Declining Enrollment in K-12 Public Schools in the United States

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Abstract

We examine recent trends in enrollment in traditional K–12 public schools in the United States following the Covid-19 pandemic. Using data from the National Center for Education Statistics and the U.S. Census Bureau, we find that enrollment in traditional public schools declined significantly after the pandemic and has not fully recovered. At the same time, enrollment in charter schools, virtual schools, private schools, and homeschooling options increased, reshaping the K–12 education landscape. We show that these shifts are not evenly distributed: districts serving different racial and socioeconomic populations have experienced enrollment declines at varying rates. We also find that continued enrollment losses are associated with an moderately increased likelihood of school closures. Together, these patterns highlight the operational challenges that public school systems may continue to face in the coming years.

1 Introduction

Enrollment in traditional public schools has steadily declined in recent years, a trend that has been further heightened by the Covid-19 pandemic (Goulas and Pula, 2024). Continued enrollment declines present a complex policy challenge, with significant implications for school organization, quality, and equity. From an organizational standpoint, administrators must now make difficult decisions about the allocation of students and resources. As public school funding is often tied to student enrollment, declining numbers may translate into reduced financial resources, increasing the risk of district restructuring, school closures, and staff layoffs. While there have been cases where officials decided not to cut budgets after lower-than-expected enrollment, such as with New York City during pandemic recovery, the fear of budget cuts still looms large (Elsen-Rooney, 2022).

As enrollment continues to decline, the quality of education students receive is at risk. Both students who leave the public system and those who remain are affected, but in different ways. Students who transition to private schools or homeschooling fall outside the scope of public accountability, making it difficult to evaluate the quality of the education they receive. Conversely, students who remain in under-resourced public schools may face declines in instructional quality.

Furthermore, enrollment declines may have implications for equity. If students leaving public schools are disproportionately from specific racial or socioeconomic groups, continued declines may increase school segregation and thus unequal access to education. As districts adjust to potential budget cuts, underserved students may be more likely to face the consequences of resource constraints such as school closures or under-staffing.

Due to the issue's importance, declining public school enrollment has gained significant attention from both policymakers and the media in recent years. School closures and fiscal challenges tend be central concerns. For example, in response to declining enrollment and budget restrictions, Jackson, Mississippi Superintendent Errick Greene justified closing 11 schools and merging two others by asking, *"[Is it worth] investing this money in these school buildings if they're at best at half capacity?"* (Jacobson, 2024). Some policymakers have sought creative solutions in an attempt to retain existing students and encourage those who have left to return. New York City Mayor Eric Adams and education Chancellor David Banks have signaled that their administration is looking to create new programs and improve on existing ones to get students back into public schools (Amin, 2022). Others have suggested schools could adapt their curriculum to better serve students (Grose, 2023), or attempt to increase parental engagement and highlight

the high performing public schools in their district (The Education Trust - New York, 2023)

Although understanding the drivers and implications of enrollment declines is critical, existing literature on the subject is limited by the evolving nature of the problem and the availability of data. Each year, parents re-evaluate the options available to them, educators update their practices, and districts restructure their schools and curriculum. These continuous shifts make the problem a dynamic one, requiring constant re-evaluation. As a result, past research quickly becomes outdated. Furthermore, education data is sensitive, especially when linked to individual students, and aggregated data is only available on a delayed basis which varies from state to state. These data challenges combined with the evolving nature of the problem, pose significant challenges for the analysis.

The present analysis uses the most recent enrollment data available for 2023-24 from the National Center for Education Statistics to investigate the latest trends and provide an updated picture of the K-12 educational landscape today. Specifically, we aim to answer to following questions: (1) How has the proportion of students enrolled in non-traditional public school (non-TPS) options evolved over time? (2) How do districts serving student bodies with different economic and racial compositions experience enrollment declines, particularly those serving larger proportions of low-income and minority students? (3) What is the relationship between enrollment declines and school closures?

We find that the moderate decline in non-TPS enrollment observed in school year 2022-23 was not indicative of a slow recovery toward pre-pandemic levels of enrollment. While the proportion of students outside of public schools decreased from 13.1 percent in 2021–22 to 11.6 percent in 2022–23, in 2023–24 the proportion increased again to 12.6 percent. This finding may partially support concerns that the pandemic shift may have permanent consequences for public school enrollment across the country.

We also analyze changes in enrollment for districts of varying demographic and socioeconomic characteristics. Two key patterns relating to race emerge from the data. First, districts serving predominantly Black students have had the highest proportion of students outside TPS by a wide margin. For example, in 2023-24 non-TPS enrollment in predominantly Black school districts was 23.10 percent, compared to 12.86 and 9.16 percent in predominantly White and predominantly Hispanic school districts. Second, the trends for each group are unique. For schools serving a student body with greater than 90 percent Hispanic students, we find that the pandemic accelerated prior growth in non-TPS enrollment. For schools serving predominantly White students, stable pre-pandemic non-TPS en-

rollment began to grow following the pandemic. We additionally identify that the proportion of non-TPS enrollment in low-, medium-, and high-poverty schools grew post pandemic, but has grown most uniquely in low-poverty school districts compared to the pre-pandemic trend. In 2023-24, 15.93 percent of students in low-poverty districts enrolled in non-TPS, 19.90 percent in medium-poverty districts, and 26.02 percent in high-poverty districts.

Furthermore, we provide estimates for future traditional public school enrollment through 2050. Understanding future trends is critical for long-term planning by administrators and policymakers. We estimate that, given the current enrollment declines and projected demographic changes between now and 2050, the number of seats needed in traditional schools will range between 34.57 million and 40.84 million students. While these estimates do not take into account the potential policy changes that may influence enrollment patterns (e.g., school choice programs), they may serve as a useful baseline for weighing the implications of continuing along current trends. Our projections suggest a possible decline in TPS enrollment of between 7 percent and 28 percent by 2050.

Finally, we examine the effect that declining enrollment may have on school closures. Our model estimates that an additional one-percentage-point decline in school enrollment in the previous year is statistically significantly associated with a 4.19 percent increase in the likelihood of a school closing in the present year. Additionally, the model estimates that an additional two-year cumulative decline in enrollment of one percentage-point is statistically significantly associated with a 3.15 percent increase in the likelihood of a permanent school closure in the current year. This observational examination suggests that current enrollment declines are associated with severe operational challenges for school districts, even closures.

Organization. The rest of the thesis is organized as follows. In Section 2, we review the related literature on school enrollment. In Section 3, we provide details on the datasets and the data pre-processing used for analysis in later sections. In Section 4, we demonstrate the overall trend in K-12 enrollment and consider the differences in enrollment trends state-to-state. In Section 5, we examine how changes in TPS enrollment have affected school districts serving student bodies with different characteristics. In Section 6, we present projected trends in student populations. In Section 7, we analyze the effect of enrollment declines on school closures. In Section 8, we discuss potential implications of enrollment declines and school closures. Section 9 concludes.

2 Related Literature

This section examines the existing literature relating to enrollment declines in K-12 public schools in the United States. Many studies consider declining enrollment in specific states. For example, one of the earliest state-focused studies examined enrollment declines in Massachusetts and found such declines were concentrated in traditional school districts (rather than charter, virtual, and vocational districts that had increased enrollment), smaller school districts, districts with higher concentrations of economically disadvantaged students, and districts serving more White students (Dee and Murphy, 2021). A Virginia study used student-level data to examine Prekindergarten through 12th-grade enrollment and found the enrollment decline was primarily attributable to decreases in the number of new enrollees in Prekindergarten and Kindergarten. This decline was particularly pronounced for White students and non-economically disadvantaged students (Schueler and Miller, 2023). A Michigan study using enrollment and survey data documented a shift away from public education particularly for Black students, low-income students, and Kindergarten students. However, they observed that, while low-income families and Black families were less likely to enroll children in Kindergarten, high-income students and White students were more likely to exit the public school system in favor of alternatives (Musaddiq et al., 2022). A California study documented enrollment changes and argued declines were mostly attributable to birth rate declines and migration trends. They showed that counties with more English learners, Asian students, Black students, and Hispanic students exhibited larger declines and connected enrollment declines to increased school closures (Lafortune and Prunty, 2023).

Other studies examine national trends. An early work from Burtis and Goulas (2023) showed a substantial decline in enrollment in traditional public schools, especially in urban and high-poverty school districts. Dee (2023) leverage state-level data and show that substantial enrollment declines coincided with large growth in homeschooling and moderate growth in private schooling (30 percent and 4 percent, respectively), although more than a third of enrollment declines could not be explained by gains in private school enrollment, homeschooling, or demographic changes. The most recent national analysis from Goulas (2024) documented modest enrollment gains in the 2022-23 school year, leaving questions about the future trend of enrollment declines and the potential for a recovery back to pre-pandemic levels of enrollment in public schools.

