The Role of Comprehensive Student Support Interventions during School Turnaround

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The persistence of underperformance in schools within large urban districts remains a significant challenge in the U.S. K-12 education system. Education policymakers have enacted legislation aiming at improving these schools through ``turnaround'' initiatives. However, students attending underperforming schools face multifaceted challenges that extend beyond the classroom. Therefore, restructuring the underperforming schools without addressing critical out-of-school factors appears to be insufficient to achieve the goal of these legislative efforts. In this study, we focus on a large urban school district in Massachusetts with many underperforming schools undergoing school turnaround. During the turnaround process, some schools implemented a comprehensive student support intervention while others did not. The variation in supplementing school turnaround with comprehensive student support intervention and the timing of the implementation of the intervention allows us to explore whether comprehensive student support aiming at addressing out-of-school factors enhances student performance during the school turnaround process. Employing difference-in-differences and event studies research designs, our findings reveal that schools and grades implementing the comprehensive student support intervention during their turnaround efforts demonstrate improvement in math and English language arts compared to those not implementing the intervention. These results provide valuable insights for policymakers, emphasizing the essential role of comprehensive student support in enhancing the success of school turnaround.

The Role of Comprehensive Student Support Interventions during School Turnaround [*]

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Abstract

The persistence of underperformance in schools within large urban districts remains a significant challenge in the U.S. K-12 education system. Education policymakers have enacted legislation aiming at improving these schools through "turnaround" initiatives. However, students attending underperforming schools face multifaceted challenges that extend beyond the classroom. Therefore, restructuring the underperforming schools without addressing critical out-of-school factors appears to be insufficient to achieve the goal of these legislative efforts. In this study, we focus on a large urban school district in Massachusetts with many underperforming schools undergoing school turnaround. During the turnaround process, some schools implemented a comprehensive student support intervention while others did not. The variation in supplementing school turnaround with comprehensive student support intervention and the timing of the implementation of the intervention allows us to explore whether comprehensive student support aiming at addressing out-of-school factors enhances student performance during the school turnaround process. Employing difference-in-differences and event studies research designs, our findings reveal that schools and grades implementing the comprehensive student support intervention during their turnaround efforts demonstrate improvement in math and English language arts compared to those not implementing the intervention. These results provide valuable insights for policymakers, emphasizing the essential role of comprehensive student support in enhancing the success of school turnaround.

1   Introduction

The persistence of underperformance in schools in large urban districts is a pervasive issue plaguing the K-12 education system in the United States. The cause of the underperformance in these schools is multifaceted. Many of these underperforming schools are located in the inner city with a high poverty rate. These schools have to allocate their limited resources to meet diverse student needs (e.g., language barriers, mental health issues, and poverty) and have difficulty keeping qualified teachers (Boyd et al., 2005; Jacob, 2007; Carver-Thomas and Darling-Hammond, 2017). Students attending these schools are from racial, ethnic, and socioeconomic groups that are historically underserved and under-resourced in the education system. Furthermore, the challenges facing these students extend far beyond the classroom and are formidable throughout their developmental years, including limited access to educational resources at home (Cornelli Sanderson and Richards, 2010), precarious living conditions (Solari and Mare, 2012), food insecurity (Morrissey et al., 2016), and inadequate health care (Mayer, 1997; Flores and Tomany-Korman, 2008; Solari and Mare, 2012). Leaving children experiencing these out-of-school challenges without adequate support leads to persistent learning and behavioral problems in schools, perpetuating a cycle of disadvantage, limiting the prospects of students, and impeding social mobility (Duncan and Murnane, 2011).

School turnaround is a policy initiative that aims to reform the structure and operation of the underperforming schools fundamentally. However, because many of the challenges facing the students in these underperforming schools are from outside the schools, restructuring schools without addressing the out-of-school factors cannot achieve the policy goal. Although comprehensive student support intervention is not designed for school turnaround, its components such as multi-tiered and individualized support as well as incorporation of community partners and resources that are crucial for underperforming schools undergoing turnaround process. Evidence from survey and qualitative studies reveals the importance of supplementing school turnaround with comprehensive student support intervention (Stein

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et al., 2016; Strunk et al., 2016). However, few studies have examined the interaction of the turnaround practice and the comprehensive student support intervention quantitatively. This study addresses the literature gap by investigating the role of a comprehensive student support intervention, City Connects, during school turnaround within the context of Springfield Public Schools (SPS) in Massachusetts.

Grounded in developmental science, the City Connects intervention aims to address the out-of-school (e.g., homelessness, food insecurity, etc.) challenges that impact student performance. The intervention relies on community- and school-based resources to provide tailored plans of support for each and every student in the school. Through addressing some of the out-of-school obstacles faced by high-needs students in underperforming schools, it is expected that the City Connects intervention can enhance the school turnaround process. Section 3 provides details on the City Connects intervention.

Employing difference-in-differences and event studies research designs and exploiting the variation of City Connects implementation at the school-grade level, we compare SPS turnaround schools and grades that adopted the City Connects intervention to those that did not during the turnaround process. Our analysis indicates that, beyond the academic improvements attributable to the turnaround effort, schools and grades that adopted the City Connects comprehensive student support intervention exhibited better performance in standardized statewide assessments than those that underwent turnaround without implementing the intervention. Our preferred and most conservative specifications reveal an increase of 0.163 standard deviations in math (with a standard error of 0.086) and 0.139 standard deviations in ELA (with a standard error of 0.063) for the turnaround schools that integrated the comprehensive student support intervention during the turnaround process.

This study contributes to the literature in different ways. First, we explicitly model the turnaround process and account for many observable school-level characteristics experiencing significant changes during the turnaround process. In doing so, we provide evidence regarding the effect of turnaround practice in narrowing the achievement gap. Second, as

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the focus of this study, we provide new insights into the effectiveness of comprehensive student support interventions in promoting student academic achievement in a distinct context. Finally and most importantly, we present evidence demonstrating the crucial role of comprehensive student support interventions in aiding underperforming schools throughout their turnaround process. The findings of this study have significant policy implications for educational policymakers, district administrators, and school leaders as they design and implement turnaround plans aimed at restructuring underperforming schools.

Previous studies have investigated the impact of school turnaround practices on student performance across various contexts and the findings on the effectiveness of turnaround practice are not conclusive. Early research spanning from 1992 to 2000, as summarized by Wong and Shen (2003), indicates that mayoral or state takeovers of low-performing schools yield moderate and mixed effects on student academic performance (largely depending on whether there is an effective accountability system established during the takeovers). More recent studies use experimental or quasi-experimental research designs to explore the effects of turnaround initiatives. For instance, Dee (2012) utilizes a regression discontinuity design to assess the impact of California's school reforms funded by the School Improvement Grant and finds significant improvements in test-based school performance among schools categorized as "lowest-achieving" and undergoing dramatic staff turnover. The estimates reveal a 0.1 standard deviation increase in test scores based on a reduced form specification and a 0.3 standard deviation increase based on instrumental variables specifications. Redding and Nguyen (2020), in a meta-analysis of studies related to turnaround practice, observe general positive effects on student academic performance, with an increase of 0.08 standard deviations in math and 0.04 standard deviations in ELA, alongside improvements in attendance and graduation rates. Similarly, Schueler et al. (2022) conduct a meta-analysis, confirming positive results in math performance with an increase of 0.07 standard deviations, although no significant improvement is found in ELA. They further explore heterogeneity across different research designs, noting more pronounced effects in studies employing ran-

domized controlled trials: with a 0.24 standard deviation increase in math, and particularly significant effects among Hispanic students, with a 0.23 standard deviation increase in math.

Some studies show limited outcomes of school turnaround efforts. For instance, Strunk et al. (2016) examine the turnaround efforts of the Los Angeles Unified School District and note mixed results across cohorts: while the second cohort exhibited considerable improvement, the first cohort showed no progress, and the third cohort even experienced a decline in test scores. Similarly, Heissel and Ladd (2018) utilize a regression discontinuity design to investigate school turnaround practice in North Carolina, finding that schools' performance declined after implementing turnaround strategies.

The reason for the inconclusive findings surrounding school turnaround is likely due to the complexity and variety of the turnaround practices across states and districts (and even within districts). Despite being categorized under the same term and with the shared objective of school reform, different states adopt varied practices and emphasize different interventions. Scholars investigating turnaround practices have sought to discern the effects of different turnaround strategies, such as replacing teachers or principals. However, given that students attending these schools are from lower socioeconomic groups and many of the obstacles of learning are related to out-of-school factors, it is evident that merely restructuring instruction activities cannot achieve the goal of substantial improvements in these underperforming schools.

In a report by the American Institutes for Research (Stein et al., 2016), researchers identified four key practices crucial for successful turnaround initiatives based on turnaround practices in Massachusetts: establishing a community of practice through leadership, shared responsibility, and professional collaboration; employing intentional practices to improve teacher-specific and student-responsive instruction; providing student-specific supports and interventions informed by data and the identification of student-specific needs; and establishing a climate and culture that provide a safe, orderly, and respectful environment for students and a collegial, collaborative, and professional culture among teachers that sup-

ports the school's focus on increasing student achievement.

Stein et al. (2016) also identified nine essential elements associated with evidence of improvement in turnaround efforts. Among these elements, consistent implementation of a well-defined multi-tiered support system and provision of non-academic student support, including social and emotional support, emerge as critical factors in a comprehensive approach to student support. School leaders and staff also emphasize the importance of forging community partnerships to provide these supports effectively. In another mixed-methods study conducted by Strunk et al. (2016), conclusions drawn from qualitative and survey data suggest that increased student support and assistance, in conjunction with efforts to reconstitute and restart instructional activities, contribute to gains observed in the second cohort of turnaround initiatives.

2 Policy Background and School District Context

2.1 Policy Background

Federal school turnaround legislative initiatives in the 21st century commenced with the No Child Left Behind Act (NCLB) in 2002. NCLB mandated that states establish assessment standards and accountability systems, enabling governments to set measurable benchmarks for school performance and hold leaders accountable. Additionally, NCLB allocated federal funding to support underperforming schools and facilitate restructuring instructional activities. Building on this foundation, the American Recovery and Reinvestment Act of 2009 allocated unprecedented funding to aid underperforming schools nationwide. These schools were required to implement more substantial reforms or undergo a turnaround. Further federal legislative efforts of the 2015 Every Student Succeeds Act (ESSA) made the state responsible for overseeing accountability systems and providing sufficient support to underperforming schools through turnaround initiatives.

In compliance with federal regulations, the state legislature of Massachusetts passed

An Act Relative to the Achievement Gap in January 2010. According to this legislation, the Massachusetts Department of Elementary and Secondary Education (DESE) is tasked with establishing a new accountability system. Under this system, all public schools in Massachusetts are categorized into one of five levels, with Level 1 representing the highest-performing schools and Level 5 indicating the lowest-performing ones. The assignment of levels is primarily determined by school performance in the standardized statewide assessment — Massachusetts Comprehensive Assessment System (MCAS), and is updated annually.

