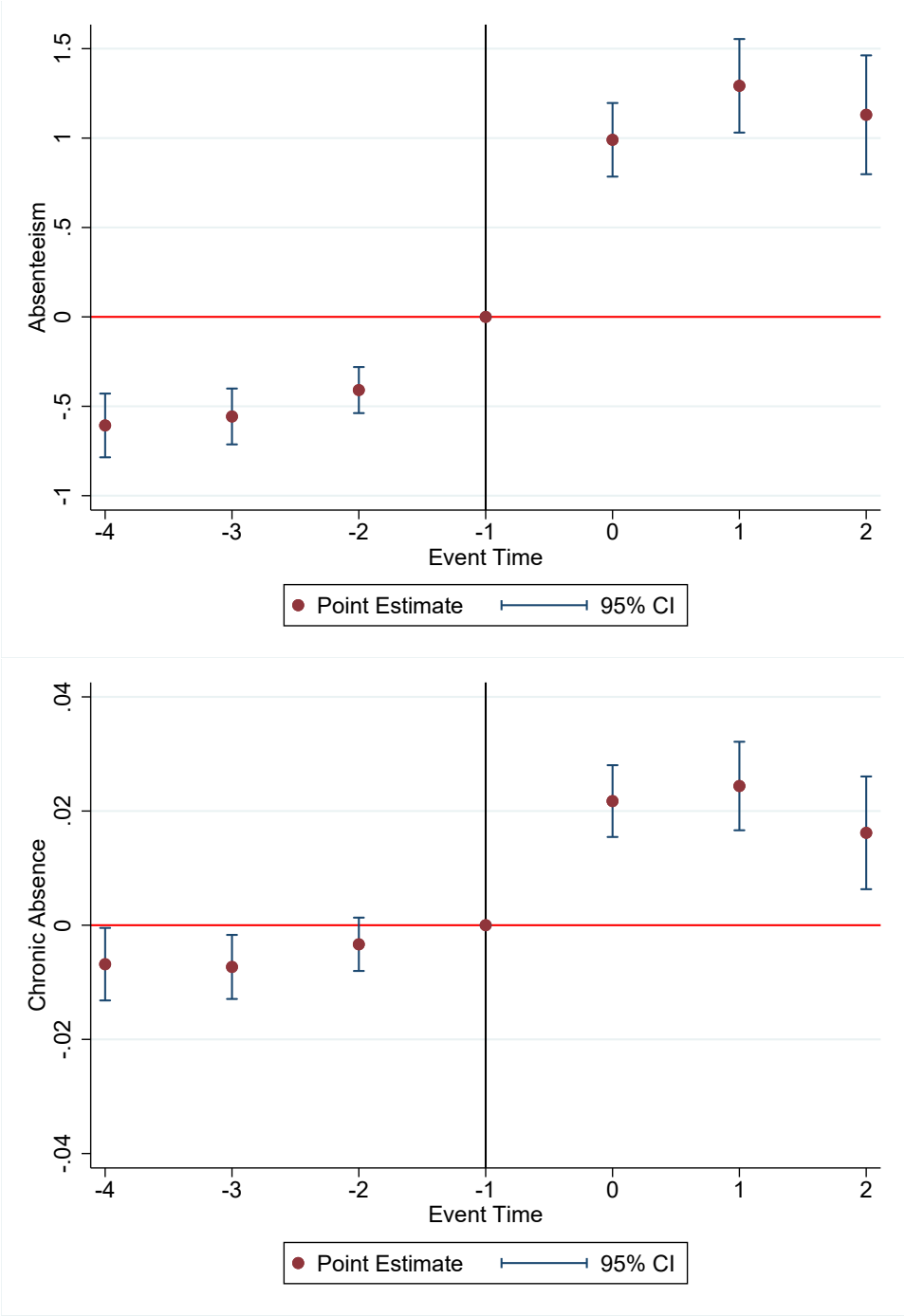

Figure 2: Event Study: The Impact of Transfer in Middle School on Absenteeism

Notes: The graphs show estimation results from the event study about changes in behavioral performances before and after the first school change in middle school. The upper panel shows the results of days of absenteeism and the lower panel shows the results of chronic absenteeism. The sample consists of all students in the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. The treated group includes students who made school changes in middle school, and the comparison group includes students who either stayed in the same school or made structural school change. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Robust standard errors are clustered at the student level to correct for correlations in the errors among repeated student observations.

with a tailored set of prevention, intervention, and enrichment services in the school and community according to their strengths and needs (Walsh et al., 2014). City Connects began in one public school in 2001 as a collaboration and partnership among Boston College, school districts, and community agencies (Walsh and Backe, 2013). As of the 2022-23 school year, it has grown to serve 179 public, charter, and Catholic schools across five U.S. states and ten schools in Dublin, Ireland.

City Connects, based on developmental science, is designed to address the out-of-school factors that affect student learning in school (Walsh et al., 2014; Moore and Emig, 2014). The intervention is implemented by on-site coordinators who connect students with services and enrichments in the school and the community. The coordinators are master-level licensed personnel with a professional background in social work or school counseling. In addition to the knowledge of education, child development, and the daily operation of the school, coordinators are familiar with the community. Coordinators identify the resources and services in the neighborhood and connect students with a tailored set of the resources and services. The services include three different intensity levels: prevention and enrichment programs, early intervention programs, and intensive/crisis intervention. Specifically, the programs include but are not limited to academic supports such as tutoring, after school enrichments, summer programs, application preparation; health supports such as vision, dental, health skills development; social-emotional-behavior supports such as sports activities, mentors, violence intervention; and family supports such as donation, family assistance, etc. Study shows that City Connects schools have more community partners that provide services to students than comparison schools (Bowden et al., 2020).

At the beginning of each school year (typically in October and November), coordinators meet with teachers individually to conduct a whole class review thoroughly assesses the strengths and needs of each student. The whole class review evaluates the risks and strengths of each student based on four developmental domains: academic, social/emotional/behavioral, health, and family. Students are assigned to four tiers according

to the degree of risk for thriving across the four domains. For students experiencing intensive risk, the coordinator conducts individual student reviews to seek a more detailed evaluation and understanding of the student's strengths and challenges. In conducting individual student reviews, the coordinator meets with a team that includes the classroom teacher and other adults involved in the student's development, such as school administrators, counselors, school nurses, and community partners providing services to or in the school. Based on the evaluation and the understanding of the student's needs and strengths from the whole class review and individual student review, the coordinator designs and makes adjustments to tailored support plans using the resources in the community and the school. The services are continuous and followed up throughout the school year and documented through a student support-information system managed by City Connects.

City Connects intervention was first implemented in elementary schools or elementary grades in K-8 schools. Over the years, City Connects expanded the implementation to middle schools, middle school grades in K-8 schools, and high schools. City Connects has developed ways to adjust its practices to adapt to different school settings and better serve students of different developmental stages. For the urban district in this study, most of the schools have a K-8 structure. And most schools started the City Connects implementation in the elementary grades and expanded to middle school grades in the following years. In these K-8 schools, the school environment of the middle school grades is very similar to elementary grades. Therefore, the practices mentioned above apply to these middle schools with little modification. The middle school students meet in a homeroom at the beginning of the day and take classes in different classrooms after the homeroom period. The homeroom teacher is the main person the coordinators work with to conduct the whole class review and individual student review.