The issue of declining school enrollment has received wide attention from researchers, policymakers, and media, who outline a litany of potential repercus-

sions of recent trends (Randazzo and Barnum, 2024). A primary concern with declining enrollment is the impact that fewer students have on school budgets, as funding is directly tied to enrollment counts (Dee, 2023; Jacobson, 2024; Lafortune and Warren, 2020). The potential for budget cuts is especially concerning because they relate directly to the potential for increased school closures and teacher layoffs (Burtis and Goulas, 2023; Dee, 2023; Jacobson, 2024), particularly in areas with under-served student populations (Lafortune and Prunty, 2023). Many have argued that increased school closures are likely to impact minority and low-income communities the most, and worry about the potential relationships between enrollment declines and school segregation (Dee, 2023; Jacobson, 2024). Broadly, declining school enrollment, including delayed kindergarten enrollment, may undermine the length and consequently the quality of schooling (Burtis and Goulas, 2023; Dee, 2023; Lafortune and Prunty, 2023). Outside of the direct impact on the public school system, there are substantial concerns about whether and where parents enroll their children for school, and why they choose those options over public school options (Dee, 2023; Elsen-Rooney, 2022). Though many families may have considered alternative options in response to district policies surrounding the pandemic, it is difficult to say if these decisions could result in long-term declines or if these parents may re-enroll their children in public schools (Musaddiq et al., 2022). Some have cautioned optimism about potential returns and suggested these returns have yet to be seen (D'Souza, 2024).

The phenomenon of declining public school enrollment has been intensified after the Covid-19 pandemic; therefore, the related literature is recent but growing. The significant drop in public school enrollment after the pandemic is well documented (Burtis and Goulas, 2023; Dee, 2023; Dee and Murphy, 2021; Goulas, 2024; Lafortune and Prunty, 2023; Musaddiq et al., 2022; Schueler and Miller, 2023). Researchers have noted that the declines in enrollment were atypical following the pandemic, given previous historical enrollment patterns (Goulas, 2024). Schueler and Miller (2023) documented this decline in Virginia, and found that 84 percent of the decline in enrollment was attributable to a drop in the number of "new-enrollees," that is, students who would be enrolled in public schools for the first time. They also observed a decrease in mobility between schools and districts following the pandemic. Other scholars have noted that the specific choices of parents who choose not to enroll their students in public schools may reveal their reasoning in part. Musaddiq et al. (2022) found that the district response to the pandemic played a key role in the alternatives parents sought. Districts that moved to virtual schooling saw higher increases of private enrollment, while those offering in-person instruction had greater increases in homeschooling.

This finding complements other empirical work demonstrating that homeschooling experienced proportionally greater growth than private schooling during the pandemic (Dee, 2023). Other researchers have considered the role the pandemic played in motivating parents to reconsider the options available to them. Considerations about when to enroll and whether to enroll in kindergarten, public options, or private/homeschooling were more common due to the pandemic (Lafortune and Prunty, 2023).

Whereas existing analyses often focus on specific states (see, for instance, Dee and Murphy (2021) for Massachusetts, Lafortune and Warren (2020) for California, and Musaddiq et al. (2022) for Michigan) or rely solely on aggregate data (for example, Goulas (2024) which uses only the most recent data from the National Center for Education Statistics—NCES), our study uses a comprehensive set of federal data on the demographic composition of schools and investigate its association with enrollment declines. Our analysis contributes to the existing literature by leveraging the most recent post-pandemic enrollment data to examine national trends in enrollment and break down how districts with different demographic and socioeconomic characteristics have responded to pandemic-era enrollment declines.

3 Data and Data Pre-processing

In this section, we provide details on the datasets we used in our analysis and describe the data cleaning process we followed.

3.1 Datasets

To analyze trends in enrollment across the United States, we use data from the Common Core of Data of the National Center for Education Statistics, the Small Area Income and Poverty Estimates of the Census Bureau, the Population Division of the Census Bureau, and the Private School Universe Survey of the National Center for Education Statistics.

Common Core of Data ("CCD"). The CCD data include detailed school-level data for thirteen years, beginning with the 2011-12 school year and continuing through the 2023-24 school year (NCES, nda). Each row represents one school in a given year and provides unique codes identifying the individual school and its district. The data includes information on location, including the state, city,

zip code, longitude and latitude, street address, and an indicator for urban, rural, or suburban location. Moreover, the data include a number of status indicators describing what grades are offered, whether a school is traditional, alternative, virtual, or a charter, and whether the school was still operational for the given school year. Furthermore, the data includes information on the number of students enrolled in each grade disaggregated by race/ethnicity and gender. Finally, the dataset has information that is not used in the present analysis, such as information about staff, National School Lunch Program status, and charter authorization.

U.S. Census Bureau data ("SAIPE" and "Census"). The Small Area Income and Population Estimates (SAIPE) data from the Census includes district-level data for thirteen years, beginning with the 2011-12 school year and continuing through the 2023-24 school year (Census, ndb). Each row represents a single district in a given year, and includes three items: the overall population estimated to be served by that school district (regardless of age), the number of school-age children (ages 5-17) estimated to reside in the school district, and the number of those school-age children who are in poverty. Additional Census data from the Population Division projects the expected school-age population in the United States every 5 years from 2025 through 2100 (Census, nda).

Private School Universe Survey data ("PSS"). PSS data includes national- (NCES, ndb) and state-level (NCES, ndc) counts of the number of students reported to attend private schools. A key characteristic of the PSS data is that it is only reported every other year in odd-numbered years. For the present evaluation, we utilize estimates from 2011 through 2021, the most recent available years.

Each of these datasets contributes critically to our analysis. While the CCD dataset contains detailed school-level data on public school enrollment, we require PSS data for estimates of private school enrollment. Without both datasets, we cannot construct accurate estimates of overall enrollment. Moreover, because neither dataset has school-age population estimates, we use Census datasets for the number of potential students who live in a given school district. Combining these datasets allows us to reliably estimate student populations and distributions.

Table 1: SCHOOL AND DISTRICT CHARACTERISTICS, 2011-12 TO 2023-24

	Mean	Std. Dev.	N
Observations			1,311,482
Unique Schools			120,039
K-12 Student Population	495.29	458.06	1,270,698
Grade Level Served (%)			
Elementary Schools	35.22		461,878
Middle Schools	12.62		165,448
High Schools	17.30		226,889
Multi-Level Schools	30.45		399,351
School Classification (%)			
Traditional Public School	83.05		1,088,710
Charter School	6.68		87,520
Alternative School	9.55		125,142
Virtual School	0.73		9,616
School Locale (%)			
Urban	27.40		359,134
Suburban	30.97		405,957
Town	13.30		174,293
Rural	28.33		371,408
District Characteristics (%)			
Child Poverty	16.44	9.03	13,281
Black	12.17	23.24	16,938
White	62.60	32.35	16,938
Hispanic	16.01	21.89	16,938
Asian	2.24	5.80	16,938
Native American	3.58	14.44	16,938
Other	3.40	3.80	16,938

Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Author calculations

Notes: An observation refers to a single school in a given year. Grade levels are classified as follows: elementary (K-5), middle (6-8), and high (9-12), where multi-level schools teach grade levels in more than one of these grade spans. Virtual schools are those classified by the CCD as either fully virtual or virtual with face-to-face options. Charter schools are indicated in the CCD data. Alternative schools are those whose CCD school type code was not 1 (regular). Locale follows Census classifications. Poverty levels represent the weighted average child poverty level for a district from 2016 to 2019 as indicated by SAIPE. Racial characteristics are based on 2016-17 levels.

Table 1 reports descriptive characteristics of the schools in our sample. Our CCD data includes 1,311,482 school by year observations from 2011-12 through 2023-24. This data includes 120,039 unique schools. The average school enrolled 495.29 K-12 students, but a standard deviation of 458.06 students indicates significant variation in enrollment. Most schools were elementary schools, followed by multi-level schools, high schools, and middle schools. An overwhelming majority of schools (83.05 percent) in the sample are traditional public schools. Similar numbers of observations come from urban, suburban, and rural schools (27.40, 30.97, and 27.33 percent, respectively), while far fewer (13.30 percent) came from schools in towns. The bottom section of Table 1 shows the racial and socioeconomic characteristics of the school districts in our sample. Child poverty proportions were computed using the SAIPE dataset that reports school-age population and the number of school-age children in poverty. Data between 2016 and 2019 were used to calculate each district's poverty level. The average school district had 16.44 percent of students-age children living in poverty, with moderate variation. We observe higher variation in the racial makeup of the enrolled students. For example, while the average school district had 12.17 percent Black student population, 59.78 percent of districts had fewer than 3 percent Black and 8.73 percent of districts served student bodies with greater than 50 percent Black students. The average district served 62.60 percent White students, and 16.01 percent Hispanic students. The variation in the percentage of White students is even greater than that of Black students, while there was less variation (though still substantial variation) in the proportion of Hispanic students.