The 2010 Massachusetts Act requires districts housing Level 4 schools to develop a comprehensive turnaround plan to accelerate academic progress and establish a high-functioning learning environment (Level 5 schools face state takeover). The development of the turnaround plan for these designated schools requires collaboration with a local stake-holder group comprising diverse representatives from the community, educators, parents, and social services.

The turnaround plan outlines specific and measurable annual objectives to effectively monitor progress. These objectives encompass both academic and non-academic indicators, which include performance metrics on standardized tests, such as the MCAS, improvements in areas of academic underachievement, advancements among various student subgroups, and the narrowing of achievement gaps associated with limited English learners, special education students, and those from low-income backgrounds.

To achieve these goals, the turnaround plan addresses critical factors impacting student performance. It outlines measures to strengthen ELL programs, develop financial strategies for school improvement, and address social service and health needs to cultivate a conducive "ready to learn" environment. Furthermore, the plan prioritizes initiatives to enhance child welfare services and ensure a safe and secure learning environment.

The Massachusetts legislation also includes provisions allowing for expedited arbitration in cases involving the dismissal of teachers with professional status in Level 4 schools for justifiable cause. This measure aims to hold educators accountable for their performance.

Turnaround schools are encouraged to seek additional funding, such as School Redesign Grants, to support turnaround practices. The funding enables schools to implement student support and enrichment programs or hire personnel to provide needed services to students. Each turnaround plan is authorized for up to three years, during which the superintendent assumes the responsibility for achieving the specified goals and ensuring their effective implementation.

2.2 Previous Studies on Massachusetts School Turnaround

An evaluation conducted by the American Institutes for Research (LiCalsi and Píriz, 2016) finds that Massachusetts turnaround schools utilizing School Redesign Grants consistently improved student academic performance measured by MCAS, with gains of 0.41 and 0.31 standard deviations in math and ELA, respectively. This improvement is observed across grade levels, student subgroups, turnaround cohorts, and school districts, and is particularly significant for English language learners (ELL). Specifically, LiCalsi and Píriz (2016) note significant academic achievement gains among students in Springfield's turnaround schools within the first three years of implementing turnaround practice. Similarly, Schueler et al. (2017) investigate the state takeover of the Lawrence Public Schools and identify significant achievement gains in math and modest improvements in reading during the initial two years of state receivership.

In a study closely related to this one, Gandhi et al. (2018) find that students in Massachusetts turnaround schools that adopted the Wraparound Zone initiative demonstrated significant improvements, with an increase of 0.24 and 0.30 standard deviations in math and ELA, respectively, after three years of implementation. Notably, these learning gains are particularly pronounced for ELLs and students in earlier grades (grades 3 and 4).[1] However, it is worth noting that their estimated results may be attributed to many school-level changes

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[1]Funded through Race to the Top, the Massachusetts Department of Elementary and Secondary Education (DESE) launched its Wraparound Zone Initiative in 2011 to build district capacity to support schools in their efforts to build comprehensive programs integrating non-academic and academic supports. City Connects is listed as one of the Wraparound student service models.

that they did not control for in their analysis. In appendix A, we provide a series of graphs showing the changes in student demographic composition, teacher quality, and academic achievement before and after school turnaround among Massachusetts schools ever being designated as Level 4 school. The dramatic changes in student demographic composition indicate the importance of controlling these factors when estimating the effect of education intervention during the turnaround process.

2.3 District Context

In this study, we aim to examine the role of a comprehensive student support intervention during the school turnaround process in SPS. While focusing on a single school district restricts our analytical sample, it offers advantages for identification. First, turnaround plans and improvement efforts vary from district to district, making comparisons across districts challenging. Since turnaround plans within the same school district share many practices, focusing on one school district allows us to capture how the common features of school improvement efforts interact with comprehensive student support intervention. Second, each school district has unique characteristics, such as demographics, socioeconomic backgrounds, and community resources that can be utilized for student support. Variations in these district characteristics can lead to different effects of the student support programs. Focusing on a single geographic location helps mitigate the impact of these variations on the conclusion of the study.

The city of Springfield, located 90 miles west of Boston, is the third-largest city in the Commonwealth of Massachusetts. According to the 2010 Census, the population of Springfield is approximately 153,000. The median household income stands at $55,000, compared to $62,000 across Massachusetts in 2010. The poverty rate for households with dependent children under 18 years old is 31.5%, in contrast to the statewide rate of 12.8% (2010). Among the population aged 25 and older, approximately 18% has a bachelor's degree or higher, significantly lower than the statewide percentage of 39%. Hispanic descendants

constitute 40% of the Springfield population, a stark contrast to the 9.6% in Massachusetts overall. Additionally, around 14% of the population is from Puerto Rico, and 12% are foreign-born residents. These demographic characteristics underscore the unique socioeconomic challenges facing the Springfield community, which may have implications for educational outcomes and the effectiveness of turnaround efforts within the school district.

In the 2012-2013 school year, SPS served approximately 25,000 students from kindergarten to 12th grade, with a significant population of low-income students, predominantly Hispanic or African American. For many years, the district has grappled with many challenges associated with underperforming schools. During the initial year of the turnaround initiative, 2011, ten schools serving grades 3-8 in SPS were categorized as Level 4 schools. Over the subsequent years, the number of turnaround schools increased, with one more school designated in 2012, three in 2013, one in 2014, and one in 2016. Each Level 4 school underwent a substantial restructuring of instructional activities, along with the replacement of the principals and a significant portion of teachers. Among these Level 4 schools, some schools or grades opted to adopt the City Connects intervention as a comprehensive student support approach among their turnaround strategies.

Table 1 compares SPS turnaround schools, SPS non-turnaround schools, and non-turnaround schools across Massachusetts, using data from the DESE data archive. The comparison underscores the significant demographic distinctions between the SPS and the statewide average. In particular, SPS serves a higher proportion of marginalized students, has a lower proportion of effective teachers, and exhibits below-average performance on standardized assessments relative to Massachusetts as a whole. Not surprisingly, turnaround schools in SPS serve an even higher proportion of marginalized students and underperform average SPS schools in assessments.

Table 1: Summary Statistics for Springfield Turnaround Schools (2009-2010 School Year)

	Springfield Turnaround	Springfield Non-turnaround	Massachusetts Non-turnaround
Math	-1.07	-0.50	0.01
ELA	-1.01	-0.49	0.00
English Language Learner(%)	16.49	10.72	7.10
Student with Disability (%)	23.17	21.94	16.37
Low Income (%)	86.97	80.90	34.60
African American (%)	20.19	21.20	8.65
Hispanic (%)	63.95	51.94	14.91
White (%)	10.00	19.32	67.98
Number of Teachers	54.74	36.20	37.54
Enrollment	575.13	404.93	484.38
Teacher Retention Rate (%)	82.10	88.00	85.34
N	57	80	4077
Teachers Licensed (%)	93.37	97.03	97.09
Teachers Highly Qualified (%)	90.17	96.23	97.49
N	45	78	3966

Notes: Data are from the Massachusetts DESE website. The table shows the summary statistics for Springfield turnaround schools, Springfield non-turnaround schools, and Massachusetts non-turnaround schools. We use the sample of 2009-2010 school year, the year before any school started the turnaround practice.

3 City Connects Intervention and its Implementation in Springfield

3.1 The City Connects Intervention and its Main Components

City Connects, as a comprehensive student support intervention, was developed in response to the recognition that social and behavioral factors in the context of academic learning may seriously impede students' ability to benefit from academic instruction (Walsh and Backe, 2013). City Connects provides a system for identifying, documenting, and addressing each student's holistic strengths and needs. It connects students with a customized set of prevention and enrichment opportunities, as well as early intervention and intensive services (Walsh et al., 2014). Initiated in 2001 as a research and practice partnership between Boston College and the surrounding community, City Connects has served more than 300 public, charter, and Catholic schools across nine states in the U.S. and the Republic of Ireland.

As a hub of student support, the school counselor or social worker (referred to as City Connects Coordinators) develop a tailored plan of support for every student. With the teacher, the Coordinator assess the strength and needs of the students and facilitate the connection of students with services (e.g., art classses, music, sports) available in the school and wider community. These plans encompass the academic, social-emotional-behavioral, physical health and family domains of child development. The leverage of community resources to mitigate the impact of out-of-school risk factors on student academic achievement. This core component of City Connects' practice aligns with the recommendations from researchers, practitioners, and the federal government in the past few years (Moore and Emig, 2014; Moore et al., 2017; García and Weiss, 2017; US Department of Education, 2021). Research indicates that City Connects schools have more community partners that provide services to students than comparison schools (Bowden et al., 2020).

Recognizing students' diverse needs and developmental stages across different school settings, City Connects has developed adaptable practices to better serve students at elemen-

tary, middle school, and high school levels. We limit our analysis to SPS schools that serve grades 3-8. In this context, the classroom teachers play an important role in working with coordinators to conduct the whole class review and individual student review.

3.2 Previous Studies about City Connects

Research on City Connects has shown positive impacts across various student outcomes and domains. Multiple studies have highlighted the model's effectiveness in promoting student learning and achievement in elementary and middle school settings (Walsh et al., 2014; An, 2015; Walsh et al., 2015; O'Dwyer et al., 2016; Jiang et al., 2023). Dearing et al. (2016) find that immigrant students participating in the City Connects intervention achieve higher ELA scores than their peers in comparison schools. Similarly, Akbayin (2017) shows that City Connects accelerates the language proficiency of migrant children and reduces the time they spend in the ELL program. Studies on the long-term impact of the City Connects intervention reveal that students exposed to the intervention during elementary grades exhibit lower dropout rates in high school (Lee-St. John et al., 2018). Pollack et al. (2023) further show that students who received the City Connects intervention during elementary grades exhibit a higher estimated probability of postsecondary enrollment and degree completion. Moreover, Jiang et al. (2023) find that the City Connects intervention leads to improvement in both academic and behavioral performance among middle school students during the transition period of the school year. Evidence also shows that the economic benefits of City Connects outweigh the costs (Bowden et al., 2015, 2017).

City Connects is implemented predominantly in urban schools, where most students come from families with limited resources and higher needs, including a significant proportion of immigrants. Compared to their more advantaged peers, students in these schools require additional support but often their families lack awareness of the full set of available resources in their schools and communities. These challenges become more pronounced during periods of school turnaround, characterized by significant restructuring and the replacement of a great

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portion of teachers, staff, and the principal. Amidst such dramatic change within the school environment, high-need students may feel particularly disoriented and vulnerable, risking being overlooked during the transition. City Connects coordinators, armed with knowledge of school and community resources, a deep understanding of student developmental issues, and the necessary skills to provide support, can play a crucial role in bridging the gap and supporting students during times of change. Combined with reforms in instructional activities, comprehensive student support interventions can potentially enhance student academic performance. As noted above, mixed-methods studies based on surveys and interviews by Stein et al. (2016) and Strunk et al. (2016) show evidence supporting the pivotal role of comprehensive student support intervention during school turnaround.