Studies on the City Connects model have shown positive impacts on multiple student outcomes and domains. Studies also show that the City Connects model promotes student learning in elementary and middle school (Walsh et al., 2014; An, 2015; Walsh et al., 2015;

O'Dwyer et al., 2016; Khanani et al., 2020). Dearing et al. (2016) find that immigrant students who experienced City Connects intervention achieved higher English language art scores than the same student body in comparison schools. Akbayin (2017) also shows that City Connects accelerates the language proficiency of migrant children and shortens the time they spend in the English language learner program. Studies on the long-term impact of the City Connects model show that students exposed to the intervention in elementary grades have a lower dropout rate in high school (Lee-St. John et al., 2018). Evidence shows that the economic benefits of City Connects outweigh the costs (Bowden et al., 2015, 2017).

This study focuses on students who experienced school mobility in middle school grades. The hypothesis is that City Connects provides support that makes the transition period smoother for mobile students. One section of the coordinator's practice manual is designed to guide the coordinators to accommodate student transition. Coordinators are required to identify the mobile students and provide support accordingly. When students enter a new middle school, City Connects coordinators are usually the designated school personnel to help the students navigate the new school environment. When the students move to a City Connects school during a school year, following the initial support in navigating the transition, the coordinator works with the new classroom teacher immediately to assess the needs and strengths of the student. When the students show emotional or behavioral difficulties related or unrelated to the school change, their challenges are identified by the coordinators, which is less likely to happen to students entering a school without City Connects intervention. Coordinators connect students to appropriately tailored services and resources in the community and the school, which help address the challenges associated with out-of-school factors that lead to school changes. These supports and information are especially valuable if the students happen to move into the neighborhood and lack information about local resources and support. In addition, by participating in the whole class review and individual student review, teachers and other adults in the school have a better understanding and sympathy for the challenges faced by the mobile students. With this additional protection

and support, students can better adapt to a new school environment compared to their peers who move into a new middle school without such a student support system.

All-in-all, through the integrated support of the coordinator, students who experience school changes to City Connects middle schools could have a smoother transition compared to their peers who move to a non-City Connects school. Furthermore, with their transition period being smoother and out-of-school factors better addressed, they are more likely to achieve better academic or behavioral outcomes.

4 Identification Assumptions and definition of the Analytical Sample

In this section, we move on and focus on the students who made school changes during middle school grades. We define the sample of students in the treatment and the comparison groups.

Findings in the literature and the patterns shown in this study suggest that students who changed school in middle school face additional challenges after the school change. From the standpoint of student support, more attention and resource should be diverted to reducing the barriers and facilitating the transition period for mobile students. The City Connects intervention intends to support every student according to their needs and strengths. Students who made school changes to a middle school that operates City Connects intervention are more likely to receive support than those who made school changes to middle schools that do not implement City Connects intervention. With the protection and support from the City Connects intervention, students who experienced school changes are likely to adapt to the new environment smoothly. All else equal, we expect to observe that the students who made school changes to a City Connects middle school had better academic and behavioral performance than students who made such changes to a middle school that does not operate City Connects.

The challenge in estimating the effect of integrated student support as the City Connects

intervention is that the intervention is not randomly assigned to operating schools. City Connects is typically implemented in urban schools that serve low-income families. For the large urban school district in this study, many factors affect the school's decision to adopt the City Connects model. Hence, these factors could confound the estimated results of the City Connects treatment effect.

Despite all the challenges in performing a causal evaluation of the impact of City Connects on students' outcomes, the administrative data set and the setting of the question still provide identification opportunities for such an investigation. Parents make joint decisions about housing and children's schooling. Many life factors come into the decision-making process: housing conditions, school quality, commute time and distance, neighborhood quality, the convenience of enrolling multiple children in the same school to save time, etc. However, parents would not know or consider whether the school operates City Connects intervention when they make such a decision. Therefore, though the adoption of City Connects intervention is not random, there is a random feature about whether there happens to be a City Connects operation when a student makes a school change to a middle school. As shown in the following discussion, most schools in the urban school district of this study serve a higher proportion of minority and low-income students. If parents have the means, they will choose better schools for their children, for example, private schools, religious schools, or suburban school districts. Furthermore, even though the schools operating City Connects have certain features that make them not comparable to other schools, the timing of the City Connects adoption in a middle school and the timing of a student making such a school change still introduce randomness of receiving the intervention for a specific student. Based on the assumption that City Connects intervention is not the consideration when students and their parents make their school choice, we explore the causal effect of the City Connects intervention on the student performance after they change schools during middle school grades.

To have relatively clean identification, we restrict our sample to students who have never

been exposed to City Connects intervention in elementary grades. Such a restriction rules out the confounding effect that previous exposure to the intervention might have a lingering impact; for example, prior exposure to student support might increase the resilience and the ability to adapt to a new environment when students change schools. The treatment group consists of students who receive City Connects after they change school in middle school, and the comparison group comprises students who do not receive City Connects after they make a school change in middle school. We use the observations from 4th grade through 8th grade. As a result, we observe at most five years of assessments or behavioral measurements of a student. Such restriction allows us to focus on the more recent performance related to the school changes in middle school.

We further restrict the sample to students who received City Connects intervention only by moving to a new middle school. Specifically, we exclude students who received City Connects because the school newly adopted the City Connects model without the student changing schools. Finally, as will be discussed in Section 5, we try to estimate the dynamic effect of receiving City Connects. Therefore, for students who left City Connects schools after receiving the City Connects intervention, we only keep the observations when they received the intervention.

The data set we constructed from the administrative data includes anonymized student enrollment records, demographic characteristics, and academic and behavioral performance. Table 3 shows the demographics of students who moved to a City Connects middle school and those who moved to a non-City Connects school, both made school changes in middle school. The two groups both have slightly more male students than female students. For the sample students who moved into a middle school that operates City Connects, there is a higher ratio of White students, a comparison of 21.71% to 13.72%. The group of students who moved into a City Connects middle school also has a higher percentage of Asian students. There is a lower ratio of Black students who moved into a City Connects school in middle school grades, a comparison of 30% to 40%. There is a similar ratio of Hispanic students in the two groups,

at around 37%. The students who received free or reduced-price lunches are around 83% in the two groups, indicating that both groups of schools serve high poverty communities. The ratio of students receiving special education is approximately 25% in both groups. The proportion of students who speak a foreign language other than English at home is similar in both groups.

The grade 5 standardized test scores are not significantly different between the two groups, both for math and ELA. The assessments for math and ELA are standardized with a mean equal to zero and a standard deviation equal to one. The test score used to calculate the measurement is the standardized test operated by the state in the spring of each school year. The test scores are standardized by subject, grade, and year. The group that moved into a City Connects middle school has more days of absence compared to students who move into other middle schools. Though the two groups have some differences in their racial-ethnic combination, they are very similar in terms of their economic status and other observable characteristics. Most importantly, there is no significant difference in their 5th-grade assessments, meaning the two groups are comparable in their academic performance before entering middle school. In addition, we intend to use the individual fixed effect to compare differences in the outcome measures before and after moving into a middle school with the City Connects intervention. Such within-student comparison provides us with more identification power.[8]

Eight schools in the large, urban, public school district of this study have ever implemented the City Connects intervention between 2001 and 2015. The earliest school adopted City Connects in their middle school grades in 2002, and the latest one adopted City Connects in 2014 (as of 2015). Table 4 shows the adoption timeline of the eight schools.[9] Although only eight schools with middle school grades operate City Connects, there is variation in the timing of adoption, which provides identification power. Most schools that eventually

[8]Actually, the students who entered City Connects schools have lower mean test scores in math and ELA, though the difference is not statistically significant.