3.2 Data Pre-processing

Extensive data cleaning and pre-processing were required to prepare the data for analysis, particularly given our use of multiple units of analysis—school, district, state, and national levels. One first challenge was to combine the CCD data for each year. For example, beginning in 2014-15, NCES began reporting data in a long format with many rows rather than a wide format with many columns. Rather than reporting a single column for each combination of sex, race, and grade (alongside columns for other characteristics), in 2014-15 the NCES started reporting this data as individual rows. To combine these datasets required converting earlier data into the longer format before combining the data for all years. Additionally, variable names and levels for categorical variables changed over the years, which required refactoring to ensure consistency across years.

Our analysis focuses exclusively on trends in K-12 education in the United

States. As CCD includes records for schools providing adult education and pre-kindergarten, as well as institutions located in US territories, we restricted our dataset by filtering out non-K-12 grade levels and excluding entries from non-state jurisdictions. We then recomputed total enrollment with only K-12 grade levels. This ensured that our analysis reflects only the relevant population of interest.

We also recoded many of the categories reported by the CCD. First, we refactored the locale reported by the CCD to include only four levels—urban, suburban, town, and local. Similarly, using grade-level indicator variables, schools were reclassified as elementary (K-5), middle (6-8), high (9-12), or multi-level schools (a combination of grade ranges). We additionally created a classification variable that categorized each school as either a traditional public school, charter school, virtual school, or alternative school.

Beyond the CCD data, we also utilized SAIPE Census data for the school-age population, and PSS data on the number of students in private schools both nationally and in each state. The PSS data required minimal cleaning. The SAIPE dataset, which included district-level student populations and poverty levels, was filtered to remove US territories. Furthermore, we updated the student population counts for any districts that SAIPE reported a smaller school-age population count than the number of students in the CCD district counts. We also used SAIPE data on the number of students residing within a district and the number of students in a district who are in poverty to calculate the proportion of students in poverty in each district. These proportions allowed us to categorize districts as low-, medium-, and high-poverty districts based on which child poverty proportion tertile they fall in. Additional Census data used to generate projections of student populations required no additional cleaning.

4 Enrollment Declines Post Pandemic

In this section we draw on the most recent CCD data to examine the pre- and post pandemic trends in school enrollment. We examine how the proportion of students in non-TPS evolved over the past decade and decompose enrollment changes by school type. Overall, we find that the proportion of students in traditional public schools was relatively constant from 2016-17 through 2019-20. However, the years after the pandemic show a noticeable shift, with more families choosing non-TPS options.

Figure 1 demonstrates the changes in the proportion of enrollment in non-TPS from 2016-17 through 2023-24. It combines SAIPE estimates of the school-age

children population with CCD data to estimate the share of school-age children attending different types of school over time. Additionally, it includes PSS estimates of the number of students enrolled in private K-12 schools to account for private enrollment and more accurately depict the proportion of students who are unaccounted for (the difference in SAIPE population estimates and total PSS and CCD enrollment data).

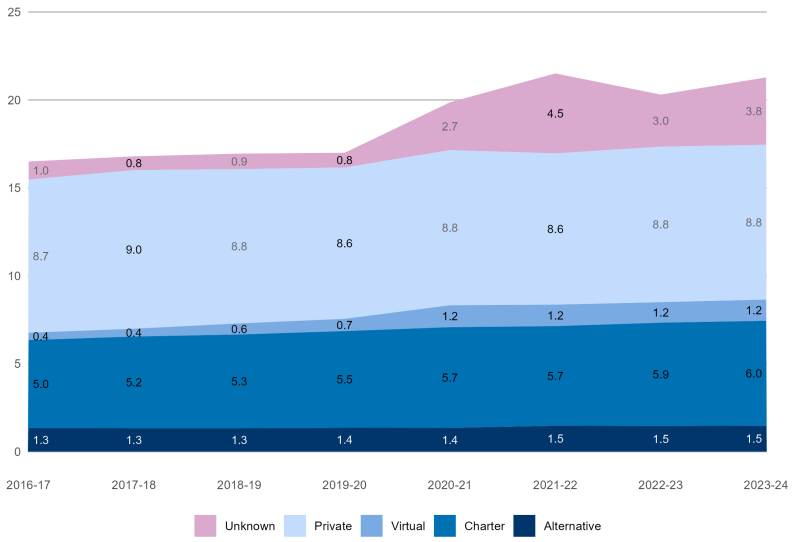
Figure 1 illustrates key shifts in the K–12 education landscape over time. Enrollment in alternative public schools has remained relatively stable, growing from 1.3 percent in 2016-17 to 1.5 percent in 2023-24. The proportion of students in charter schools grew consistently over the same period from 5.0 percent to 6.0 percent. Enrollment in virtual schools was uncommon prior to the pandemic, with only 0.7 percent of students in those schools in 2019-20, but the pandemic increased virtual enrollment to 1.2 percent. The combined proportion of students outside of public schools (that is, the sum of private school enrollment and students unaccounted for) averaged approximately 9.7 percent in the years prior to the pandemic. This proportion rose to 11.5 percent in 2020–21, peaked at 13.1 percent in 2021–22, and remained high at 11.8 percent in 2022–23 and 12.6 percent in 2023–24. Corresponding student counts by school type for each year are reported in Table S1 in the Appendix.

While the proportion of students outside of public schools (the sum of private enrollment and students unaccounted for) can be directly computed using Census and CCD data, PSS data only reports private school enrollment for odd-numbered years, most recently 2021-22. The proportion of students estimated to be in private schools has remained relatively constant at a level of around 8.8 percent, although we estimated even-numbered years using a linear trend.

Estimates of private school enrollment and students unaccounted for in 2022-23 and 2023-24 should be interpreted with some caution, although they likely represent conservative lower bounds. Linear approximations of these values rely on data through 2021-22 and therefore cannot account for changes in policy or parental choices in more recent years. However, one might expect realized private enrollment to be greater in 2022-23 and 2023-24 than the estimates presented, as many states have adopted voucher programs for private education. While precise data on private enrollment for even years and in 2023-24 are not yet available, the combined share of students enrolled in private schools and those not accounted for in formal schooling records (e.g., 12.6 percent in 2023) are accurate based on available SAIPE and CCD data.

Evaluating the national enrollment trend can potentially obscure state-level variation in the proportion of students unaccounted for. To better understand the

Figure 1: SCHOOL ENROLLMENT TRENDS, 2016-17 TO 2023-24



Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Private School Universe Survey (PSS), National Center for Education Statistics; Author Calculations

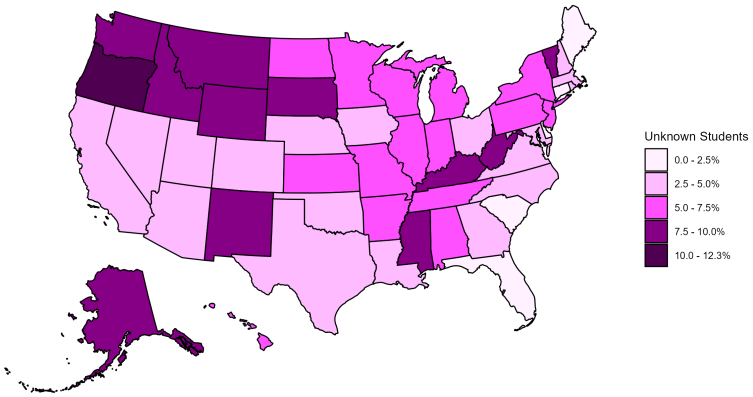
Notes: Proportions calculated as percentage of national school-age population indicated by SAIPE data. Virtual, alternative, and charter proportions are derived from CCD data, while private enrollment proportions are calculated using PSS data. PSS data is not reported for even numbered years, and was most recently updated in 2021. To fill gaps, even-numbered years and 2023-24 have a linear estimate of the expected proportion of students in private schools. The sum of students outside of public schools (Unknown + Private), however, is verifiable given CCD and Census data.

variation across states, we combine SAIPE school-age population estimates with CCD records of public school enrollment by school type and NCES-reported private school enrollment numbers by state. Using this approach, we calculate the number of students unaccounted for in each state in 2021–22–the most recent year for which all three data sources are available.

Figure 2 shows the proportion of students unaccounted for in each state for the 2021-22 school year. Florida, Delaware, and the District of Columbia report public and private enrollment equal to the SAIPE school-age population estimates, which means none of their students are unaccounted for. Other states have large proportions of students who are unaccounted for, with the largest being Oregon at 12.3 percent. Table S2 in the appendix reports the number and proportion of

students unaccounted for by state. It is important to note that this is not indicative of the level of privatization in a given state, but instead reveals the number of students who are not represented in public or private school records. Therefore, states like Florida with expanding private school markets can still have low values as long as the total number of students they report in public and private schools is near the school-age population for that year.

Figure 2: PROPORTION OF STUDENTS UNACCOUNTED FOR, 2021-22



Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Private School Universe Survey (PSS), National Center for Education Statistics; Author Calculations

Notes: The proportion of students unaccounted for in each state is calculated as the school-age population in a state given by SAIPE data minus the sum of public enrollment in CCD data and private enrollment in PSS data divided by the student population in that state.