3.3 City Connects in Springfield

The City Connects intervention was implemented in the SPS over the years. Table 2 demonstrates the timeline for both the Level 4 school designations and the adoption of the City Connects intervention within 16 schools in SPS. The analysis focuses on schools serving grades 3-8. By excluding schools only serving high school grades (9-12) or K-2 grades, we can use statewide standardized math and ELA assessments, MCAS, as outcome measurements, which are applicable to grades 3-8. The grade numbers in the table show the grades that implemented the City Connects intervention during the school year. The cells filled with gray indicate the school year when the schools were designated as Level 4 schools. As can be seen in the table, some schools are not continuously designated as Level 4 schools. However, according to state legislation, once schools are designated as Level 4, they are labeled as underperforming schools and are required to start the turnaround process. After the initial designation, the Massachusetts DESE examines the entire performance trajectory of schools for three to four years and lets schools exit the underperforming school status when they show continuous improvement. Therefore, we use the first year of the Level 4 designation and construct the event time relative to the Level 4 designation in the empirical analysis.

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First, the table shows the variation in the adoption of the City Connects intervention at the school level. Some schools adopted City Connects in the same year when they were designated as turnaround schools, while some other schools adopted the City Connects intervention after they were designated as turnaround schools. Second, instances exist where turnaround schools did not adopt City Connects during the specified time frame, and conversely, schools not undergoing turnaround adopted City Connects. Furthermore, within schools adopting City Connects, there is also variation at the grade level, with not all grades in a City Connects school implementing the model.

The table demonstrates that schools vary in the timing and grades regarding the adoption of the City Connects implementation. The variation in the adoption of the intervention presents an opportunity for identification through comparisons between schools or grades that implemented City Connects and those that did not. Such comparisons allow us to associate the City Connects intervention with difference in student performance during the school turnaround process. However, it is essential to acknowledge that the City Connects intervention is not implemented through randomized controlled trials, thus limits the interpretation of our findings as the causal effect of City Connects.

4   Data

We leverage publicly available longitudinal school- and grade-level data from DESE to conduct the analyses. These data span the 2005-2006 to 2016-17 school years. The grade-level average scores on the statewide standardized assessment in math and ELA are available, which we standardize within grade, subject, and year to use as our outcome measures. Data include various demographic information at the school level, including student race and ethnicity, economic disadvantage status, ELL status, and special education status. Furthermore, DESE provides school-level information on the percentage of licensed teachers, the percentage of classes taught by highly qualified teachers, and teacher retention. We incor-

Table 2: Chronology of Level 4 Designation and City Connects Adoption in Springfield Public Schools and Grades

	School Type	2011	2012	2013	2014	2015	2016
School A	PreK - 8	PreK - 8	PreK - 8	PreK - 8	PreK - 8	PreK - 8	PreK - 8
School B	PreK - 5	K - 5	K - 5	K - 5	K - 5	K - 5	K - 5
School C	6 - 8		6	6	6		
School E	PreK - 5	PreK - 5	PreK - 5	PreK - 5	PreK - 5	PreK - 5	PreK - 5
School G	6 - 8						
School H	PreK - 5	PreK - 5	PreK - 5	PreK - 5	PreK - 5	PreK - 5	K - 4
School I	PreK - 5						K - 5
School J	6 - 8						
School L	6 - 8		6	6	6		
School M	6 - 12			6	6, 7, 9	6 - 7	6
School N	6 - 8		6	6	6 - 7	6 - 7	
School O	PreK - 5			K - 4	1 - 4	1 - 4	K - 3
School Q	6 - 8				6	6	
School S	6 - 8						
School T	PreK - 5	K - 5	K - 5	K - 5	K - 5	K - 5	K - 5
School U	PreK - 5			K - 5	K - 5	K - 5	K - 5

Notes: The table shows the chronology of schools' adoption of City Connects intervention and turnaround status. The grade numbers in the cells show the grades that implement City Connects intervention during a school year. The cells with gray color are designated turnaround schools. The school names are anonymized for confidentiality.

porate these school-level data as our control variables. To determine the Level 4 school or turnaround status and the timing, we refer to DESE documents on school accountability dating back to the 2010-2011 school year, when the school turnaround practice was initiated.

To address the research question regarding how City Connects enhances school turnaround practice, we narrow our sample to the SPS turnaround schools that serve at least one grade between grades 3 and 8 (for example, excluding high schools). This selection is deliberate, as students in grades 3-8 are assessed using statewide standardized tests, providing a consistent metric for student achievement. Additionally, we restrict the study to the period between the 2005-2006 and 2016-2017 school years. The rationale for this time frame is multifaceted. First, it allows us to capture data before a significant policy change related to the turnaround school designation. Specifically, starting from the 2017-2018 school year, the DESE introduced the Sustainable School initiative, broadening systemic interventions beyond just Level 4 schools to include a larger number of struggling schools. This shift in policy blurred the definition of turnaround schools, which is essential for the study. Additionally, post-2018 years are susceptible to the impacts of the COVID-19 pandemic, which could confound our analysis. We ensure a more stable and interpretable analysis by focusing on data before the policy shift and major disruptions. Our sample comprises various school types: elementary schools (typically serving grades K through 5), middle schools (typically serving grades 6 through 8), and combined (K-12) schools, as long as they serve at least a grade between grade 3 and grade 8. In total, our district-wide sample comprises 16 schools, with 11 implementing City Connects for at least one school year in at least one grade level as of the 2017-18 academic year.

Table 3 provides a comparative snapshot of Level 4 schools in SPS, distinguishing between those that never adopted the City Connects intervention and those that eventually did, as of the year 2009, preceding the enactment of the Massachusetts Act Relative to the Achievement Gap. Column 1 presents the characteristics of Level 4 schools that never adopted the City Connects intervention (as of 2017), while column 2 outlines the characteristics of Level 4

schools that eventually adopted City Connects (as of 2017). The unit of analysis is at the school-grade level. The table shows that SPS Level 4 schools, regardless of City Connects adoption, exhibit similar characteristics with respect to low performance in both math and ELA and serving student populations predominantly from high-poverty and marginalized backgrounds. There are no significant differences across many characteristics between the two samples, except for a lower proportion of student with disabilities (SWD) in Level 4 schools that eventually adopted the City Connects intervention. Additionally, schools that eventually adopted City Connects tend to be relatively smaller in size, as reflected by teacher count and student enrollment. Notably, schools and grades that later adopted City Connects have slightly lower achievement in both math and ELA before the turnaround practice and the implementation of City Connects in some schools. This comparison across many dimensions suggests that the two samples are comparable, laying a foundation for meaningful comparative analyses.

Table 4 extends the comparison of the Level 4 schools in SPS, utilizing the same variables but examining a later year within the sample period, specifically 2016, by which time many Level 4 schools adopted the City Connects intervention. This table indicates that the two groups of Level 4 schools in SPS still resemble each other in many characteristics. Nonetheless, notable differences emerge between the two groups. First, the Level 4 schools that adopted City Connects display higher levels of academic achievement in math and ELA. Second, schools that adopted City Connects by the end of the sample period demonstrate a higher teacher retention rate and an increased proportion of classes taught by highly qualified teachers. Finally, schools not adopting City Connects experienced more pronounced declines in enrollment and teacher count compared to their City Connects-adopting counterparts. The comparisons and trends in school characteristics underscore significant shifts within schools upon the start of the turnaround practices. The diverse turnaround practices likely yield varying outcomes for schools and students. In general, the pattern revealed in Table 3 and Table 4 implies a likely correlation between the adoption of City Connects and factors

Table 3: Summary Statistics for Springfield Turnaround Schools (2009-2010 School Year)

	Comparison Mean	City Connects Mean	Diff.	P-value
Math	-0.96	-1.13	0.17	0.06
ELA	-0.88	-1.07	0.19	0.02
English Language Learner (%)	14.95	17.26	-2.31	0.26
Student with Disability (%)	26.03	21.75	4.28	0.00
Low Income (%)	88.41	86.26	2.16	0.38
African American (%)	18.74	20.91	-2.17	0.27
Hispanic (%)	65.92	62.97	2.95	0.39
White (%)	10.28	9.86	0.42	0.77
Number of Teachers	69.26	47.47	21.79	0.00
Enrollment	771.91	511.47	260.44	0.00
Teacher Retention Rate (%)	81.78	82.26	-0.48	0.77
N	57	19		
Teachers Licensed (%)	91.65	93.92	-2.27	0.16
Teachers Highly Qualified (%)	91.15	89.86	1.29	0.51
N	45	11		

Notes: Data are from the Massachusetts DESE website. The table shows the summary statistics for SPS Level 4 schools that never adopted the City Connects intervention and Level 4 schools that eventually adopted the City Connect intervention as of 2016. The sample includes all Level 4 schools in the SPS that serve at least one grade between grades 3 and 8. We use the cross-sectional sample of the 2009-2010 school year, the year before any school started the turnaround practice.

Table 4: Summary Statistics for Springfield Level 4 Schools (2016-2017 School Year)

	Comparison Mean	City Connects Mean	Diff.	P-value
Math	-0.83	-0.44	-0.39	0.00
ELA	-0.70	-0.45	-0.25	0.03
English Language Learner(%)	18.28	17.15	1.13	0.64
Student with Disability (%)	22.66	17.32	5.34	0.00
Low Income (%)	80.29	75.76	4.52	0.29
African American (%)	16.84	19.65	-2.81	0.06
Hispanic (%)	71.88	68.02	3.86	0.26
White (%)	8.02	9.41	-1.39	0.45
Number of Teachers	39.24	38.32	0.91	0.80
Enrollment	434.06	455.14	-21.08	0.63
Teacher Retention Rate (%)	54.73	71.77	-17.04	0.00
Teachers Licensed (%)	81.78	92.22	-10.44	0.00
Teachers Highly Qualified (%)	65.69	84.50	-18.81	0.00
N	54	17		

Notes: Data are from the Massachusetts DESE website. The table shows the summary statistics for SPS Level 4 schools that never adopted the City Connects intervention and SPS Level 4 schools that eventually adopted the City Connect intervention as of 2016. The sample includes all Level 4 schools in the SPS that at least serve one grade between grades 3 and 8. We use the cross-sectional sample of the 2016-2017 school year, six years after the establishment of the Massachusetts level system.

that reflects the dramatic changes of the school structure such as teacher retention rate. While it is challenging to control for all factors during the school turnaround, we endeavor to control as many observable factors that might be correlated with evolving dynamics over time as possible.

5   Empirical Method

We employ a quasi-experimental design to examine the impact of the City Connects intervention on student academic performance during the SPS turnaround practice. We utilize data from the Massachusetts DESE, focusing on school-grade-level observations. Our outcome variables of interest are the state-wide standardized test scores in math and ELA, measured at the school-grade level. The analysis is at the school-grade level because the implementation of the City Connects intervention is determined at the school-grade level, i.e., in some schools, only specific grades implement the comprehensive student support intervention. We include other variables to control for student characteristics, teacher characteristics, and leadership changes, all measured at the school level.