[9]The year is defined as the school year. The year 2001 refers to the 2001-02 school year. School names are anonymized for the reason of confidentiality.

Table 3: Summary Statistics for Students

	CCNX Students	Comparison Students	Difference
Male	0.524	0.523	0.001
			[0.04]
White	0.217	0.137	0.080
			[4.77]
Black	0.298	0.400	-0.102
			[-4.29]
Asian	0.102	0.079	0.023
			[1.73]
Hispanic	0.365	0.371	-0.006
			[-0.24]
Other races	0.019	0.014	0.005
			[0.84]
Free/Reduced Price Lunch	0.829	0.834	-0.005
			[-0.23]
Special Education	0.259	0.236	0.023
			[1.10]
Bilingual	0.110	0.120	-0.010
			[-0.65]
Grade 5 ELA score	0.046	0.088	0.042
			[-0.80]
Grade 5 Math score	0.059	0.078	0.019
			[-0.35]
Absenteeism (days)	9.40	8.35	-1.05
			[2.44]
Chronic Absenteeism	0.171	0.133	0.038
			[2.27]
N	433	24,045	

Notes: The table shows the comparison in demographic characteristics, social-economic status, and 5th grade test scores between students who moved to a City Connects school and those who moved to a non-City Connects school during middle school. All students made school changes during middle school grades (6-8) and did not receive City Connects intervention in elementary schools. All students in the sample are from a large, urban, public school district in the United States between 2001 and 2015. The t-values are in the brackets.

Table 4: Chronology of City Connects Adoption in Middle Schools and the Middle School Grades Served

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
School A												6	6 - 7	6 - 8	6 - 8
School B													6 - 8	6 - 8	6 - 8
School C		6 - 8	6 - 8	6 - 8		6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8
School D							6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8	6 - 8
School E														6 - 8	6 - 8
School F												6 - 8	6 - 8	6 - 8	6 - 8
School G													6 - 8	6 - 8	6 - 8
School H										6	6	6	7		

Notes: The school names are anonymized for confidentiality. Most of the schools have a K-8 structure, except for School F. School F is a middle school serving grades 6-12.

implemented the City Connects model are K-8 schools. These schools gradually expanded the City Connects model to middle school grades after several years of implementation in their elementary grades. This fact is important because school administrators and personnel familiar with the City Connects model from their experience in elementary grades can expand the operation to middle school grades without many obstacles. As a result, the expansion can start smoothly from the first year of the implementation in middle school grades. Therefore, the treatment effect is expected to show up at the beginning of the operation, if there is any.

Table 5 shows the summary statistics of the middle schools that eventually operated City Connects and schools that had not yet implemented City Connects by 2015 in the same school district. City Connects schools are similar to the comparison schools in terms of gender composition, both having around 47% of female students. There is some difference in the racial-ethnic combination of the school population. City Connects schools have a lower proportion of Black students compared to non-City Connects schools, a comparison of 26% to 34%. City Connects schools have a higher proportion of Hispanic students, a comparison of 43% to 39%. City Connects schools have a slightly smaller percentage of White students

Table 5: Summary Statistics for Comparison Schools and City Connects Schools

	Comparison Mean	City Connects Mean	Diff.	t-stat
Female %	46.48	47.00	-0.522	-0.16
White %	16.59	15.20	1.392	0.21
African American %	33.49	25.63	7.867	1.00
Hispanic %	39.08	43.41	-4.331	-0.53
Asian %	5.39	12.18	-6.780	-1.69
Attendance Rate	92.87	94.19	-1.320	-0.84
English Language Learner %	25.78	29.55	-3.772	-0.57
Students with Disabilities %	21.49	23.44	-1.943	-0.35
Economically Disadvantaged %	72.28	75.74	-3.462	-0.46
Average Class Size	18.04	17.21	0.823	0.49

Notes: The information on the schools' characteristics is collected from the state education department website. The values are calculated by the authors based on the information from the 2012-2013 school year. The authors thank Xiaohan Qian for her assistance in collecting and organizing the data. The eight schools that implemented City Connects are listed in Table 4.

but a higher proportion of Asian students. However, none of the differences in the racial-ethnic combination of the two groups are statistically significant. City Connects schools have a higher proportion of students with disabilities compared to non-City Connects schools, a rate of 23.4% to 21.5%. In terms of the social-economic status of the students, City Connects Schools have more students from economically disadvantaged households. City Connects schools have a higher proportion of English learner students and a higher proportion of students with disability. City Connects schools have a slightly smaller class size and a higher attendance rate. Regardless of the differences, both groups serve a dominantly high proportion of students from low-income families, with around three quarters of the students from economically disadvantaged families. Students of the two groups have different types of difficulties. And none of the observed school characteristics mentioned above are statistically different.

5 The Effects of City Connects Intervention on Students Performance – Empirical Methods

We explore both the academic and the behavioral outcomes of the City Connects intervention after school changes in middle school grades. The academic outcome measures include math and ELA achievements on the state's standardized assessments. The assessments are available for most students as far back as third grade. The behavioral outcome is absence, the days a student is absent from school in a school year. We also code a dummy variable for chronic absenteeism from the days of absence. The dummy variable takes the value one if a student misses more than 10% of the 180 school days.

We look at the impact of receiving the City Connects intervention on student achievement and behavior after the students make school changes in middle school. We restrict the data to students who had never received the intervention before middle school. The treatment group consists of 433 students who received the intervention for at least one year between sixth and eighth grade, and for whom we observe at least one outcome observation before and after the exposure to the City Connects intervention. For the students who were ever exposed to the intervention in middle school grades, approximately 74% of the treatment sample received the intervention for one year, 21% received it for two years and 5% for three years. The comparison sample, encompassing over 24,000 students, never received the intervention in elementary or middle school.

As shown in Table 3, the treatment sample appears less likely to be of high-needs status than the comparison group. However, because our models focus on within-student change, holding constant the time-invariant characteristics, we are not particularly concerned from an internal validity standpoint about differences between treatment and comparison groups. These differences do, however, limit the external validity of our findings.

The limitation of the data set is obvious. We only obtain the administrative data from the school district. As a result, we loose track of students when they move out of the school

district (for instance, moving to another public school district or to a private school, etc.).

Another limitation of the data is that it does not have a record of whether the student made the school change at the beginning of the school year or in the middle of the school year. Those students who change schools during the school year are usually at higher risk than students who change schools between school years. In this study, we do not distinguish the two types due to the lack of this information.