5 Demographic Decomposition

This section examines the way schools serving different student bodies have been effected by declining enrollment. Specifically, this section will first examine how enrollment in school districts serving predominantly Black, White, or Hispanic students has changed. Additionally, this section will consider how enrollment has changed in low-, medium-, and high-poverty school districts.

5.1 Racial/Ethnic Decomposition

SAIPE estimates of school-age population are not disaggregated by race for each school district. As a result, we cannot provide a racial decomposition of pub-

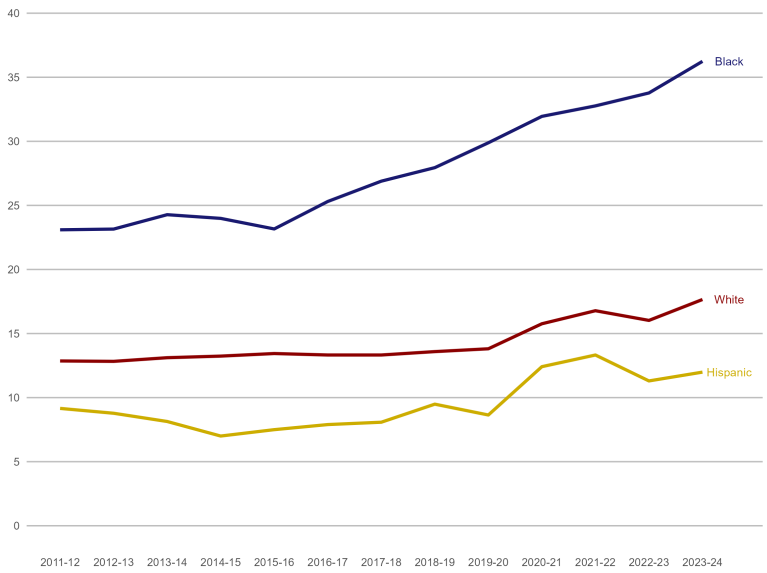
lic school enrollment trends using the same approach applied to the national trend. As an alternative approach, we restrict our analysis to school districts where a single racial group comprises more than 90 percent of the student population. Using CCD data, we calculate the proportion of students of a given race in each school district in 2016-17 as a baseline year, and then restrict our analysis to districts with greater than 90 percent of a given race. While this does not capture precisely which students are remaining in public schools or choosing non-traditional schooling, it can shed light on the expected characteristics of students staying and leaving the traditional public school system.

Figure 3 illustrates the evolution of the proportion of students outside of traditional public schools in districts meeting the 90 percent threshold for a given race. The proportion of students outside of traditional public schools includes students in private schools, charter schools, alternative schools, virtual schools, and otherwise unaccounted for. The graphic reveals an interesting difference in the proportion of students outside of traditional public schools when comparing districts with high proportions of a certain race, as well as interesting trends in the rate of growth for each group.

We find that districts serving predominantly Black students have had the highest proportion of non-TPS enrollment. This number has increased steadily from 23.16 percent in 2015-16 to 36.24 percent in 2023-24. This steady growth did not noticeably change following the pandemic. In contrast, districts serving predominantly Hispanic students exhibited the lowest proportions of non-TPS enrollment. Prior to the pandemic, the proportion of students outside of traditional public schools in predominantly Hispanic districts peaked in 2018-19 at 9.49 percent, with a low of 7.00 percent in 2014-15. Following the pandemic, the proportion of students outside of traditional public schools in Hispanic school districts grew noticeably, reaching 13.32 percent in 2021-22 and most recently 11.99 percent.

School districts serving predominantly White students showed remarkably stable proportions of non-TPS enrollment prior to the pandemic, with the lowest proportion being 12.83 percent in 2012-13 and the highest being 13.81 percent in 2013-14. Following the pandemic, however, this trend shifted upward, with the proportion reaching its highest level of 17.65 percent in 2023–24. A detailed breakdown of student proportions by district type for each year from 2011–12 through 2023–24 can be found in Figure S3 in the appendix.

Figure 3: PROPORTION OF NON-TPS ENROLLMENT, BY RACE/ETHNICITY



Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Author Calculations
Notes: Trendlines plot the group trend for all districts serving student populations of predominantly one race according their 2016-17 proportion. For example, we filter for districts that are predominantly White, sum the student population by district from Census data, sum the traditional public school enrollment, and use those numbers to calculate a proportion for each year.

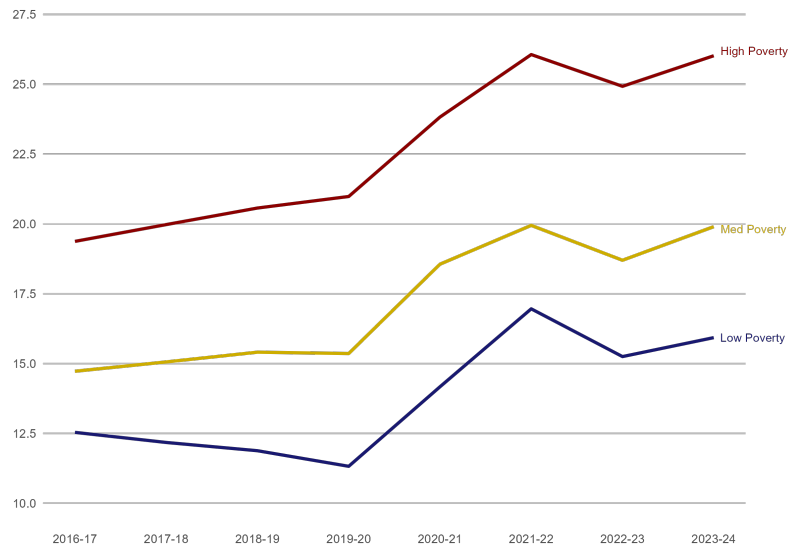
Overall, there is a noticeable difference in the trend of each racial group. The proportion of students in districts serving predominantly Black students grew consistently and rapidly from 2011-12 to 2023-24. The pandemic did not stop or accelerate this trend. In contrast, the proportion of non-TPS enrollment in districts serving predominantly White or Hispanic students was relatively steady prior to the pandemic. Following the pandemic, non-TPS enrollment for these two groups grew moderately. While these changing trends could plausibly be the result of choice shifts after the pandemic, the magnitude and rate of growth in non-TPS enrollment in predominantly White and predominantly Hispanic districts is smaller than that for predominantly Black school districts. This potentially indicates that students from historically disadvantaged backgrounds may be more vulnerable to the factors driving non-TPS enrollment.

5.2 Socioeconomic Decomposition

The SAIPE school-age population estimates include data on the number of students living in poverty in each school district. This allows us to calculate the proportion of students in poverty for each school district each year and to compare trends across high-, medium-, and low-poverty districts. To classify each district as high-, medium-, or low-poverty, we took the sum of both the student population and the number of students in poverty for each district over the period of 2016 to 2019 and computed an overall poverty proportion. This approach provides a more stable measure of long-term poverty levels compared to using a single year of data and is akin to a weighted average student poverty level. After computing these proportions, districts were divided into tertiles based on poverty levels. Districts with less than 11.47 percent of students in poverty were classified as low-poverty districts, those with between 11.47 and 19.22 percent were classified as medium-poverty districts, and those with greater than 19.22 percent of students in poverty were classified as high-poverty districts.

Figure 4 shows the proportion of students outside of traditional public schools by the poverty level of their district. For each observed year, the proportion of non-TPS enrollment is the highest among high-poverty districts, followed by medium-poverty districts and then low-poverty districts. Prior to the pandemic, both high-poverty and medium-poverty districts experienced moderate increases in the proportion of non-TPS enrollment, with the proportion in high-poverty districts growing from 19.38 percent in 2016-17 to 20.98 in 2019-20. The proportion of non-TPS enrollment in medium-poverty districts grew from 14.73 percent to 15.36 percent over that same period. These trends accelerated following the pandemic. In high-poverty districts, the proportion rose from 20.98 percent in 2019–20 to 26.02 percent in 2023–24, and in medium-poverty districts from 15.36 percent to 19.90 percent. In contrast, low-poverty school districts experienced a declining proportion of non-TPS enrollment prior to the pandemic, from 12.54 percent in 2016-17 to 11.32 percent in 2019-20. However, this trend reversed after the pandemic, with the proportion increasing to 15.93 percent by 2023–24, peaking at 16.96 percent in 2021–22. We report the yearly non-TPS enrollment in each type of district in Figure S1 in the appendix. The proportion and number for each type of school district in each year is reported in Table S4 and Table S5 in the appendix.

Figure 4: PROPORTION OF NON-TPS ENROLLMENT BY DISTRICT POVERTY



Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Author Calculations
Notes: Low-poverty districts are those with fewer than 11.47 percent of students in those districts living in poverty, reported in SAIPE data. Medium-poverty districts had between 11.47 percent and 19.22 percent of students in poverty, and high-poverty districts had greater than 19.22 percent of students in poverty. District poverty rate was calculated as a weighted average of district poverty rate from 2016 to 2019.