Our study encompasses on all Level 4 schools within the SPS that serve at least one grade between grades 3 and 8. We compare the Level 4 schools and grades that implemented City Connects with those that did not implement the City Connects intervention during the time frame. As discussed above, the turnaround of the Level 4 schools is a comprehensive and complicated process that involves different practices. We try to model this process by applying different empirical strategies. First, we include the event time relative to the time of Level 4 designation. This allows us to capture the changes in school operations in anticipation of, and response to, the dramatic shift during the turnaround practice. Second, given that teacher replacement is a significant aspect of the turnaround process, we include variables such as teacher retention rate and the percentage of licensed teachers. These indicators reflect changes in teacher composition and skill levels, which are crucial factors influencing student achievement. By incorporating these control variables into our analysis, we try to account for the multifaceted dynamics involved in school turnaround initiatives.

The specification used for the analysis is as follows,

$$Y_{gst} = \beta_0 + \beta_1 CCNX_{gst} + \delta_{gs} + \eta_t + \sum_{r=-5}^{4} \gamma_r \cdot I(t - t_s^{Turnaround} = r) + \beta_2 X_{st} + \beta_3 Z_{st} + \epsilon_{gst}. \quad (1)$$

Here, Y_{sgt} represents the outcome variables, e.g., state-wide standardized tests in math and ELA, measured in grade g at school s during the school year t. $CCNX_{gst}$ indicates receiving the City Connects intervention in grade g at school s during the school year t. δ_{gs} represents the school-grade fixed effects that capture the time-invariant factors specific to a grade of a school; while η_t represents the school year fixed effects, capturing common factors affecting all schools and grades in a particular school year. The term $I(t - t_s^{Turnaround} = r)$ is an indicator function denoting the event year relative to the first year of the Level 4 designation of school s. Depending on the turnaround cohorts, we model up to five years leading to and five years following the Level 4 designation, with $r = 0$ representing the exact year of Level 4 designation and the start of the turnaround practices. The coefficient γ_r represents the estimated effects of turnaround practices at a relative event time. X_{st} comprises time-varying school-level controls for student characteristics, such as the percentages of Hispanic, African American, and White students, as well as the percentage of ELLs, SWD, and economically disadvantaged students. Z_{st} includes school-level control variables reflecting changes in school administration and operations related to turnaround practices, such as teacher retention rate, percentage of classes taught by highly qualified teachers, and the percentage of licensed teachers. Lastly, ϵ_{gst} represents the residual term.

The coefficient of interest is β_1, estimating the effect of the City Connects intervention on student performance during the school turnaround practice. By including fixed effects at the school and grade level, we account for unobserved factors specific to a given grade within a school. This approach enables us to compare student performance in math and ELA within the same school and grade, thus controlling for potential confounding variables that may vary across different grades and schools.

In essence, this methodology allows us to isolate the impact of City Connects on student outcomes, providing valuable insights into how the comprehensive student support intervention contributes to academic achievement amidst the challenges of school turnaround initiatives.

We also use a more flexible model to examine the dynamic effects of adopting the City Connects model on academic performance during the turnaround process, where we estimate the following empirical model:

$$Y_{gst} = \alpha_0 + \sum_{k=-4}^{3} \beta_k \cdot I(t - t_s^{CCNX} = k) + \delta_{gs} + \eta_t + \sum_{r=-5}^{4} \gamma_r \cdot I(t - t_s^{Turnaround} = r) + \beta_2 X_{st} + \beta_3 Z_{st} + \epsilon_{gst}.$$

(2)

The key difference from the previous specification in Equation 1 is the treatment variable, which is now represented by a series of coefficients, β_k, indicating the dynamic treatment effect in each period relative to the first year of the City Connects adoption. These coefficients are estimated for up to four years before the adoption and up to three years after the adoption, allowing us to capture the dynamic effects over eight event years. All other control variables, relative event estimates for turnaround, and fixed effects are the same as those in Equation 1. By employing this event study approach, we try to uncover how the effects of the City Connects intervention on academic performance evolve over time.

6 Results

In this section, we present the estimation results. Table 5 shows the estimated coefficients for the impact of the comprehensive student support intervention on academic performance in SPS Level 4 schools. Columns 1 and 2 display the effects of the comprehensive student support on math and ELA assessments for the SPS Level 4 schools, with only the school-grade fixed effects, year fixed effects, and turnaround event time fixed effects included. The coefficients for math and ELA indicate that, for Springfield Level 4 schools, students in schools and grades that adopted the City Connects model perform better than students in schools and grades that did not implement City Connects, showing an increase of 0.370 standard deviations in math and 0.365 standard deviations in ELA, respectively.

As previously discussed, student composition within Level 4 schools changes during the

Table 5: Estimated Results of the Effect of Comprehensive Student Support Intervention on Springfield Turnaround Schools

	(1) math	(2) ELA	(3) math	(4) ELA	(5) math	(6) ELA
City Connects	0.370	0.365	0.283	0.254	0.163	0.139
	(0.087)	(0.077)	(0.077)	(0.060)	(0.086)	(0.063)
Student Demo Controls	×	×	✓	✓	✓	✓
Teacher CHAR Controls	×	×	×	×	✓	✓
School-grade FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Turnaround Event Time FE	✓	✓	✓	✓	✓	✓
Observations	736	736	736	736	391	391

Notes: Data are from the Massachusetts DESE website. The table shows the estimated results of the comprehensive student support on academic performance of the Level 4 schools within SPS. The sample includes grades 3-8 from all Level 4 schools in the SPS between the 2005-06 to 2016-17 school years. The unit of observation is at the school-grade-year level. Standard errors are in parentheses. Standard errors are clustered at the school-grade level as the City Connects intervention is implemented at the school-grade level. Robust Standard errors are in parentheses.

turnaround process. Columns 3 and 4 of Table 5 present results after incorporating controls for school-level student characteristics, such as racial composition, percentage of ELLs, percentage of SWD, and percentage of students of low-income families. Including control variables for student characteristics partially accounts for the changes in student performance caused by the changes in the student composition during the turnaround process. The estimated effects of the City Connects intervention are slightly smaller in magnitude after incorporating controls for student characteristics, but remain statistically significant.

A dramatic transformation in schools during the turnaround process involves the extensive replacement of teachers and changes in leadership. School leaders in turnaround schools are granted the autonomy to replace ineffective teachers. Indeed, many Level 4 schools replace a large proportion of their teaching staff. Columns 5 and 6 of Table 5 display estimated results after incorporating variables of school-level teacher characteristics, such as the percentage of classes taught by highly qualified teachers, the percentage of licensed teachers, the teacher retention rate, and the student-teacher ratio. By including these school-level measures related to teacher characteristics and teacher retention rate, we account for different practices or emphases related to the teaching staff and leadership style during the turnaround processes. With the addition of controls for teacher characteristics and retention rate, the estimated results further decrease in magnitude, but remain statistically significant. The coefficients indicate that students in schools and grades that implemented City Connects perform better than schools and grades that did not implement City Connects, with an increase of 0.163 standard deviations in math (with a standard error of 0.086) and 0.139 standard deviations in ELA (with a standard error of 0.063). The model used in columns 5 and 6 is the most conservative and our preferred specification. The full estimation results are presented in the appendix.

Figure A7 presents the results of event studies using the specification represented in equation 2. The upper graph displays the estimated results for math, and the lower graph shows the results for ELA. On the horizontal axis, each event year is relative to the first year of

the City Connects implementation, with zero representing the exact year of implementation. The dots represent the estimated coefficients of receiving the City Connects intervention for each event time, excluding the year before the City Connects implementation as the reference year. The capped lines passing through the dots represent the 95% confidence intervals. We include the same controls for school-grade fixed effects, school, and year fixed effects, turnaround event time fixed effects, and variables for school-level student characteristics, teacher characteristics, and teacher retention rate.

The coefficients in Figure A7 estimate the difference in math and ELA assessment scores between schools and grades that adopted City Connects during the turnaround process and those that never adopted it. The graphs indicate that schools and grades that received City Connects and those that did not adopt City Connects were not significantly different from each other four years before the implementation of City Connects. However, the schools and grades that received City Connects performed worse three years and two years before the City Connects implementation; this is particularly noticeable in ELA. The difference in academic performance could be attributed to the timing of Level 4 designation. Table 2 shows that several schools and grades adopted City Connects the year following their Level 4 designation. Hence, the decline preceding the City Connects implementation might reflect the disorder in these schools prior to Level 4 designation. Although we attempt to control for the event time relative to Level 4 designation and other pertinent school-level factors, there may still be omitted factors contributing to the observed difference two years before the City Connects implementation. However, given balanced groups four years before the City Connects implementation, we believe the decline ahead of the implementation does not pose a significant threat to the identification of the effect.

The estimated results for the event time after the City Connects implementation exhibit a trend of ongoing improvement in both math and ELA. Significant improvement in math and ELA is observed in the second year of implementation. This delayed effect is reasonable, considering that it takes time for coordinators to gather student information, develop support

plans, make referrals and service deliveries, and ultimately address the factors impeding student learning. The magnitude of the effects on math appears earlier and more pronounced than that on ELA, consistent with findings from previous education studies.

7   Discussion

7.1   Interpretation of the Estimated Results

The results from the difference-in-differences and the event studies strategies indicate that receiving the City Connects intervention during the SPS turnaround process leads to a statistically and practically significant improvement in academic performance in math and ELA, with increases of 0.163 and 0.139 standard deviations, respectively. To put this into perspective, research by Lipsey et al. (2012) suggests that one year of in-school instruction increases student scale scores by 0.22 to 0.56 standard deviations in mathematics and 0.23 to 0.40 standard deviations in reading, on average. Therefore, implementing City Connects during the turnaround process is equivalent to at least one third of the learning gain typically associated with a full year of in-school instruction. A meta-analysis by Schueler et al. (2022) shows that Hispanic students show greater improvement during school turnaround, which might explain the magnitude of the finding in this study, as 60-70% of the student population in the SPS Level 4 schools are Hispanic.