We first use a staggered difference-in-differences method to estimate the effect of receiving the City Connects intervention by moving in a middle school with City Connects model on student performance. The empirical model is

$$Y_{itsgz} = \beta_0 + \beta_1 \cdot CCNX_{it} + \delta_i + \eta_t + \sigma_s + \gamma_g + \rho_z + \gamma X_{it} + \epsilon_{itsgz}, \tag{2}$$

where Y_{itsgz} represents the academic or behavioral performance of student i in year t, school s, grade g, and living in an area with zip code z. We control for multiple fixed effects as in the above section: δ_i controls for the student's fixed effects that absorb the time-invariant factors, for example, the innate ability of the student; η_t controls for the calendar year fixed effect to capture the common factor that affects all students in a given year; σ_s controls for school fixed effect that captures the common factors that affect all students attending the same school, for example, school environment, administrative characteristics; γ_g controls for the factors that affect a particular grade; and ρ_z controls for common factors for students living in the same zip code. X_{it} controls for time-variant student characteristics, such as free or reduced-price lunch (a proxy for family income) and special education status. And the disturbance term is ϵ_{itsgz}. The main predictor of interest, β_1 is the difference-in-differences estimator for the effect of receiving City Connects in middle school on student performance.

The recent development in the literature on the methodology of staggered difference-in-differences estimation shows that the result from the TWFE estimation using equation 2 is only consistent to the average treatment effect on the treated under the strong assumption of homogeneous treatment effect across time and groups (De Chaisemartin and

d'Haultfoeuille, 2020; Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021). The main issue is to use early-treated groups as the control for the later-treated groups and incorporate the estimates to construct a weighted average from all two-by-two difference-in-differences estimates (Goodman-Bacon, 2021). Such a strong assumption of homogeneous treatment effect is implausible under the context of this study. We use the Stata `csdid` package based on Callaway and Sant'Anna (2021) that avoids using the early-treated groups as the control for later-treated groups.[10]

Additionally, the difference-in-differences method also relies on the parallel trend assumption. We use an event study to test the balance of the pre-treatment period. Though not sufficient, a balanced pre-trend provides some support for the parallel trend assumption. The event studies follow the specification:

$$Y_{itsgz} = \beta_0 + \sum_{r=-4}^{2} \beta_r \cdot I(t - t_i^{CCNX} = r) + \delta_i + \eta_t + \sigma_s + \gamma_g + \rho_z + \gamma X_{it} + \epsilon_{itsgz}. \quad (3)$$

Similar to the specification in the earlier section, Y_{itsgz} is the outcome of interest indicating student academic or behavioral performance of a student i, in grade g, in school s, living in residency with zip code z, and year t. The term $I(t - t_i^{CCNX} = r)$ is an indicator function representing the event time r, relative to the first year a student receives City Connects intervention in middle school. It has the same fixed effects and control variables as in equation 2.

The main predictor of interest, β_r, is the regression coefficient capturing the difference in the outcomes between those who received the City Connects intervention and those who did not in the relative event year r. Controlling for the individual fixed effects allows us to compare the within-student change in academic or behavioral performance for each year before and after the students are exposed to City Connects after they move into a new middle school. The year before they received the City Connects intervention (indexed as "-1") is

[10]The Stata `csdid` package has some limitations when including many fixed effects. Therefore, the estimation using the package has fewer control variables than in the more flexible basic difference-in-differences method. We use the package to check the robustness of the results.

used as the reference time, and the estimate is omitted for this period, i.e., the estimate for β_{-1} is omitted.

Event studies suffer from the same issue as in the staggered difference-in-differences using TWFE discussed above. In addition to the basic event studies practice, we also use the Stata package of `csdid` based on Callaway and Sant'Anna (2021) and avoid using the early-treated groups as the control for later-treated groups when conducting the event studies.

Among the sample of students who made a school change during middle school grades, we compare students who happen to move into a middle school that implements the City Connects intervention to students who happen to move into a middle school that does not have City Connects. We argue that controlling for all of these factors, assignment to the intervention is as if random. Therefore, the treatment effects can be understood as causal estimates of the intervention on student achievement.

6 The Effects of City Connects Intervention on Students Performance – Results

In this section, we report the main findings of the analysis. Table 6 shows the result from the difference-in-differences estimation specified in equation 2. Column (1) shows the estimated result for standardized math assessment. The estimated coefficient means that among students who made school changes in middle school, those who moved in a school with City Connects intervention achieved higher math scores than those who moved to a school without City Connects intervention, a difference of 0.15 standard deviations (with a standard error equal to 0.037). Column (2) reports the estimated result for standardized ELA. It shows that mobile students who received City Connects intervention achieved better ELA scores than the comparison students, a difference of 0.107 standard deviations (with a standard error equal to 0.044). Column (3) shows that mobile students who received City Connects intervention have 1.566 fewer days of absence (with a standard error equal to 0.656) compared

to students who did not receive City Connects intervention. And finally, Column (4) shows that the probability of chronic absenteeism is 5.3 percentage points lower (with a standard error equal to 2 percentage points) for students who received City Connects intervention compared to their peers who did not receive the City Connects intervention.

Table 6: Difference-in-differences Estimation about the effects of City Connects intervention on student performance for students experienced school change

	(1) Math	(2) ELA	(3) Days of Absence	(4) Chronic Absenteeism
City Connects	0.152	0.107	-1.566	-0.053
	(0.037)	(0.044)	(0.646)	(0.020)
within R^2	0.086	0.057	0.064	0.286
N of clusters	23,245	23,075	29,893	30,098
N of observation	81,332	79,385	107,597	113,254

Notes: The table shows results from the difference-in-differences analysis about the effect of City Connects intervention in middle school on student academic and behavioral performances after students experienced school changes. The sample consists of students who made school changes in the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Math and ELA achievement are standardized by grade-subject-year within the sample. Robust standard errors are clustered at the student level to correct for correlations in the errors among repeated student observations. The standard errors are in parentheses.

Table 7 shows the results from the difference-in-differences analysis based on Callaway and Sant'Anna (2021). It shows that the result is consistent for math assessment. Mobile students who received City Connects intervention achieved higher math scores than students who did not receive City Connects intervention, a difference of 0.13 standard deviations (with a standard error equal to 0.047). However, based on results in Table 7, there is no significant

change in ELA assessment. Columns (3) and (4) show that the effects on days of absence and the probability of experiencing chronic absenteeism are robust by using the estimation method based on Callaway and Sant'Anna (2021). It shows that students received City Connects intervention when they changed school have 2.616 fewer days of absence than their peers who did not receive City Connects when they changed schools (with a standard error equal to 0.867). And the difference in the likelihood of experiencing chronic absenteeism is 9.6 percentage points between the two groups (with a standard error equal to 2.7 percentage points). Note that the estimated results from the Table 6 and 7 are not directly comparable, because the estimation based on Callaway and Sant'Anna (2021) does not have as many control variables as in the basic TWFE estimation. Therefore, the estimation results in the Table 7 are more noisy than those in Table 6. Nevertheless, the estimation in Table 7 shows that the results for math, days of absence, and probability of chronic absenteeism are robust.