The trend among low-poverty districts calls for investigation. The proportion of non-TPS enrollment in low-poverty districts declined up to the pandemic, and then rapidly increased following the pandemic. One possible explanation for the pre-pandemic decline is that those in low-poverty districts, likely those with access to well-resourced and high-performing public schools, had fewer incentives to seek alternative educational options. Explaining the post-pandemic increase is more complex. It suggests that even families in traditionally well-served districts began exploring non-TPS options at higher rates. Although the available data do not allow us to directly attribute this increase to private enrollment, the pattern is consistent with the possibility that some of the growth reflects movement toward private schools. Note that projected private enrollment in Figure 1, which rely on data from prior to 2021, could not reflect this possibility. However, it is reasonable to hypothesize that there may now be a higher proportion of private enrollment.

While the trend in low-poverty districts can be explained with this possibility, it is difficult to argue that those in high-poverty school districts have the same access to private schools. Additionally, parents of students in high-poverty districts are less likely to have the resources necessary to adequately homeschool their students. One potential explanation for this trend may be that students in high-poverty school districts have decided to forgo education altogether in favor of work alternatives. This explanation is plausible especially because of increased financial hardships during and after the pandemic. More research is needed to fully understand where students are going and what motivates that transition.

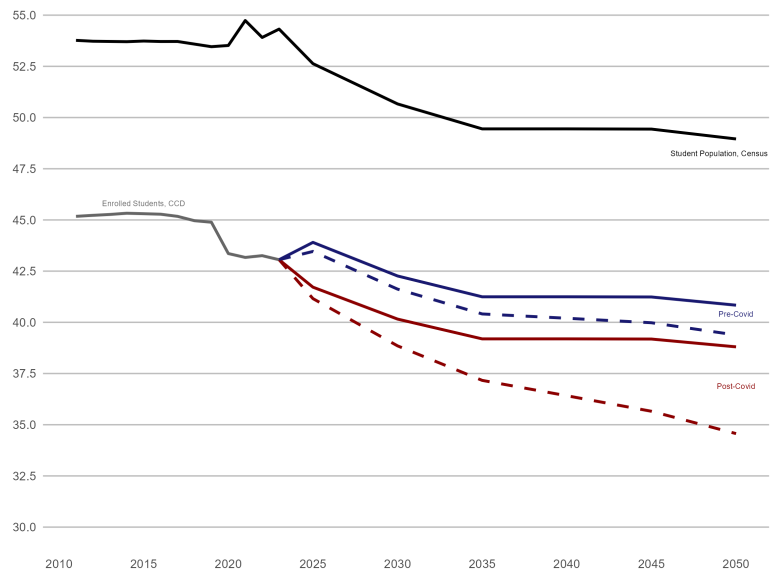
6 Projections

In this section, we provide projections for TPS enrollment in future years. As the landscape of K-12 education continues to evolve, school district administrators will need to prepare the operational needs of their districts to change. If current trends in population decline and a decreasing proportion of students in traditional public schools persist, districts will likely require fewer student seats.

Figure 5 presents projections for the number of seats that will be required in traditional public schools across the country to serve students through 2050. These projections, while preliminary, provide an initial view of how districts may look different in the coming decades. The black line in the figure charts Census projections of student-age population over time, which declines steadily, particularly between 2025 and 2035. As the overall school-age population declines, a corresponding decline in the TPS enrollment is expected. The gray line charts the actual student enrollment in traditional public schools up to 2023, as reported in the CCD data. Recall from Section 4 that enrollment was relatively stable prior to the pandemic, experienced a sharp single-year decline in 2020–21, and has followed an accelerated downward trend in the years since.

The blue and red lines in Figure 5 represent projections for TPS enrollment. The most optimistic projections assume that the pandemic shock has a temporary effect on public school enrollment, and the proportion of students in traditional public schools should (eventually) return to pre-pandemic levels. These estimates, labeled as "Pre-Covid" projections, are shown in blue. The solid blue line represents the trend if the proportion of students in traditional public schools returns to the average proportion of students in traditional public schools in the years before the pandemic, 2011-12 through 2019-20. This is the most conservative estimate of enrollment decline. The dashed blue line shows TPS enrollment if the slight

Figure 5: PROJECTED TPS STUDENT ENROLLMENT, IN MILLIONS



Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Population Division, Census Bureau; Author Calculations

Notes: The black line represents school-age population and projections reported by the Census. The gray line represents TPS enrollment reported by CCD data. Blue and red lines present projections. The solid blue line is TPS enrollment if the future proportion of TPS enrollment is equal to the average proportion of TPS enrollment from 2011-12 to 2019-20. The dashed blue line is TPS enrollment if the proportion of TPS enrollment returned to the slight linear decline in proportion of TPS enrollment pre-pandemic (2011-12 to 2019-20). The solid red line is TPS enrollment if the future proportion of TPS enrollment is equal to the average proportion from 2020-21 to 2023-24. The dashed red line is TPS enrollment if the proportion of TPS enrollment returned to the linear decline in proportion of TPS enrollment post-pandemic (2020-21 to 2023-24).

downward trajectory observed before the pandemic continues. In other words, this line was created by computing a linear trend of the proportion of students in public schools from 2011-12 through 2019-20, which saw a slight decline over these years, and multiplying this changing proportion by the Census projections.[1] This is also a relatively conservative estimate of potential enrollment declines.

[1]The simple linear model fit was $Y_i = \beta_0 + \beta_1 X_i + \varepsilon$, where X_i is a school year between 2011 and 2019 and Y_i is the proportion of students outside of traditional public schools. This model predicted a 0.10 percentage point decline in the proportion of students in traditional public schools per year, from 82.51 percent in 2025 to 80.22 percent in 2050.

However, it is possible that the pandemic has led to lasting changes in family choices for schooling. To reflect this possibility, less conservative projections are constructed using post-pandemic data in a similar fashion to those above. These projections are plotted in red. The solid line represents the trend if the proportion of students in traditional public schools remains at the average level observed from 2020–21 through 2023–24. The dashed line represents the trend if the slight downward trend in the proportion of students enrolled in traditional public schools after the pandemic continues. This projection is based on a linear model fitted to the proportion of students enrolled in traditional public schools from 2020–21 through 2023–24, with the resulting trend applied to Census population projections.[2] This projection is the least optimistic and predicts significant declines in TPS enrollment by 2050.

The most recent year of CCD data show that, at the beginning of the 2023-24 school year, 43.06 million students were enrolled in traditional public schools out of the 54.32 school-age children estimated by the Census. In 2025, our projections range between 41.16 million and 43.90 million students in traditional public schools. This presents the possibility of either a moderate decline or a partial recovery. However, due to projected declines in the overall school-age population, by 2050 enrollment is expected to fall to between 34.57 million and 40.84 million students. Nevertheless, it is reasonable to expect that traditional public schools will serve at least 2.22 million fewer students—and potentially as many as 8.49 million fewer—by 2050. Table S6 in the appendix shows the school-age population, traditional public school enrollment, and projections by year.

7 School Closures

One concern associated with declining TPS enrollment is the potential reduction in the number of schools needed to serve students (Randazzo and Barnum, 2024). As enrollment decreases, districts may consider closing schools—particularly those experiencing substantial declines—in an effort to reduce fixed operational costs. Districts may consolidate students in the same grade level to a single school rather than maintaining multiple underutilized buildings. This section explores the relationship between enrollment declines and school closures.

[2]The simple linear model fit was $Y_i = \beta_0 + \beta_1 X_i + \varepsilon$, where X_i is a year between 2020 and 2023 school year and Y_i is the proportion of students outside of traditional public schools. This model predicted a 0.16 percentage point annual decline in the proportion of students in traditional public schools per year, from 78.68 percent in 2025 to 74.80 percent in 2050.

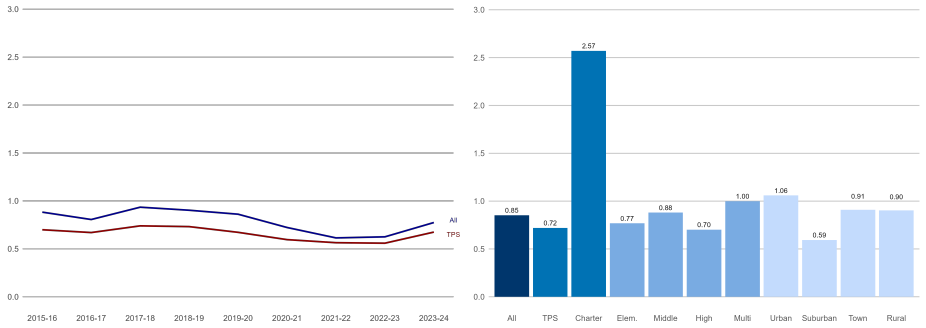
Before modeling the relationship between enrollment declines and closures, it is important to recognize that school closures occur relatively infrequently. While school closures can have large negative impacts on students, teachers, parents, and communities they occur in, only a small proportion of schools close each year. Figure 6 demonstrates three approaches to understanding closure rates for brick-and-mortar public schools. Each subfigure includes only school closures for brick-and-mortar charter schools and brick-and-mortar traditional public schools.