7.2   Potential Identification Threats

Several factors might lead to biases in the estimation. First, the adoption of the City Connects intervention at the school-grade level raises concerns about potential spillover effects to other grades not implementing City Connects in the same school. These effects could occur through improvements in the overall school environment or coordinators assisting in other capacities within the school they serve. However, failing to account for possible spillover effects could lead to a downward bias in the estimated effects. This bias arises
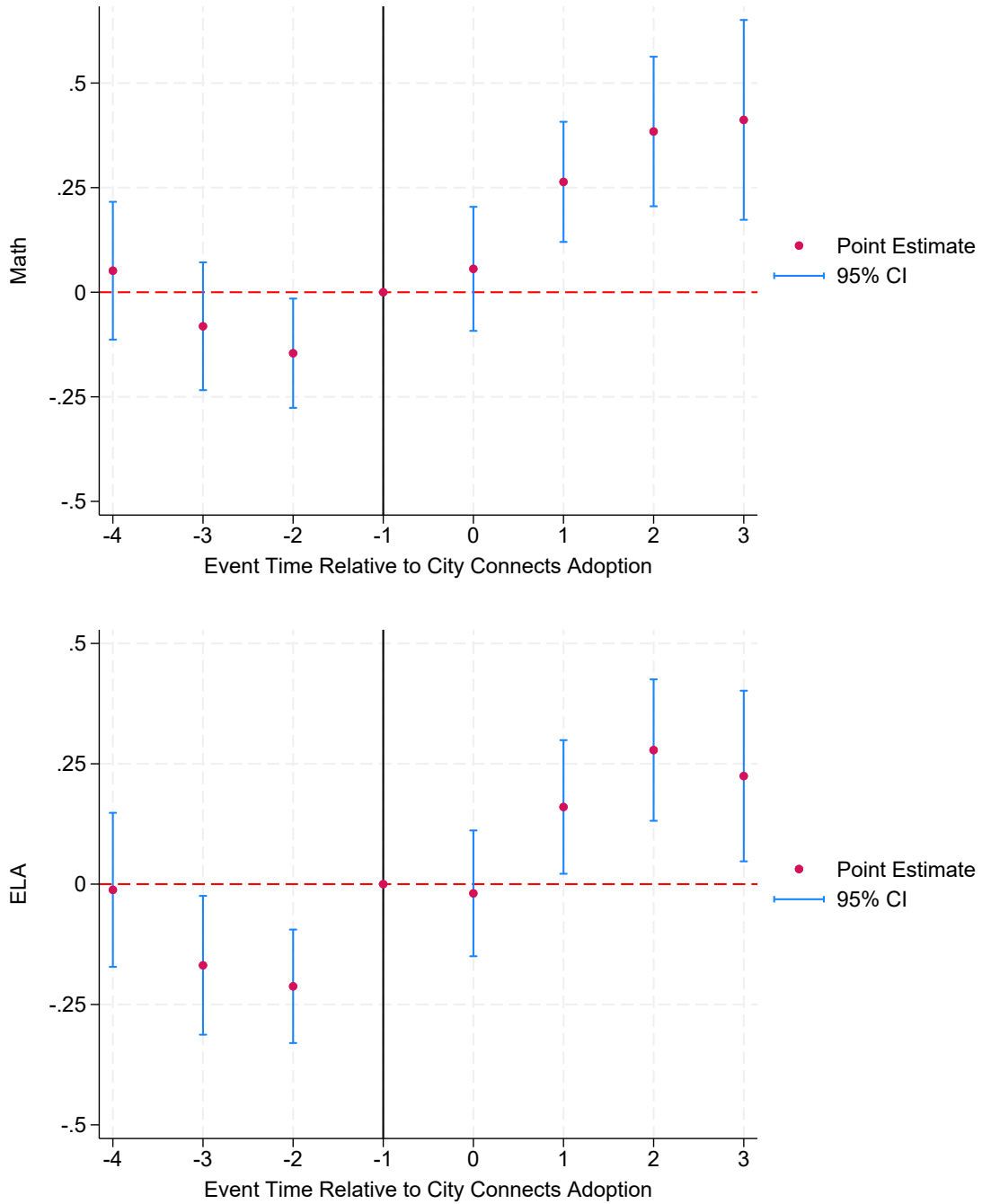
Figure 1: The Effect of City Connects on Academic Performance - Event Studies

Notes: Data are from Massachusetts DESE website. The graphs show the estimated results of the comprehensive student support on academic performance of the Level 4 schools within SPS. The sample includes grades 3-8 from all Level 4 schools in the SPS between the 2005-06 to 2016-17 school years. The unit of observation is at the school-grade-year level. Standard errors are clustered at the school-grade level as the City Connects intervention is implemented at the school-grade level.

because the comparison group may also benefit from the intervention indirectly. Therefore, the findings of this study likely represent a lower-bound estimate of the true effect of receiving the City Connects intervention during the turnaround process.

Furthermore, the self-selection of families out of Level 4 schools following their designation could introduce a significant bias in the estimation of the City Connects intervention's effects during the turnaround. Families who are more informed about the impending changes may move their children to other schools, altering the composition of the student population remaining in the Level 4 schools. If students with more resources or options tend to leave, the estimates may reflect the effects of the City Connects intervention primarily for students with fewer resources or options. Additionally, students with outside options may be expected to perform better academically compared to those who remain in Level 4 schools. The departure of students with alternatives could further diminish the average performance within the schools. In such a scenario, the estimates might be downward biased relative to the true effect of comprehensive student support during turnaround. However, it's also plausible that students with fewer resources have more room for improvement when provided with better instruction and support. In this case, the estimates might be upward biased relative to the true effect. While we endeavor to control for observable student characteristics at the school level, such as racial composition, the percentage of low-income students, disability status, and ELLs, to mitigate the influence of changes in student composition, it's impossible to account for all possible shifts in relevant student demographics.[2]

7.3   Limitations

While this study provides valuable insights, it is not without its limitations. First, the implementation of the City Connects in SPS Level 4 schools is not based on random assignment. This lack of randomization admits the possibility to potential selection bias, wherein schools opting to implement City Connects may possess certain inherent characteristics that con-

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[2]School-level student demographics and teacher characteristics may not reflect the characteristics in specific grades. However, these data are only measured at the school level from the DESE data archive.

tribute to improved student performance during the turnaround process. Despite our efforts to control for many observed characteristics and structural changes within schools during their turnaround practice, there could still be omitted factors that can potentially interact with the adoption of the intervention and lead to biased results. However, the results from event studies offer some assurance that the schools and grades receiving City Connects and those not receiving the intervention are not meaningfully different from one another at the beginning of the analytical time frame, providing a degree of confidence in the results.

Second, there is a legitimate concern regarding the potential influence of other initiatives and resources allocated to SPS Level 4 schools during the turnaround process and the implementation of City Connects. One such program worth mentioning is the Springfield Empowerment Zone Partnership (SEZP), a nonprofit organization committed to enhancing student achievement in Springfield. However, this initiative commenced its work with SPS in 2015, which is four to five years later than the implementation of City Connects in most SPS schools. In addition, the SEZP initiative only works with middle and high schools, while in this study, we focus on schools serving grades 3-8. Therefore, in terms of the time frame and grades that receive the services, the SEZP has a relatively small overlap with the analytical sample of this study. While efforts have been made to control for various factors that could impact student academic outcomes by including multiple fixed effects and school-level controls, it is impossible to account for all potential confounders in the analysis.

Another limitation of this study is the reliance on publicly available school- and grade-level data from the DESE website. This restricts our ability to delve into the heterogeneity of effects and mechanisms underlying the City Connects intervention. Access to administrative individual-level data would enable researchers to explore how the intervention impacts various student subgroups. While the majority of students in SPS turnaround schools are low-income minority students, conducting further subgroup analyses could offer insights into how different student population may benefit differently from the comprehensive student support intervention during school turnaround. Such analyses could shed light on the inter-

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vention's mechanisms and provide valuable information for tailored interventions.

Moreover, it is important to note that the study only focuses on the turnaround process within one urban school district in Massachusetts. Consequently, caution must be exercised in generalizing the findings of this study to other contexts. The unique characteristics of the district, coupled with its interactions with the City Connects intervention, may contribute to the estimated effects, which would not have been achieved had the model been implemented in other settings during their turnaround process. Thus, future research should aim to replicate and expand upon these findings in diverse educational contexts to ensure their broader applicability and relevance.

8 Conclusion

The findings of this study shed light on the efficacy of comprehensive student support interventions, such as City Connects, within the context of school turnaround efforts. Turnaround initiatives, aimed at bridging the achievement gap in impoverished communities, encompass multifaceted strategies, and their effectiveness can vary widely across schools and districts. Qualitative research has underscored the importance of tailored and individualized student support as a crucial component of successful turnaround endeavors. By examining the gradual adoption of the City Connects program in Level 4 schools in SPS, our study seeks to understand the extent to which such comprehensive student support interventions contribute to academic performance during the turnaround process. Employing differences-in-differences and event studies research designs, we uncover significant improvements in math and ELA learning outcomes following the implementation of City Connects. Specifically, our estimates reveal a notable increase of 0.163 standard deviations in math and 0.139 standard deviations in ELA among Level 4 schools in SPS after receiving the City Connects intervention.

The findings of this study offer clear implications for policymakers tasked with reforming underperforming schools in urban districts. In particular, it is evident that the impact of

outside-school factors on student achievement and thriving has only increased in the past few years as a result of the COVID-19 pandemic years and beyond. In 2022, most public school leaders reported a negative impact of the pandemic on student social-emotional development and behavior, seeking more support for student and staff mental health and students' socioemotional development (National Center for Education Statistics, 2022). It has thus become especially evident through the COVID-19 pandemic that schools must provide more than just academic support for students to thrive (US Department of Education, 2021). This has been reflected through increased investments by states using the American Rescue Plan Elementary and Secondary School Emergency Relief Fund to increase non-academic support and resources, such as more social workers, mental health counselors, and nurses (US Department of Education, 2021).

However, many schools still lack systematic and effective approaches to address the diverse needs of their students. As a result, there has been a heightened focus on increasing access to and providing individualized support through community partnerships, leveraging data-driven approaches. This study presents results on to what extent the City Connects intervention can improve the student learning during the turnaround process by integrating community resources to support students' social-emotional development and academic success. Policymakers can draw from the insights of this study to inform the design and implementation of similar comprehensive student support interventions aimed at improving outcomes for students in underperforming schools.

For underperforming schools serving students from marginalized groups, the need for comprehensive student support is ever more urgent and essential. Restructuring efforts for these schools can benefit from the integration of comprehensive student support interventions throughout the turnaround process. By doing so, schools can better address the multifaceted needs of their students and work towards narrowing persistent achievement gaps. Policymakers and education leaders must recognize the critical role of comprehensive support in promoting equitable outcomes for all students, especially those who have historically been

underserved.

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Appendix for "The Role of Comprehensive Student Support Interventions during School Turnaround"

A   Massachusetts Turnaround

This study does not aim to assess the direct impact of the turnaround practice itself. Nonetheless, given the temporal overlap between the implementation of the City Connects intervention and the Springfield turnaround initiative, we present general trends of some observable metrics of the Massachusetts Level 4 schools before and after their Level 4 designation. Data for all Level 4 schools are from the Massachusetts DESE website.

Figure A1 illustrates the changes in student enrollment during the turnaround practice. The horizontal axis represents the years relative to the Level 4 designation and the beginning of the turnaround, with zero indicating the exact year of the Level 4 designation. The graph shows that, before the Level 4 designation, enrollment slightly declines, which continues for four years into the Level 4 designation. Enrollment begins to recover five years after the Level 4 designation, returning to the level observed before the Level 4 status.

Figure A2 depicts the changes in the racial composition of Level 4 schools. The graph indicates a slight decrease in the percentage of White and African-American students during the first year of the Level 4 designation, accompanied by an increase in Hispanic students during the same period. Furthermore, Figure A3 illustrates the trends in the percentage of students who are ELLs and SWD. It shows an increase in the percentage of ELL and a decrease in the percentage of SWD during the turnaround process. However, these groups exhibited trends before the Level 4 designation, suggesting that the observed changes may be influenced by broader demographic shifts rather than solely attributable to the turnaround initiative. These figures provide insights into the demographic shifts and enrollment dynamics within Level 4 schools, offering context for the subsequent analysis of comprehensive student support within the SPS.