Figure 3 shows the results using event studies as specified in equation 3. The graph shows the difference in academic performance between the treatment and comparison groups at relative event times. The upper panel of Figure 3 shows the results for math, and the lower panel shows the results for ELA. The horizontal axis of the graphs represents the event time relative to receiving City Connects intervention for the first time when the student moved to a middle school with City Connects model. The height of the dots show the estimated coefficients from equation 3, and the vertical capped bars represent the 95% confidence intervals. The upper panel shows that after moving into a new middle school, students exposed to City Connects intervention have a steady increase in standardized math assessment. On average, the math score of the treated students increases by around 0.2 standard deviations, and the results are statistically significant. The graph also confirms that there is not a clear trend before the student received City Connects intervention. The lower panel of Figure 3 shows that after receiving the City Connects intervention, the standardized ELA test does not change significantly. Besides, there seems to be an upward trend before the students receive the City Connects intervention. As a result, it confirms that it hard to claim the

Table 7: Difference-in-differences Estimation about the effects of City Connects intervention on student performance for students experienced school change based on Callaway and Sant'Anna (2021)

	(1) Math	(2) ELA	(3) Days of Absence	(4) Chronic Absenteeism
City Connects	0.130	-0.042	-2.616	-0.099
	(0.047)	(0.055)	(0.867)	(0.027)
N of observation	66,509	66,448	102,451	112,073

Notes: The table shows results from the difference-in-differences analysis about the effect of City Connects intervention in middle school on student academic and behavioral performances after students experienced school changes. The esimation is conducted using Stata package `csdid` based on Callaway and Sant'Anna (2021) The sample consists of students who made school changes in the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Math and ELA achievement are standardized by grade-subject-year within the sample. Robust standard errors are in parentheses.

estimated result in Table 3 for ELA as robust. This is consistent with the result in in column (2) of Table 7, which shows not significant change in ELA assessment when using the method based on Callaway and Sant'Anna (2021). Observing improvement in math assessment rather than in ELA after receiving an intervention is not surprising. The education literature often shows that compared to ELA, math score is relatively more likely to show improvement in a short term when students receive appropriate support.

Figure 4 shows the estimated results for absenteeism using the specification shown in equation 3. The upper panel shows the results for annual days of absence, and the lower panel shows the results for chronic absenteeism (missing at least 10% of the school days). From the upper panel, there seems to exist a upward trend. And after the treatment, there is a trend break, and the days of absence start to drop. The days of absence continuously

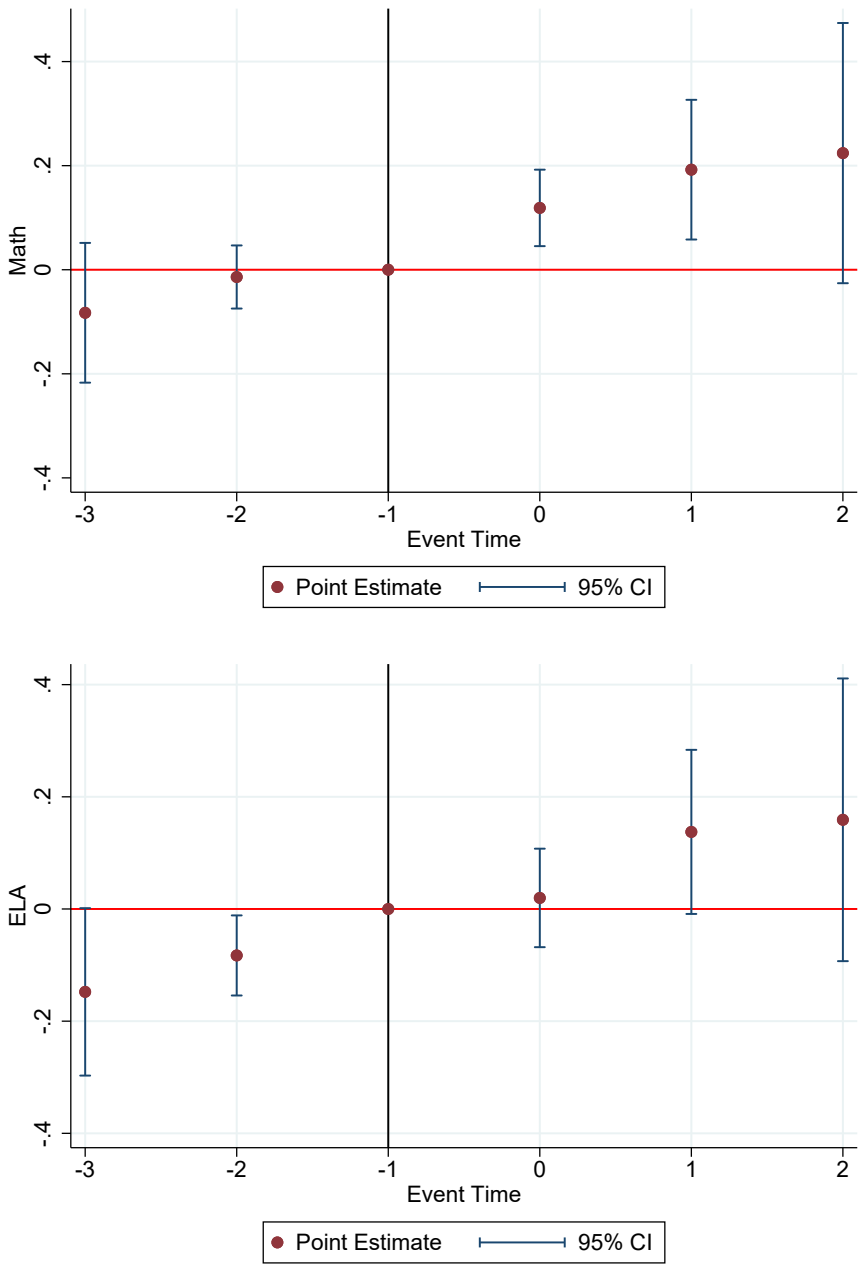

Figure 3: Event Study: The Impact of City Connects on Academic Performance

Notes: The upper and lower panels show the results from event studies on how receiving City Connects in middle school affects academic performance. The sample consists of the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. The sample is restricted to the students who made school changes in middle school. The treated group includes students who received City Connects intervention in middle school, and the comparison group includes students who never received City Connects intervention. Neither group had previous exposure to City Connects in elementary school. The upper panel shows the effect on math, and the lower panel shows the effect on ELA. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Math and ELA achievement are standardized by grade-subject-year within the analytic sample. Robust standard errors are clustered at the student level to correct for correlations in the errors among repeated student observations.

decrease after receiving the intervention. The average reduction in the first three years after the treatment is around 3 days. Recall that there is an increase in absenteeism for the students who made school change in middle school relative to students who did not change schools in middle school. The decrease in absenteeism after receiving the intervention offsets the loss from the school mobility.

The lower panel of Figure 4 shows results for the chronic absenteeism. The pre-trend is relatively balanced, which supports the parallel trend assumption. The probability of experiencing chronic absenteeism decreases gradually after receiving the City Connects intervention in new middle schools. On average, the probability of chronic absenteeism decreases by around seven percentage points.