Figure 7a shows the development of the permanent school closure rate, or the share of schools open in the prior year that closed in the current year, from 2015-16 through 2023-24. Overall, the school closure rate exhibits a slight downward trend, with a recent upward trend. In 2015-16, the school closure rate for all brick-and-mortar schools was 0.88 percent (775 permanent closures), decreasing to 0.77 percent (681 permanent closures) in 2023-24. For each year, the closure rate for traditional public schools was lower than the closure rate for charter schools. One reason for this disparity is that charter schools face more threats that can cause closures, such as performance expectations and frequent charter renewals. In 2015-16, the closure rate for traditional public schools was 0.70 percent (571 permanent closures), dropping to 0.67 percent in 2023-24 (546 permanent closures). Table S7 in the appendix reports the school closure rate each year by sector.

Figure 7b reports the average closure rate over the study period by school characteristics, including sector (traditional public schools versus charter), grade level (elementary, middle, high, and multi level schools), and locale (urban, suburban, town, and rural). Over all years, the average closure rate is 0.85 percent. As remarked previously, this rate was substantially higher for charter schools, which had a closure rate of 2.57 percent compared to traditional public schools which closed at a rate of 0.72 percent. As for grade level, middle schools had the highest closure rate (1.27 percent) and high schools the lowest (0.64 percent), which elementary and multi-level schools falling between (0.78 percent and 0.99 percent, respectively). Urban schools have the highest closure rate, at 1.06 percent, though this is comparable to Town and Rural schools, with 0.91 and 0.90 percent closures, respectively. Suburban schools have the lowest closure rate, at 0.59 percent.

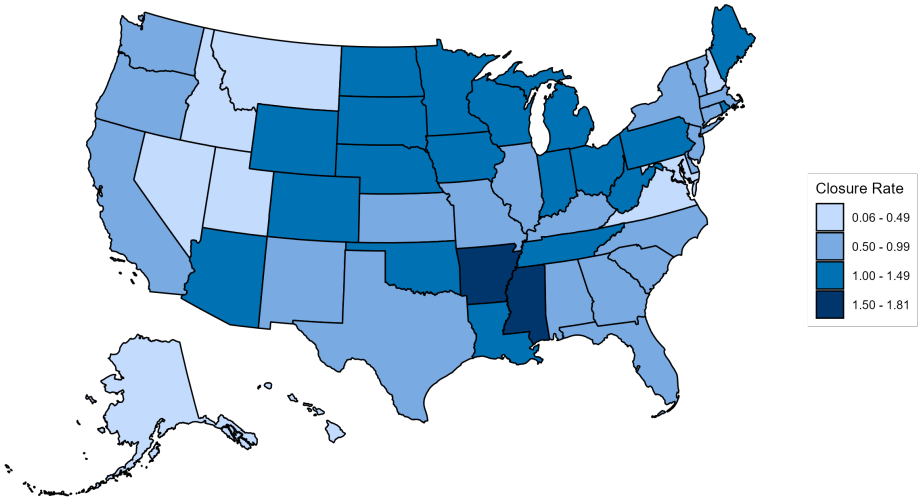
Figure 7c reveals substantial variation in the average rate of permanent school closures in public schools across states. States like Idaho, Montana, Nevada, Utah, Alaska, Hawaii, Virginia, Maryland, and New Hampshire have relatively low closure rates below 0.5 percent. In contrast, the schools with the highest permanent school closure rates were Washington, D.C. (2.06 percent), Mississippi (1.81 percent), and Arkansas (1.64 percent). Table S2 in the appendix reports the number of school closures over the observation period and the closure rate for each state.

Figure 6: SCHOOL CLOSURE RATE, 2012-13 TO 2023-24



(a) By Year

(b) By Characteristics



(c) By State

Source: Common Core of Data (CCD), National Center for Education Statistics; Author Calculations

Notes: Yearly closure rates calculated as $\frac{\text{\# Closed Current Year}}{\text{\# Open Previous Year}}$ using CCD data. Schools closed in the current year are those that were open in the previous year and reported status 2 (permanently closed) in current year. Closure rate characteristics were calculated by considering only the subset of data with a given characteristic and computing the number of closures from 2012-13 through 2023-24 divided by the number of schools open 2011-12 through 2022-23 (the previous years). State closure rates are defined from 2012-13 through 2023-24.

7.1 Modeling

In this section we quantify the effect of declining school enrollment on permanent school closures. We restrict our primary analysis to traditional public schools, but a similar analysis for charter schools can be found in the appendix.

The dependent variable, permanent school closure, is a binary variable that equals 1 if a school was open in the previous year and closed in the current year, and 0 otherwise. The independent variable, enrollment change, is defined in two ways. First, we consider measures of single-year enrollment changes that take the percent change in enrollment from $x+1$ years ago to x years ago. One such case, considering just the previous year, is defined as follows:

$$\Delta\text{Enrollment}_{t-1} = \frac{\text{Enrollment}_{t-1} - \text{Enrollment}_{t-2}}{\text{Enrollment}_{t-2}}$$

We define the four other quantities (up to $\Delta\text{Enrollment}_{t-5}$) analogously.

Figure 8 shows the distribution of $\Delta\text{Enrollment}_{t-1}$ by school closure status for each year from 2014-15 through 2023-24. Schools that remained open (colored in red) had a approximately normally distributed $\Delta\text{Enrollment}_{t-1}$, concentrated primarily between -15 (representing a 15 percent decline in enrollment) and 15 (a 15 percent growth in enrollment). In contrast, schools that closed permanently had a substantially more dispersed distribution with a higher proportion of observations experiencing enrollment declines.[3]

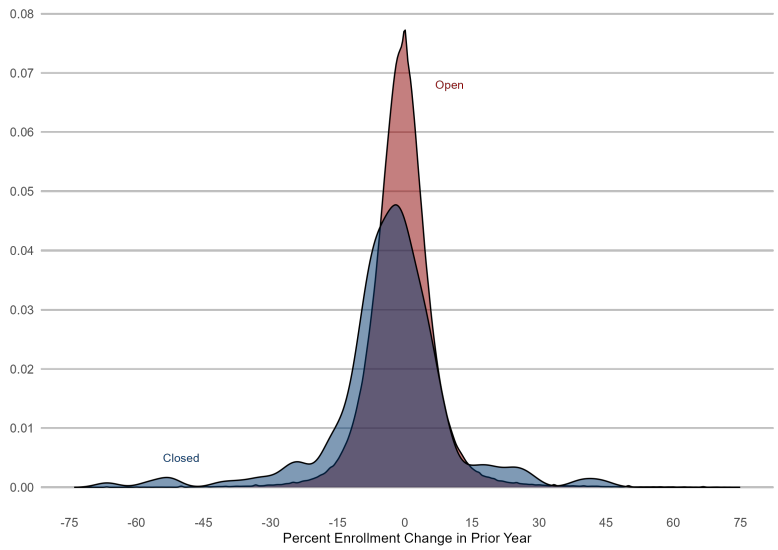
While schools that experienced permanent closures were more likely to have enrollment declines, enrollment declines certainly did not necessarily result in closures. The considerable overlap in the distributions The significant overlap in the distributions suggests that many schools with declining enrollment remained open, and conversely, not all closures followed large declines. These patterns indicate that while extreme enrollment changes may increase closure risk, broader enrollment stability is likely an important factor in supporting a school's continued operation.

In addition to five variables for year-over-year enrollment changes, we compute the two-year and five-year cumulative enrollment changes. The two-year cumulative change is defined as follows (with the five-year change using $t-1$ and $t-6$):

$$\text{Two-Year}\Delta\text{Enrollment}_{t-1} = \frac{\text{Enrollment}_{t-1} - \text{Enrollment}_{t-3}}{\text{Enrollment}_{t-3}}.$$

[3] 94.91 percent of schools that remained open fell within this range compared to 81.31 percent of those that closed.

Figure 8: DENSITY OF ΔENROLLMENT$_{t-1}$ BY CLOSURE STATUS



Source: Common Core of Data (CCD), National Center for Education Statistics; Author Calculations

Notes: $\Delta\text{Enrollment}_{t-1} = \frac{\text{Enrollment}_{t-1} - \text{Enrollment}_{t-2}}{\text{Enrollment}_{t-2}}$. Schools are defined as closed if they were open in the previous year and reported permanent school closure (status 2) in CCD data. This figure is limited to traditional public schools.

Table 2 shows the summary characteristics of each of the variables involved in the regression (multiplied by 100). While the average school experienced a very minor enrollment decline on average, there was high variation in the values. These variables will be used to model the expected likelihood of experiencing a school closure given an enrollment change.