Figure A4 presents trends in student-teacher ratio and teacher retention rate within Massachusetts Level 4 schools. In the top graph, the student-teacher ratio remains stable during the turnaround process, with a noticeable increase observed three years after the initiation of turnaround efforts. The bottom graph illustrates the teacher retention rate,

which experienced a significant decline leading up to the Level 4 designation and reached its lowest point three years afterward. Although the retention rate shows some recovery thereafter, it does not fully return to pre-Level 4 rates. The trend in teacher retention rate indicates that Level 4 schools undergo substantial changes in their teaching staff.

Figure A5 depicts trends related to teacher effectiveness. In the upper graph, there is an upward trend in the percentage of licensed teachers before the turnaround, indicating efforts by schools to address issues by replacing unlicensed teachers with licensed ones. However, there is a decline in the percentage of licensed teachers following the Level 4 designation, stabilizing at around 95% in subsequent years. The lower graph shows the percentage of classes taught by highly qualified teachers increases, which increases before the Level 4 designation but decreases once the turnaround process commences. Interestingly, the data suggests that teacher "quality" appears to rise before the start of the turnaround, despite the schools struggling with underperformance. These observations shed light on the complexities surrounding staffing and teacher quality within Level 4 schools, offering valuable insights into the challenges they face amidst turnaround efforts.

The patterns depicted in the graphs underscore the significant changes experienced by schools before and after their designation as Level 4 schools. These trends highlight the importance of accounting for student composition, teacher characteristics, and turnover in teaching staff when conducting analyses against the backdrop of turnaround efforts.

Lastly, Figure A6 shows the trends in the statewide standardized test for math (upper panel) and ELA (lower panel) before and after the initiation of the turnaround process. The vertical axis represents math and ELA scores measured in standard deviations, standardized by subject and year among all Massachusetts schools. The graphs indicate that those eventually designated as Level 4 schools, consistently underperform in both math and ELA assessments by approximately one standard deviation compared to the average schools in Massachusetts for a considerable period before the turnaround process begins. Following the initiation of the turnaround process, there is a gradual increase in test scores. However, even

five years after the initiation of the turnaround, these schools continue to exhibit relatively low scores compared to the statewide average. These observations emphasize the persistent challenges faced by underperforming schools and the incremental progress made through the turnaround process.

The trends depicted in Figure A6 suggest some general improvements in the standardized assessments within these Level 4 schools, aligning with the findings of LiCalsi and Píriz (2016). However, it is important to note that there can be considerable variation among Level 4 schools. Given that different schools adopt different turnaround practices, it is reasonable to expect varying results. In the evaluation report conducted by the American Institutes for Research for Massachusetts (Stein et al., 2016), evaluators identified four key practices crucial for successful turnaround initiatives: establishing a community of practice through leadership, shared responsibility, and professional collaboration; employing intentional practices to improve teacher-specific and student-responsive instruction; providing student-specific supports and interventions informed by data and the identification of student-specific needs; and establishing a climate and culture that provide a safe, orderly, and respectful environment for students and a collegial, collaborative, and professional culture among teachers that supports the school's focus on increasing student achievement.
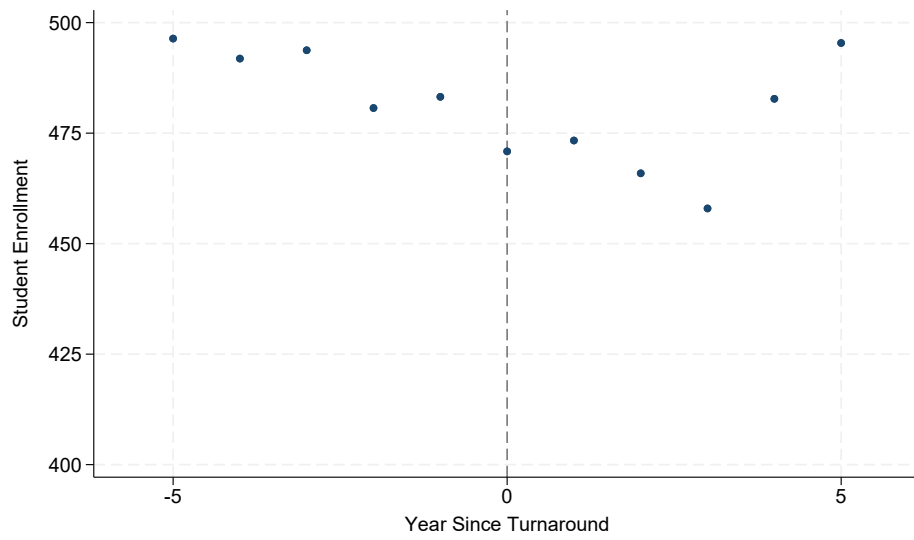
Figure A1: Student Enrollment during the Turnaround Practice

Notes: Data are from the Massachusetts DESE website. The sample includes all Level 4 schools in Massachusetts from the 2006-07 to 2016-17 school years.

Figure A2: Student Racial and Ethnicity Composition during the Turnaround Practice

Notes: Data are from the Massachusetts DESE website. The sample includes all Level 4 schools in Massachusetts from the 2006-07 to 2016-17 school years.

Figure A3: Percentage of Students as English Language Learners and Students with Disabilities during the Turnaround Practice

Notes: Data are from the Massachusetts DESE website. The sample includes all Level 4 schools in Massachusetts from the 2006-07 to 2016-17 school years.
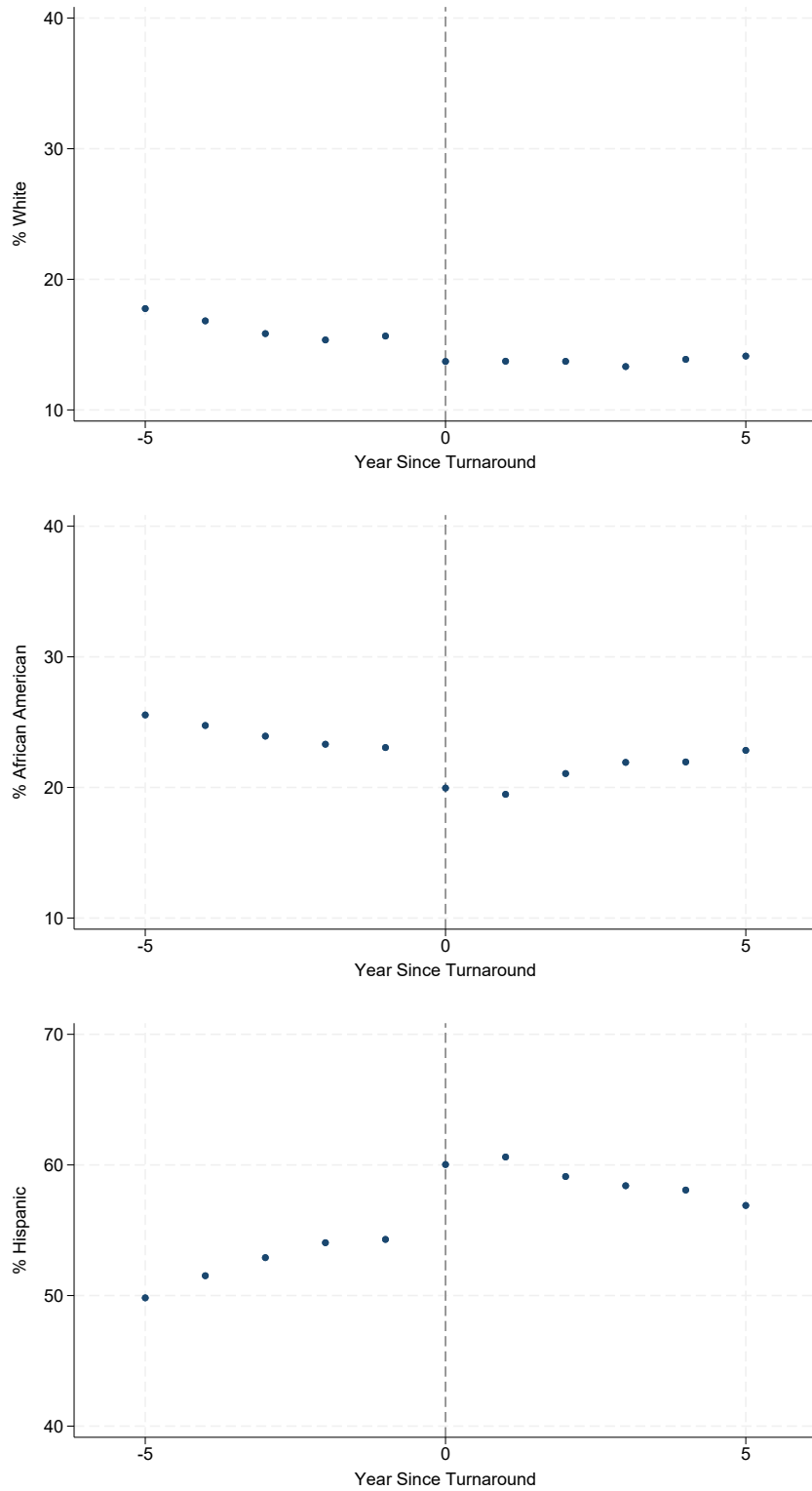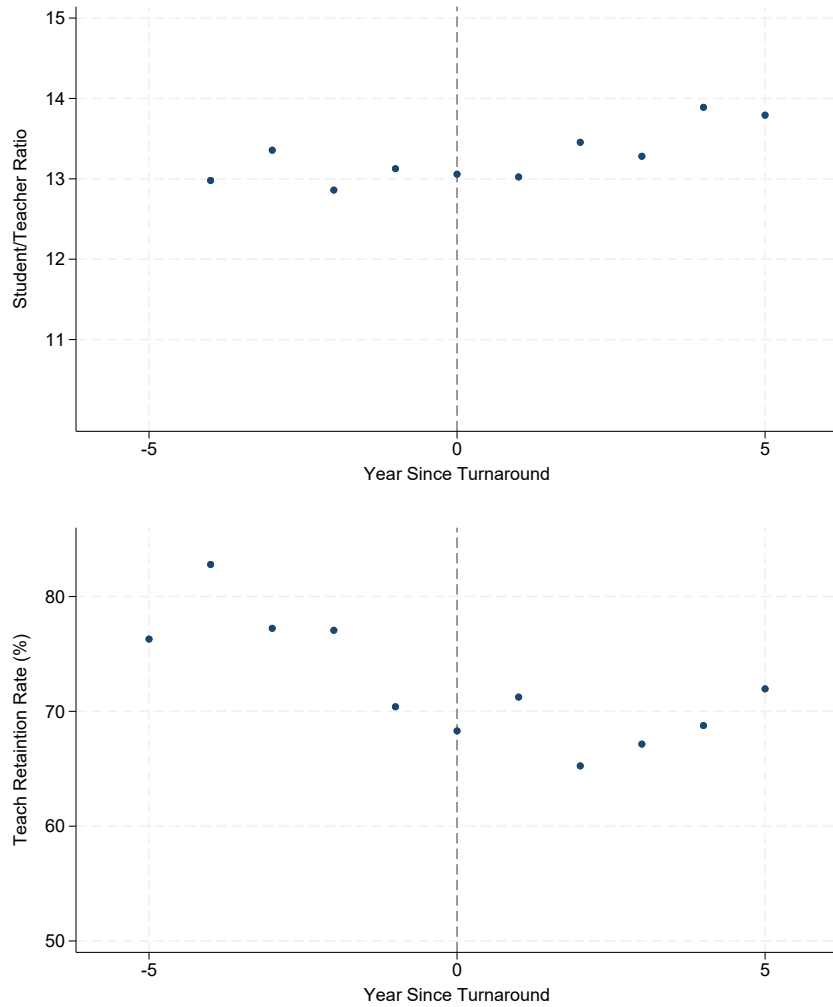
Figure A4: Student-teacher Ratio and Teacher Retention during the Turnaround Practice

Notes: Data are from the Massachusetts DESE website. The sample includes all Level 4 schools in Massachusetts from the 2006-07 to 2016-17 school years.