The changes in absenteeism can be interpreted as an improvement in behavioral outcomes as it is an important measure or proxy of the student's cognitive and non-cognitive ability, and it is a reflection of the school's effectiveness and accountability as well. The improvement in behavior performance measured by absenteeism can also be interpreted as a mediation of other student's outcomes. As the mobile students' needs and difficulties are identified by the City Connects coordinators and appropriate mitigation and support are provided, students are more like to feel connected in school. The change is more likely to be seen in attendance in the short term. Higher attendance is a good predictor for long-term academic performance and other outcomes.

As discussed in the Section 5, event studies also suffer from the same issue as in the TWFE model. Figure 5 and Figure 6 show the event studies results using the Stata `csdid` package based on Callaway and Sant'Anna (2021). The graphs show consistent trends for math assessment and absenteeism. Though using different control variables, the graphs confirm the robustness of the effects of City Connects in helping the performance of mobile students.

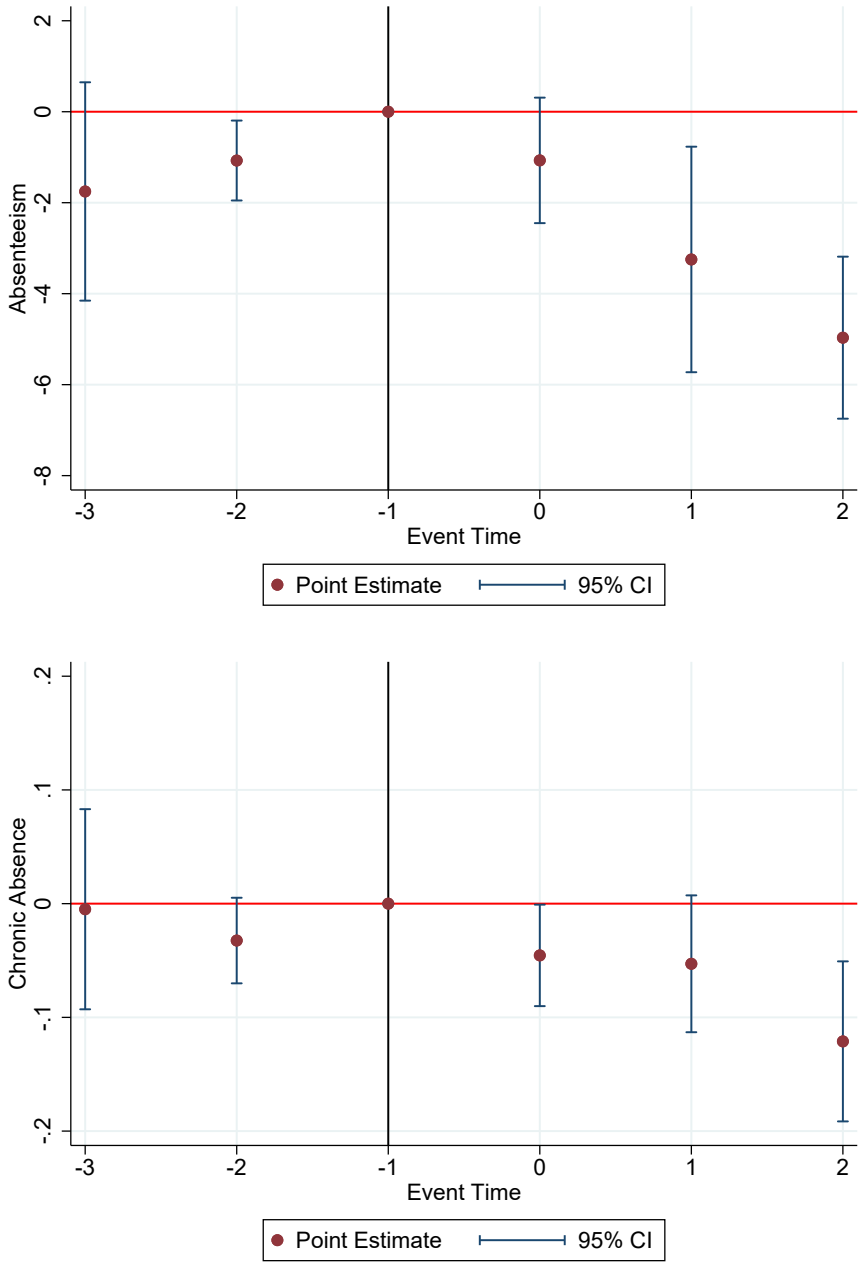

Figure 4: Event Study: The Impact of City Connects on Absenteeism

Notes: The upper and lower panels show the results from event studies on how receiving City Connects in middle school affects absenteeism. The sample consists of the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. The sample is restricted to the students who made school changes in middle school. The treated group includes students who received City Connects intervention in middle school, and the comparison group includes students who never received City Connects intervention. Neither group had previous exposure to City Connects in elementary school. The upper panel shows the results for days of absence, and the lower panel shows the results for chronic absenteeism. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Robust standard errors are clustered at the student level to correct for correlations in the errors among repeated student observations.