To evaluate the effect of enrollment declines on permanent school closures, we estimate two types of logistic regression models. Logistic regression is appropriate given the binary nature of the dependent variable (whether a school closed permanently or not). We begin by estimating a baseline model that includes only ΔEnrollment$t-1$ as a predictor. We then augment the specification by progressively adding year-over-year enrollment changes for $t-2$, $t-3$, $t-4$, and $t-5$ to capture longer-term enrollment trends. The full specification for school i in year t

Table 2: DESCRIPTIVE STATISTICS FOR ENROLLMENT CHANGE VARIABLES

Variable	Mean	Std. Dev.	N
Permanent Closure	0.678	8.205	5,560
ΔEnrollment$_{t-1}$	-0.639	6.789	731,580
ΔEnrollment$_{t-2}$	-0.642	6.726	710,554
ΔEnrollment$_{t-3}$	-0.664	6.535	622,819
ΔEnrollment$_{t-4}$	-0.230	6.254	540,399
ΔEnrollment$_{t-5}$	-0.194	6.236	461,464
Two-Year ΔEnrollment	-1.309	9.681	710,578
Five-Year ΔEnrollment	-3.291	14.980	462,586

Source: Common Core of Data (CCD), National Center for Education Statistics; Author Calculations

Notes: Values multiplied by 100. Due to difficulty disentangling enrollment changes due to actual enrollment declines and changes in grade levels served, we compute each enrollment change variable only for schools who had the same grade levels served at the start and end of the period. Observations limited to traditional public schools.

is as follows:[4]

$$Y_{it} = \beta_0 + \sum_{j=1}^{5} \beta_j \Delta\text{Enrollment}_{t-j} + \varepsilon_{it}$$

The second type of logistic regression model we estimate looks at the effect of longer-term enrollment declines on the probability of school closures. We examine two- and five-year changes in enrollment at time $t-1$ on the likelihood of school closure at time t. The specification for the two-year estimate for school i at time t is as follows:

$$Y_{it} = \beta_0 + \beta_1 \text{TwoYear}\Delta\text{Enrollment}_{t-1} + \varepsilon_{it}$$

The five-year estimate takes the same form. To ensure consistency of estimates and to avoid confusing changes in enrollment due to changes in grade level served for changes in enrollment due to actual enrollment decline, we consider only schools that served the same grade level in the starting and ending period for the calculation of a variable. We use heteroskedasticity robust standard errors throughout, and exclude each regressor's top and bottom half-percent to minimize the impact of outliers on estimates.

[4]Note that $Y = \ln(\frac{p}{1-p})$ and p is the probability of closure.

7.2 Results

The results of each logistic regression model are presented below in Table S9. Columns (1) through (3) refer to the first type of estimation, where we progressively augmented the specification to include the year-over-year enrollment changes from just in the prior year in column (1) to the prior five in column (3). The results demonstrate a few key findings. First, prior enrollment declines are strongly associated with present school closures. Second, the estimated effects on school closure in the current year are more strongly related to enrollment declines in more recent years than in years further in the past. Specifically, our estimates in column (1) demonstrate a 1 percentage point decrease in enrollment increases the log odds of school closure by 0.041. In other words, a unit drop in enrollment corresponds to a 4.19 percent increase in the likelihood of a permanent school closure, an effect that is statistically significant. Column (2) shows the statistically significant relationship between the change over the prior year and the one two years prior with closure odds. Column (3) shows that the effects of prior years are substantially lower when predicting permanent school closures.

Columns (4) and (5) present the second type of estimation, which examines the effect of longer-term enrollment declines on permanent school closure. Columns (4) presents the results for the two-year cumulative decline, and column (5) presents the results for the five-year cumulative decline. The model for column (4) estimates that a 1 percentage point decrease in enrollment increases the log-odds of school closure by 0.031, or alternatively a 3.15 percent increase in the likelihood of a permanent school closure. The model for column (5) estimates that a 1 percentage point decrease in enrollment increases the log-odds of school closure by 0.032, or alternatively a 3.25 percent increase in the odds of a permanent school closure.

To contextualize these estimates, it is useful to consider a concrete example. Between the 2014–15 and 2023–24, 0.72 percent of brick-and-mortar traditional public schools permanently closed. A 4.19 percent increase in the likelihood of closure—such as that associated with a one-percentage-point decline in enrollment—would raise the closure rate to approximately 0.75 percent, assuming all else remains constant. This moderate effect is reasonable, as school closures are complex phenomena and are driven by a multitude of factors beyond enrollment. Many of these same factors may also affect enrollment itself, potentially amplifying the observed statistical relationship while masking the underlying causal complexity.

Table 3: LOGISTIC REGRESSION RESULTS

	Dependent variable:				
	Closure				
	(1)	(2)	(3)	(4)	(5)
Δ Enrollment$_{t-1}$	-0.041^{***}	-0.039^{***}	-0.037		
	(0.016)	(0.015)	(0.024)		
Δ Enrollment$_{t-2}$		-0.056^{***}	-0.055^{**}		
		(0.016)	(0.024)		
Δ Enrollment$_{t-3}$			-0.029		
			(0.020)		
Δ Enrollment$_{t-4}$			-0.012		
			(0.022)		
Δ Enrollment$_{t-5}$			-0.018		
			(0.021)		
Δ Two-Year				-0.031^{***}	
				(0.012)	
Δ Five-Year					-0.032^{***}
					(0.010)
Observations	657,122	628,265	371,574	637,534	394,715

Source: Common Core of Data (CCD), National Center for Education Statistics; Author Calculations

Notes: *p<0.1; **p<0.05; ***p<0.01. Results reported for logistic regression model predicting closure by various enrollment change variables. Fixed effects for school year included. Excluded the top and bottom half-percent of each regressor to minimize the effect of extreme outliers.

8 Implications

The Covid-19 pandemic presented unique challenges to school districts in the United States. The consequences for student learning and development are still being felt, and the changes in the way students attended school during the pandemic have led many parents to more closely consider their schooling options. Traditional public schools face increasing competition from non-public schooling options. As a result of these changes, the landscape of K-12 education looks drastically different today than it did before the pandemic. From the 2019-20 school year to the 2021-22 school year (the most recent years with available private enrollment data), the number of students unaccounted for in either private or public school records grew by 2.05 million. This is a greater than 450 percent increase in students who are unaccounted for. Of this decline, 84 percent, or 1.72 million students, can be explained by the declined enrollment in traditional public schools.

If traditional public school enrollment continues to decline, by 2050, as few as 34.57 million students could be attending traditional public schools, compared to the 43.06 million students in 2023-24. While some of this decline is attributable to a general population decline, it also reflects changing educational choices. Our projections indicate that, had education choices continued to develop as they had prior to the pandemic, there would still be 39.38 million students in traditional public schools in 2050. In other words, more than half of the potential enrollment decline (4.81 million students) may be attributable to post-pandemic choice shifts.

One concern is that declining enrollment could speed up the closure of schools, especially if school closures more frequently impact under-served communities. Our modeling demonstrates the statistically significant relationship between enrollment declines and an increase in the likelihood of school closures, especially in more recent years. As district administrators face smaller student populations, they will have difficult decisions to make about whether to close schools, which schools to close, and who will be impacted. In the face of budgetary constraints, districts that do not close schools may be required to reduce new hires, choose not to renew teacher contracts, or relieve teachers of their duties.

The racial decomposition of enrollment declines demonstrates a continued growth of students in predominantly Black school districts seeking non-TPS options. It also revealed a new, accelerated trend in the proportion of students in predominantly White school districts seeking non-TPS options. These trends have concerning implications for potential resegregation in school districts. Furthermore, the socioeconomic breakdown showed that the pandemic reversed a trend of growing TPS enrollment in low-poverty districts. Following the pandemic, in-

stead of a slow return to traditional public schools, students in low-poverty school districts began rapidly exiting the public school system. This trend may potentially be indicative of wealthier families exiting in favor of private alternatives. In that case, large-scale exit of wealthier individuals from the public school system has the potential to drain resources from schools (especially if these families take advantage of increasingly widespread voucher programs) and entrench disparities in education quality between students from different socioeconomic backgrounds. Both types of resegregation, economic and racial, have the potential to undermine a significant role of public education in crafting citizens with diverse perspectives and preparing students to engage in their communities (Labaree, 1997).

A final concern with continued enrollment declines is the effect this may have on education quality. Students outside of public schools have a less regulated and scrutinized education. Understanding precisely where and why students are choosing alternatives is key to recognizing the impact on education quality for leavers. For stayers, declining enrollment threatens school quality through a different mechanisms. Education funding, especially from state and federal sources, is often tied to enrollment. Therefore, as more students leave schools, schools will lose more of their funding. With fewer resources, difficult decisions must be made regarding expenditures which could negatively effect the education quality of those who remain in underfunded public schools.