Figure A5: Percentage of Teachers Licensed and Highly Qualified during the Turnaround Practice

Notes: Data are from the Massachusetts DESE website. The sample includes all Level 4 schools in Massachusetts from the 2006-07 to 2016-17 school years.
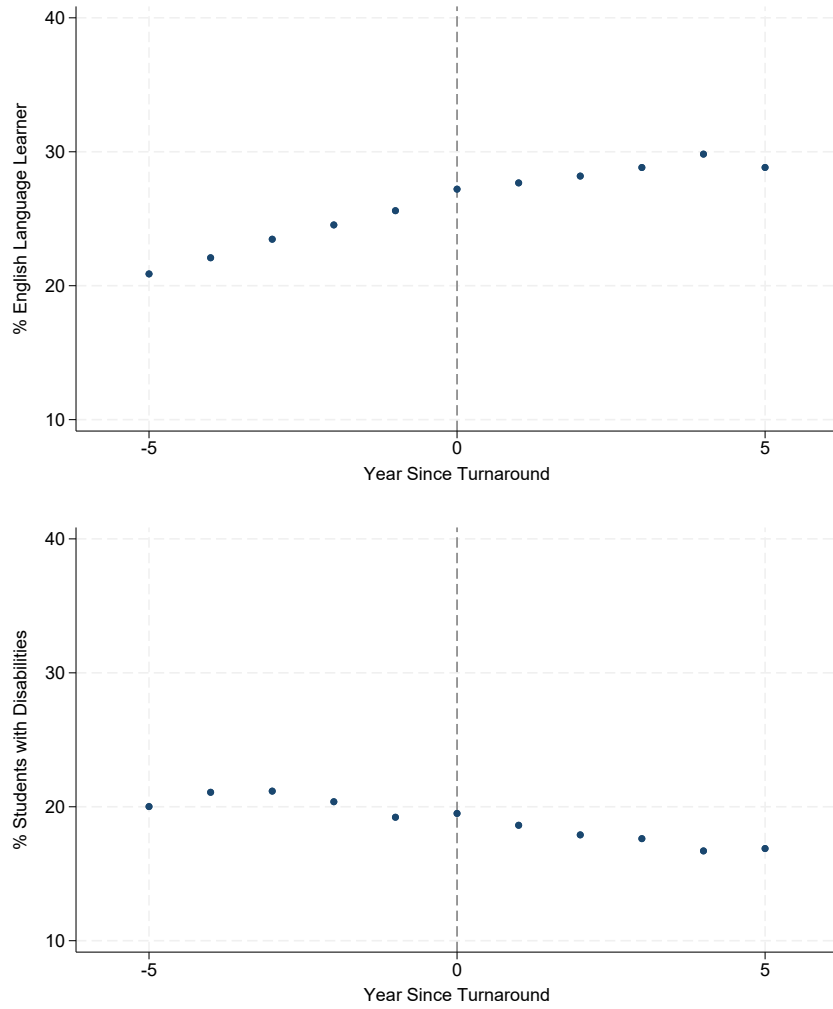
Figure A6: Math and ELA Performance during the Turnaround Practice

Notes: Data are from the Massachusetts DESE website. The sample includes all Level 4 schools in Massachusetts from the 2006-07 to 2016-17 school years.
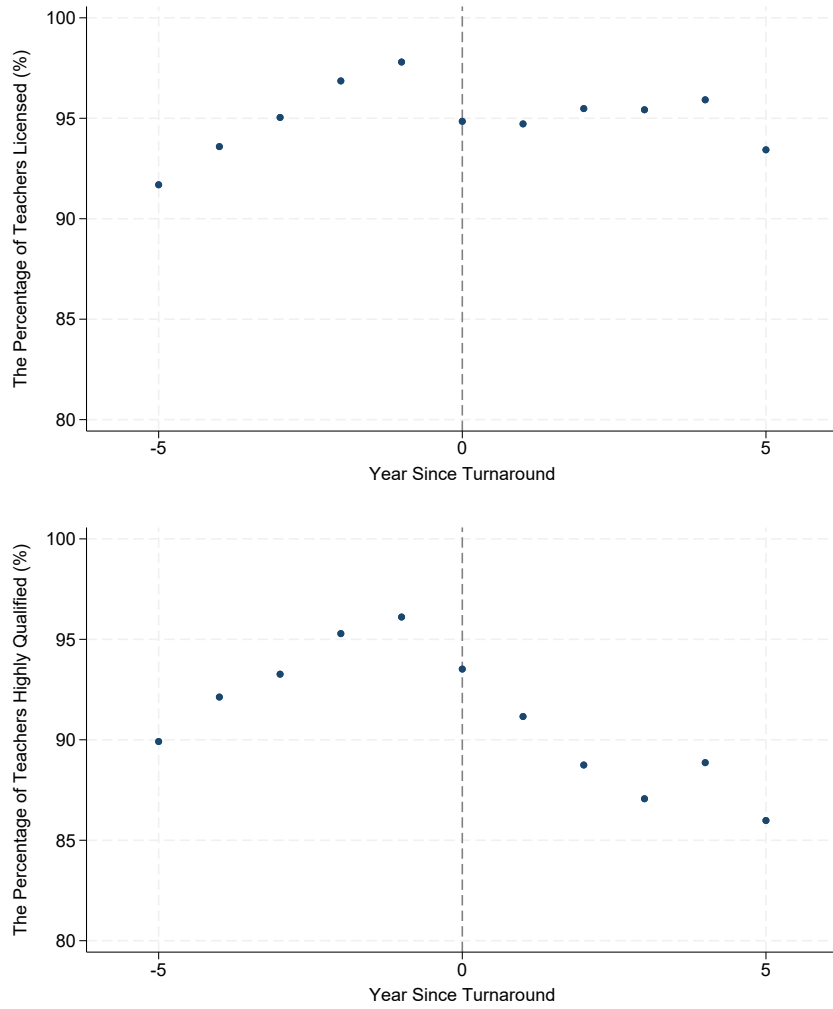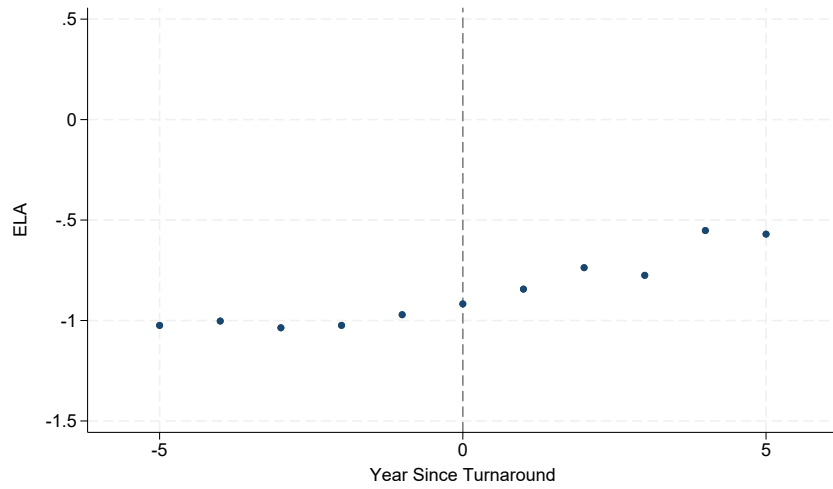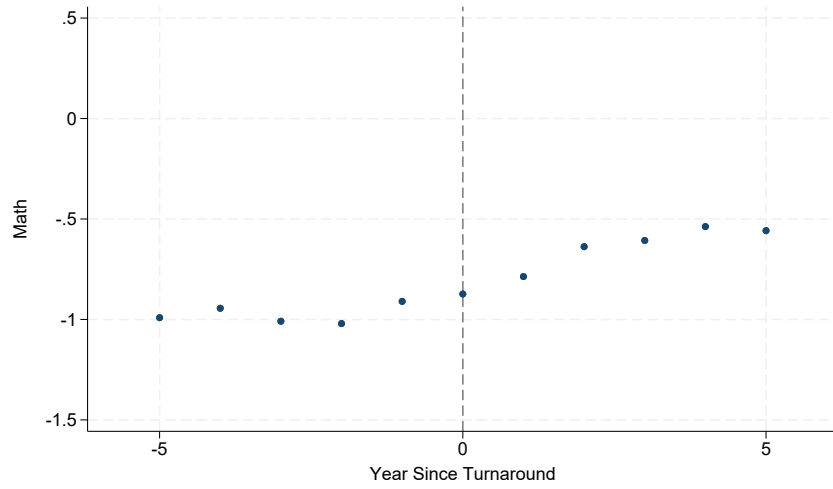
Table A1: Complete Estimation Results for the Effects of Comprehensive Student Support Intervention on Academic Performance during SPS Turnaround

	(1)	(2)	(3)	(4)	(5)	(6)
	math	ELA	math	ELA	math	ELA
City Connects	0.370	0.365	0.283	0.254	0.163	0.139
	(0.087)	(0.077)	(0.077)	(0.060)	(0.086)	(0.063)
African American %			0.041	0.052	0.024	0.036
			(0.013)	(0.011)	(0.025)	(0.019)
Hispanic %			0.036	0.038	0.026	0.026
			(0.011)	(0.010)	(0.017)	(0.014)
White %			0.053	0.056	0.042	0.038
			(0.013)	(0.013)	(0.023)	(0.020)
English Learner %			-0.012	-0.016	-0.011	-0.004
			(0.007)	(0.005)	(0.009)	(0.008)
Student with Disabilities %			-0.007	-0.001	-0.007	-0.009
			(0.007)	(0.006)	(0.010)	(0.009)
Low Income %			-0.001	-0.004	0.018	0.012
			(0.003)	(0.004)	(0.005)	(0.006)
Teacher Retention Rate					0.001	0.003
					(0.001)	(0.001)
Taught by Highly Qualified %					-0.003	0.000
					(0.004)	(0.004)
Teacher Licensed %					0.018	0.015
					(0.007)	(0.006)
Student-Teacher Ratio					0.006	0.033
					(0.017)	(0.013)
Student Demo Controls	×	×	✓	✓	✓	✓
Teacher CHAR Controls	×	×	×	×	✓	✓
School-grade FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Turnaround Event Time FE	✓	✓	✓	✓	✓	✓
Observations	736	736	736	736	391	391
R-squared	0.679	0.682	0.707	0.732	0.775	0.778

Notes: Data are from the Massachusetts DESE website. The table shows the estimated results of the comprehensive student support on academic performance of the Level 4 schools within SPS. The sample includes grades 3-8 from all Level 4 schools in the SPS between the 2005-06 to 2016-17 school years. The unit of observation is at the school-grade-year level. Standard errors are in parentheses. Standard errors are clustered at the school-grade level as the City Connects intervention is implemented at the school-grade level. Robust Standard errors are in parentheses.