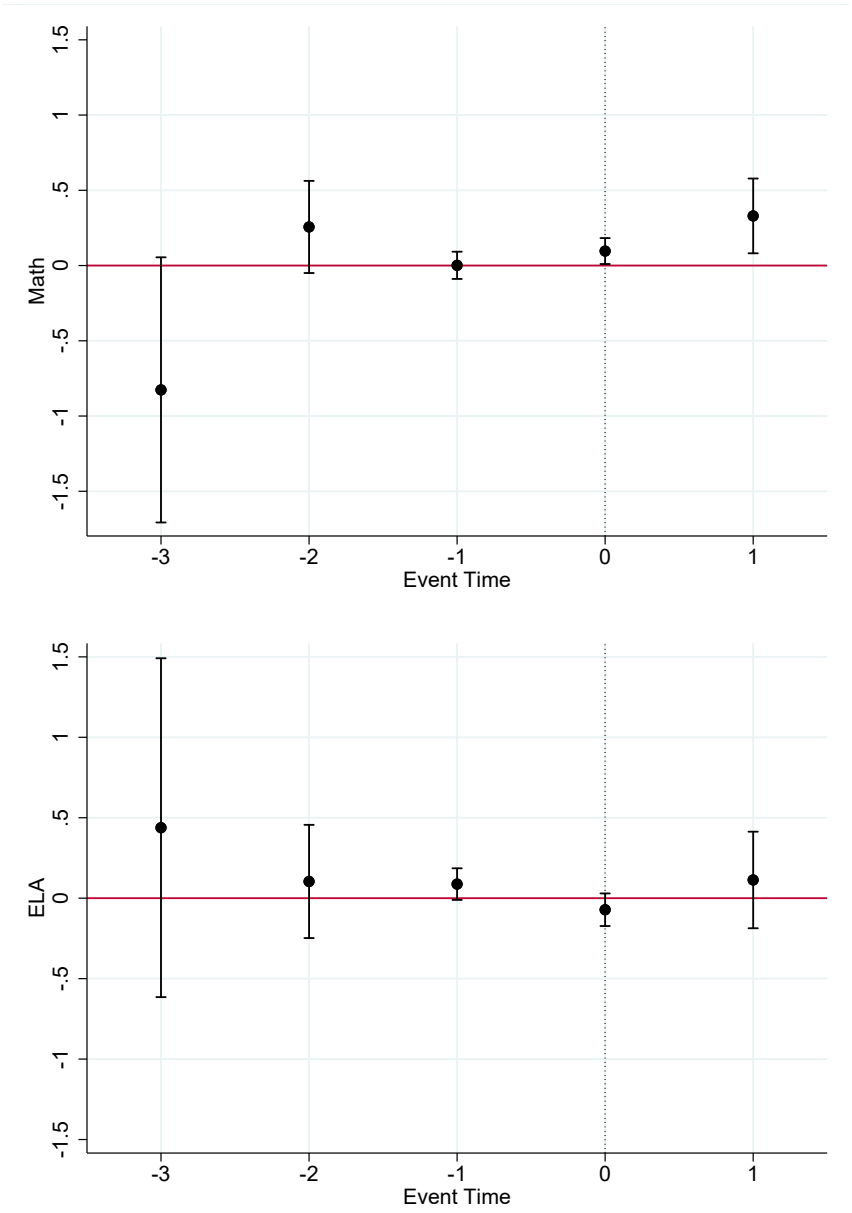

Figure 5: Event Study: The Impact of City Connects on Academic Performance based on Callaway and Sant'Anna (2021)

Notes: The upper and lower panels show the results from event studies on how receiving City Connects in middle school affects math and ELA assessments based on Callaway and Sant'Anna (2021). The sample consists of the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. The sample is restricted to students who made school changes in middle school. The treated group includes students who received City Connects intervention in middle school, and the comparison group includes students who never received City Connects intervention. Neither group had previous exposure to City Connects in elementary school. Math and ELA achievement are standardized by grade-subject-year within the analytic sample.

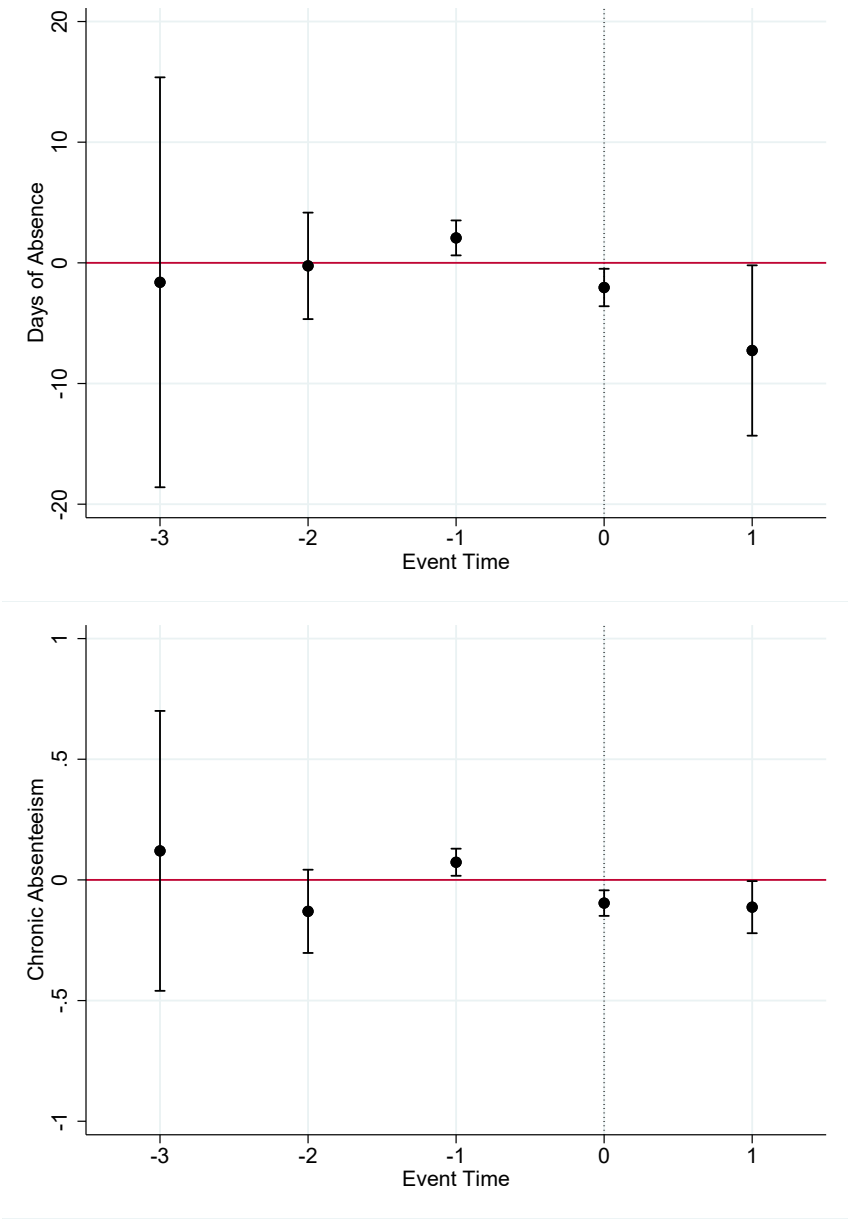

Figure 6: Event Study: The Impact of City Connects on Absenteeism based on Callaway and Sant'Anna (2021)

Notes: The upper and lower panels show the results from event studies on how receiving City Connects in middle school affects absenteeism based on Callaway and Sant'Anna (2021). The sample consists of the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. The sample is restricted to the students who made school changes in middle school. The treated group includes students who received City Connects intervention in middle school, and the comparison group includes students who never received City Connects intervention. Neither group had previous exposure to City Connects in elementary school.

7 Discussion and Conclusion

School change is a prevalent phenomenon in K-12 schools in the United States. School mobility is related to out-of-school factors that affect student achievement and behavior in school. The out-of-school factors leading to the school change exacerbate the difficulties the students face during the school change period, especially for middle school students at a unique developmental stage. Educators, school administrators, and policymakers all need to recognize the challenges faced by these students and provide appropriate support to the mobile students. Integrated student support interventions like City Connects can provide the support that is not available in many schools. Through the whole class review and individual student review, City Connects coordinators identify the needs of the students and connect students with prevention and enrichment services that address the out-of-school factors related to school mobility.

In this paper, we study a large, urban, public school district in the United States that operates City Connects intervention in several schools within the district. We first use the student-level administrative data to explore how school mobility affects student academic and behavioral performance. Using individual fixed effects and event study analysis, we find that students who experienced school changes achieve lower scores in their standardized math and ELA assessments and have more days of absence and a higher rate of chronic absenteeism.

We then focus on the subgroup of students who had made school changes and never experienced City Connects in elementary school. We examine the effect of receiving City Connects by moving in a new school that operate City Connects model on their academic and behavioral performance. Using the student's fixed effect and relying on the randomness of the timing of students moving to a school that happens to operate the City Connect model, we find that students received City Connects achieve better scores in the standardized math assessment. The effects on standardized ELA assessment is suggestive but not robust across different estimation methods. There is also consistent evidence that the intervention reduces

days of absence and the probability of chronic absenteeism. The improvement in math and the reduction in absenteeism offset the adverse impact of the school mobility in middle school. And the results are robust when we apply the method based on Callaway and Sant'Anna (2021) to deal with the issue of heterogeneous treatment effect embedded in the TWFE model in the context of staggered adoption.

The findings of this study are informative for educators, education policymakers, and student support programs in that we restate the challenges faced by mobile students in middle schools by providing new evidence from using administrative data in a large, urban, public school district and exploring the effectiveness of the integrated student support like City Connects to mitigate the adverse consequences during the transition period. More work needs to be done to better understand what aspect of City Connects is most effective in serving mobile students. Researchers have proposed policies to promote school stability, including parent engagement and improving the sense of belonging in the school (Goldhaber et al., 2022; Schwartz et al., 2009). Prevention programs like Families and Schools Together (FAST) try to engage families and inform them about the potential harm of school mobility. When school change has to happen, coordination between the two schools is essential to connect the student with continuous instruction and support programs. Integrated student support programs like City Connects can play a critical role in this process.

Given the limited literature on the effectiveness of integrated student supports in improving student outcomes, our results provide a further glimpse into how intervening against out-of-school factors related to poverty can impact student achievement. More importantly, this study also demonstrates that intervening against out-of-school factors in middle school is still possible to improve student outcomes. These findings are especially relevant given the increased efforts by states and school districts to support student's social and emotional development following the COVID-19 pandemic.

This study has some limitations as well. First, we do not have information about the reason that caused the students to make the school changes. Voluntary school changes are

expected to offset some adverse impacts of school changes. The students who made the school changes for involuntary reasons face more challenges in their life, an integrated student support program might mean more to students that made involuntary school changes. Therefore, including students who made the voluntary school changes attenuates the estimated effect of student support intervention. In this case, this study estimates a lower bound of the effect of the City Connects on students who made school changes. The education administrative data usually do not have detailed information on the family background (family income, parental education, etc.). Without such information, it is hard to investigate this issue. Future studies that can match administrative data of students' performance and their family background are valuable.

Second, this study does not distinguish school changes at the beginning of a school year and school changes during a school year. Raudenbush et al. (2011) point out that students who change schools during a school year face more obstacles and are more likely to have an unstable family environment.[11] In terms of estimating the integrated student support in mitigating the adverse impact of the school change during the school year, the effect is attenuated because these students receive a shorter time from the support. The data we acquired do not have the information that allows us to explore the effect of the intervention on the student's school changes at different times of the school year.

Third, in this study, we only observe the student's academic and behavioral performance through eighth grade, we do not examine the long-term impact of the support on academic and behavioral performance or other outcomes. Future work that can merge administrative information of students' high school achievement, dropout, and college enrollment will provide a better understanding of the long-term impact of the intervention on mobile students. The research design that can link other outcomes of the students, such as health, substance use, risk behavior, or delinquency would also be valuable. Finally, the sample size of the administrative data from the urban school district is not large enough for us to explore the

[11] Hanushek et al. (2004) find the mobile students also cause disruption for the non-mobile students in the destination schools.

impact of frequent school changes and whether the integrated student support intervention helps these students.

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Appendix for "Does an Integrated Student Support Intervention Mitigate the Adverse Impact of School Changes on Middle School Students?"

A Tables

Table A1: Estimated Coefficients of the effect of school mobility on student performances — results from event studies

	(1) Math	(2) ELA	(3) Absence	(4) Chronic Absence
$t = -4$	-0.002	0.030	-0.607	-0.007
	(0.010)	(0.009)	(0.091)	(0.003)
$t = -3$	0.020	0.036	-0.557	-0.007
	(0.007)	(0.007)	(0.080)	(0.003)
$t = -2$	0.008	0.010	-0.409	-0.003
	(0.005)	(0.005)	(0.066)	(0.002)
$t = -1$	omitted	omitted	omitted	omitted
$t = 0$	-0.023	-0.026	0.990	0.022
	(0.007)	(0.007)	(0.105)	(0.003)
$t = 1$	-0.043	0.036	1.262	0.024
	(0.008)	(0.009)	(0.113)	(0.004)
$t = 2$	-0.060	0.050	1.130	0.016
	(0.010)	(0.011)	(0.170)	(0.005)
F	11.43	12.25	43.49	8.56
N of clusters	62,108	63,969	97,074	99,769
N of observation	244,419	257,735	482,900	517,044

Notes: The table shows results from the event study about changes in academic and behavioral performances before and after the first nonstructural school change in middle school. The sample consists of all students in the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. The treated group includes students who made school changes in middle school, and the comparison group includes students who either stayed in the same school or made structural school change. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Math and ELA achievement are standardized by grade-subject-year within the sample. Robust standard errors are clustered at the student level to correct for correlations in the errors among repeated student observations. The standard errors are in parentheses.

Table A2: Estimated Coefficients of the effect of City Connects intervention on student performance for students experienced school change

	(1) Math	(2) ELA	(3) Days of Absence	(4) Chronic Absenteeism
$t = -3$	-0.083	-0.148	-1.753	-0.005
	(0.069)	(0.076)	(1.244)	(0.045)
$t = -2$	-0.014	-0.083	-1.073	-0.032
	(0.031)	(0.036)	(0.448)	(0.019)
$t = -1$	omitted	omitted	omitted	omitted
$t = 0$	0.119	0.020	-1.070	-0.045
	(0.037)	(0.045)	(0.704)	(0.022)
$t = 1$	0.192	0.137	-3.248	-0.053
	(0.068)	(0.075)	(1.265)	(0.031)
$t = 2$	0.224	0.159	-4.967	-0.121
	(0.128)	(0.129)	(0.908)	(0.036)
F	5.01	3.22	18.96	3.15
N of clusters	20,567	20,534	27,209	27,672
N of observation	78,634	76,826	104,896	110,814

Notes: The table shows results from the event study about changes in academic and behavioral performances before and after the first school year the student experienced City Connects intervention in middle school. The sample consists of students who made school changes in the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Math and ELA achievement are standardized by grade-subject-year within the sample. Robust standard errors are clustered at the student level to correct for correlations in the errors among repeated student observations. The standard errors are in parentheses.

Table A3: Estimated Coefficients of the effect of City Connects intervention on student performance for students experienced school mobility based on Callaway and Sant'Anna (2021)

	(1) Math	(2) ELA	(3) Days of Absence	(4) Chronic Absenteeism
$t = -3$	-0.827	0.438	-1.620	0.121
	(0.449)	(0.537)	(8.664)	(0.296)
$t = -2$	0.256	0.104	-0.241	-0.131
	(0.156)	(0.180)	(2.246)	(0.088)
$t = -1$	0.001	0.088	2.071	0.072
	(0.046)	(0.046)	(0.796)	(0.029)
$t = 0$	0.096	-0.072	-2.127	-0.093
	(0.044)	(0.052)	(0.796)	(0.027)
$t = 1$	0.330	0.11.	-7.277	-0.112
	(0.127)	(0.153)	(3.604)	(0.055)
N of observation	66,509	66,448	102,451	110,814

Notes: The table shows results from the event study about changes in academic and behavioral performances before and after the first school year the student experienced City Connects intervention in middle school. The sample consists of students who made school changes in the administrative data set from a large, urban, public school district in the United States between 2001 and 2015. We control for school, school year, grade, zip code, and individual fixed effects. We also control for free or reduced-price lunch and special education status. Math and ELA achievement are standardized by grade-subject-year within the sample. Robust standard errors are in parentheses.