Table A2: Complete Estimation Results for the Effects of Comprehensive Student Support Intervention on Academic Performance during SPS Turnaround (Restricted sample to avoid changes of observation due to missing values in control variables)

	(1) math	(2) ELA	(3) math	(4) ELA	(5) math	(6) ELA
City Connects	0.238	0.218	0.188	0.172	0.163	0.139
	(0.088)	(0.081)	(0.089)	(0.073)	(0.086)	(0.063)
African American			0.025	0.044	0.024	0.036
			(0.024)	(0.020)	(0.025)	(0.019)
Hispanic			0.021	0.025	0.026	0.026
			(0.017)	(0.014)	(0.017)	(0.014)
White			0.028	0.028	0.042	0.038
			(0.023)	(0.022)	(0.023)	(0.020)
English Learner			-0.015	-0.007	-0.011	-0.004
			(0.009)	(0.009)	(0.009)	(0.008)
Student with Disabilities			-0.012	-0.013	-0.007	-0.009
			(0.009)	(0.009)	(0.010)	(0.009)
Student from Low Income			0.017	0.009	0.018	0.012
			(0.005)	(0.006)	(0.005)	(0.006)
Teacher Retention Rate					0.001	0.003
					(0.001)	(0.001)
% Taught by Highly Qualified					-0.003	0.000
					(0.004)	(0.004)
% Teacher Licensed					0.018	0.015
					(0.007)	(0.006)
Student Teacher Ratio					0.006	0.033
					(0.017)	(0.013)
Student Demo Controls	×	×	✓	✓	✓	✓
Teacher CHAR Controls	×	×	×	×	✓	✓
School-grade FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Turnaround Event Time FE	✓	✓	✓	✓	✓	✓
Observations	391	391	391	391	391	391
R-squared	0.751	0.742	0.762	0.757	0.775	0.778

Notes: Data are from the Massachusetts DESE website. The table shows the estimated results of the comprehensive student support on academic performance of the Level 4 schools within SPS. The sample includes grades 3-8 from all Level 4 schools in the SPS between the 2005-06 to 2016-17 school years. The unit of observation is at the school-grade-year level. Standard errors are in parentheses. Standard errors are clustered at the school-grade level as the City Connects intervention is implemented at the school-grade level. Robust Standard errors are in parentheses.

Table A3: Complete Estimation Results for the Effects of Comprehensive Student Support Intervention on Academic Performance during SPS Turnaround (drop schools that split into two schools and restrict samples to without missing values in controls)

	(1)	(2)	(3)	(4)	(5)	(6)
	math	ELA	math	ELA	math	ELA
City Connects	0.215	0.220	0.182	0.181	0.148	0.131
	(0.097)	(0.091)	(0.089)	(0.072)	(0.081)	(0.056)
African American %			0.035	0.053	0.037	0.049
			(0.026)	(0.022)	(0.026)	(0.020)
Hispanic %			0.021	0.026	0.029	0.032
			(0.019)	(0.016)	(0.019)	(0.015)
White %			0.040	0.036	0.062	0.058
			(0.029)	(0.026)	(0.028)	(0.023)
English Learner %			-0.007	0.000	-0.001	0.006
			(0.009)	(0.009)	(0.009)	(0.008)
Student with Disabilities %			-0.015	-0.015	-0.006	-0.007
			(0.009)	(0.009)	(0.010)	(0.008)
Low Income %			0.022	0.012	0.023	0.016
			(0.006)	(0.007)	(0.006)	(0.006)
Teacher Retention Rate					0.000	0.001
					(0.001)	(0.001)
Taught by Highly Qualified %					-0.002	0.001
					(0.005)	(0.004)
Teacher Licensed %					0.023	0.021
					(0.008)	(0.006)
Student-Teacher Ratio					-0.001	0.027
					(0.015)	(0.013)
Student Demo Controls	×	×	✓	✓	✓	✓
Teacher CHAR Controls	×	×	×	×	✓	✓
School-grade FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Turnaround Event Time FE	✓	✓	✓	✓	✓	✓
Observations	328	328	328	328	328	328
R-squared	0.757	0.744	0.772	0.762	0.793	0.794

Notes: Data are from the Massachusetts DESE website. The table shows the estimated results of the comprehensive student support on academic performance of the Level 4 schools within SPS. The sample includes grades 3-8 from all Level 4 schools in the SPS between the 2005-06 to 2016-17 school years. The unit of observation is at the school-grade-year level. Standard errors are in parentheses. Standard errors are clustered at the school-grade level as the City Connects intervention is implemented at the school-grade level. Robust Standard errors are in parentheses.

Table A4: Estimated Results of the Effect of Comprehensive Student Support Intervention on Springfield Turnaround Schools (using Callaway and Sant'Anna (2021) and sample restrictions to keep the control variables without missing value, the Sample is further restricted to exclude schools that split into two schools.)

	(1)	(2)
	Math	ELA
City Connects	0.289	0.307
	(0.072)	(0.066)
Student Demo Controls	✓	✓
Teacher CHAR Controls	✓	✓
School-grade FE	✓	✓
Year FE	✓	✓
Turnaround Event Time FE	×	×

Notes: Data are from the Massachusetts DESE website. The table shows the estimated results of the comprehensive student support on academic performance of the Level 4 schools within SPS. The sample includes grades 3-8 from all Level 4 schools in the SPS between the 2005-06 to 2016-17 school years. The unit of observation is at the school-grade-year level. Standard errors are in parentheses. Standard errors are clustered at the school-grade level as the City Connects intervention is implemented at the school-grade level. Robust Standard errors are in parentheses.
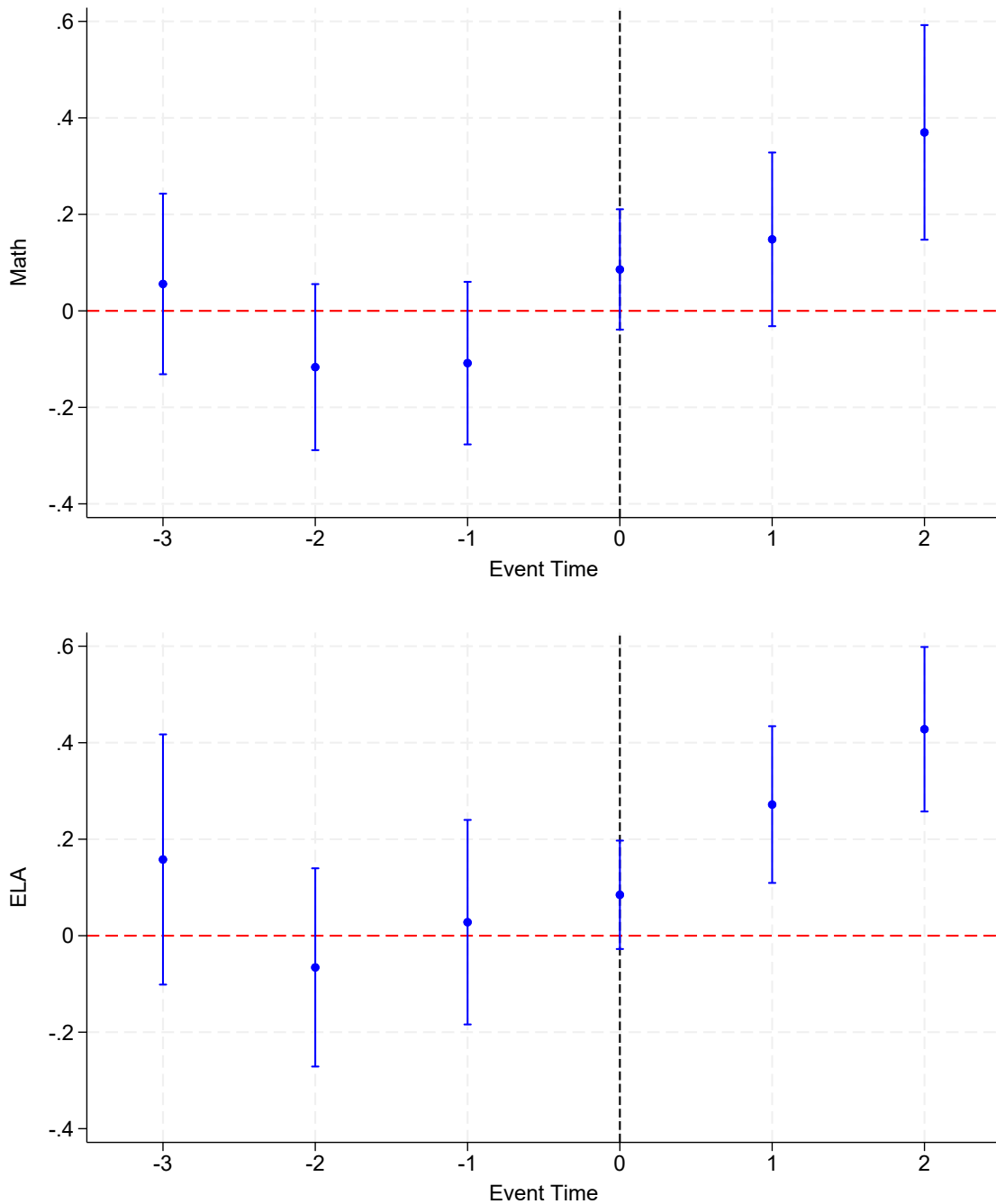
Figure A7: The Effect of City Connects on Academic Performance - Event Studies (using Callaway and Sant'Anna (2021) and restricting the sample to keep the control variables without missing values and exclude schools that split to two schools

Notes: Data are from Massachusetts DESE website. The graphs show the estimated results of the comprehensive student support on academic performance of the Level 4 schools within SPS. The sample includes grades 3-8 from all Level 4 schools in the SPS between the 2005-06 to 2016-17 school years. The unit of observation is at the school-grade-year level. Standard errors are clustered at the school-grade level as the City Connects intervention is implemented at the school-grade level.