Despite this bleak picture, there are reasons for cautious optimism. While declining enrollment can impact budgets, education officials can look for unique approaches to resolving such issues without resorting to closures or layoffs. Examples of such approaches include New York City officials promising not to cut funding (Elsen-Rooney, 2022), and promises to innovate public schools to draw students back (Amin, 2022; Grose, 2023; The Education Trust - New York, 2023). Moreover, in districts with many schools, closures can be a mechanism for right-sizing these districts, or ensuring that the district only operates as many schools as is necessary to serve the existing student population. Right-sizing can eliminate fixed costs associated with operating additional schools and potentially enable districts to expend more resources per student. Furthermore, the effects of the pandemic on education choices are still recent, and may not demonstrate long-lasting changes. The level of involvement from parents that is required to keep students homeschooling or in private schools can be incredibly high. Parents may face fatigue from making these decisions about where to enroll or what material to use and defer to the public education system instead. Additionally, as people return to the office in greater numbers, the feasibility of homeschooling may decline and the inability to expend the required time to homeschool without detriment to their

child may result in their return to public schools. While continued enrollment declines present concerns to researchers and policymakers, they do not themselves entail disaster. Careful monitoring and consideration of the options available will ensure that the public education system continues to serve all students well.

9 Conclusion

This research took stock of national enrollment declines in public schools using the newest available data. Using district level enrollment and population data, we demonstrated that the slight recovery in student enrollment in traditional public schools in 2022-23 may may not indicate a recovery trajectory. Instead, an additional year of data showed an increase in the number of students outside of traditional public schools. Furthermore, we examined the effect of enrollment declines on districts with different racial and socioeconomic makeups. While predominantly Black school districts continued a stable growth in the proportion of students outside of traditional public schools, predominantly White school districts exhibited a unique, steep growth following the pandemic indicative of greater enrollment declines for White students. Low-poverty districts showed a reversal in the trend in enrollment outside of traditional public schools following the pandemic. Finally, we investigated the relationship between enrollment declines on permanent school closures. Both single-year and cumulative multi-year declines are statistically significant drivers of permanent school closures. Though the likelihood of school closure remains low in the face of enrollment declines, with many thousands of schools in the United States, even a small proportional increase in the percentage chance of a closure can affect thousands of students.

Future research will help understand the impact of currently observed enrollment declines on realized traditional public school closures. This study has serve as a blueprint for future researchers aiming to re-assess the enrollment trajectories of public schools. Additionally, future work is needed to understand the role of different actors in enrollment declines. Understanding why parents make education decisions is crucial for predicting future declines in enrollment. Learning about administrators' perceptions of enrollment declines and their plans to address the resulting problems can help gauge the appropriate level of concern for policymakers and the media. Finally, in an ever-changing policy environment, marked by growing competition to traditional public schools and diminishing availability of federal data, providing clear benchmarks is crucial to evaluating how public schools can continue to deliver high-quality education to all students.

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Supplementary Appendix

Table S1: NUMBER OF STUDENTS BY SCHOOL TYPE, IN THOUSANDS

Year	Pop.	TPS	Charter	Alt.	Virtual	Private	Unknown
2015-16	54,174	45,304	2,556	728	211	4,903	470
2016-17	54,225	45,279	2,708	730	227	4,721	557
2017-18	54,290	45,174	2,830	722	241	4,898	423
2018-19	54,133	44,960	2,886	720	341	4,747	477
2019-20	54,077	44,887	2,976	731	375	4,652	453
2020-21	54,106	43,358	3,098	731	673	4,773	1,471
2021-22	54,997	43,169	3,116	808	671	4,731	2,500
2022-23	54,274	43,255	3,189	790	632	4,799	1,606
2023-24	54,694	43,055	3,263	805	659	4,812	2,097

Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Private School Universe Survey (PSS), National Center for Education Statistics; Author Calculations

Notes: Population reported in SAIPE data. TPS, charter, alternative, virtual enrollment are reported in CCD data. Virtual schools are those classified as fully virtual or virtual with face-to-face options. Private school totals are based on PSS data. Unknown is the difference between population and the sum of all CCD and PSS enrollment types.

Table S2: STATE UNKNOWN STUDENT AND CLOSURE STATISTICS

State	Unknown	Unknown (%)	Closed	Closure Rate
AL	63,865	7.49	115	0.72
AK	13,404	9.25	13	0.24
AZ	34,792	2.86	226	1.01
AR	33,943	6.39	206	1.65
CA	183,293	2.78	674	0.64
CO	44,977	4.75	210	1.04
CT	13,744	2.49	97	0.81
DE	0	0.00	15	0.64
DC	0	0.00	52	2.06
FL	0	0.00	327	0.82
GA	55,185	2.90	229	0.85
HI	14,012	6.32	2	0.06
ID	32,529	8.99	25	0.33
IL	117,048	5.58	392	0.85
IN	70,785	5.93	227	1.03
IA	24,963	4.50	204	1.31
KS	34,919	6.55	128	0.82
KY	59,157	7.85	117	0.82
LA	33,683	4.25	201	1.30
ME	3,103	1.70	91	1.32
MD	29,957	2.97	77	0.49
MA	30,462	3.00	194	0.93
MI	119,395	7.33	508	1.44
MN	67,763	6.84	213	1.07
MS	45,776	8.86	194	1.81
MO	74,920	7.30	133	0.51
MT	17,156	9.75	18	0.19
NE	16,386	4.53	116	1.02
NV	25,729	4.94	6	0.08
NH	8,810	4.53	28	0.49
NJ	87,996	5.83	162	0.58
NM	31,673	8.77	60	0.61
NY	222,751	7.40	346	0.63
NC	77,021	4.51	166	0.55

Continued on next page

Table S2 – *Continued from previous page*

State	Unknown	Unknown (%)	Closed	Closure Rate
ND	9,082	6.75	67	1.18
OH	94,730	4.89	600	1.46
OK	34,809	4.78	213	1.01
OR	82,147	12.33	91	0.63
PA	106,651	5.35	496	1.43
RI	4,317	2.78	40	1.15
SC	14,143	1.71	129	0.92
SD	12,439	7.59	82	1.06
TN	78,283	6.83	211	1.01
TX	204,775	3.63	618	0.65
UT	28,968	4.05	54	0.49
VT	7,484	8.43	24	0.68
VA	58,704	4.22	99	0.45
WA	97,160	7.74	119	0.50
WV	20,412	7.55	80	1.01
WI	53,434	5.54	246	1.01
WY	8,167	8.01	42	1.02

Sources: Common Core of Data (CCD), National Center for Education Statistics; Private School Universe Survey (PSS), National Center for Education Statistics; Small Area Income and Population Estimates (SAIPE), Census Bureau; Author Calculations

Notes: Data for Unknown students are for 2021-22, the most recent year of PSS data. Closed reports the number of closed schools from 2012-13 to 2023-24 and the closure rate refers to the proportion of all schools that were closed in the observed period.

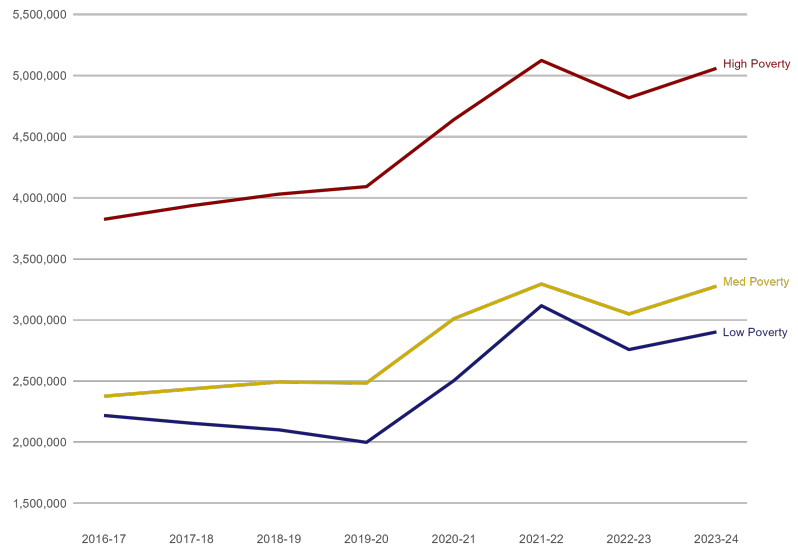
Table S3: PROPORTION OF NON-TPS ENROLLMENT BY RACE/ETHNICITY

School Year	Black	Hispanic	White
2011-12	23.10	9.16	12.86
2012-13	23.15	8.78	12.83
2013-14	24.27	8.14	13.11
2014-15	23.99	7.00	13.24
2015-16	23.16	7.50	13.44
2016-17	25.31	7.90	13.33
2017-18	26.89	8.08	13.32
2018-19	27.95	9.49	13.59
2019-20	29.89	8.64	13.81
2020-21	31.95	12.41	15.76
2021-22	32.77	13.32	16.78
2022-23	33.77	11.30	16.02
2023-24	36.24	11.99	17.65

Source: Common Core of Data (CCD), National Center for Education Statistics; Author Calculations

Notes: For each column we select districts with greater than 90 percent of a given race in 2016 and evaluate the trend in those districts over time. Students outside TPS include those in private, charter, virtual, alternative, and unknown.

Figure S1: NON-TPS ENROLLMENT BY DISTRICT POVERTY LEVEL



Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Author Calculations

Notes: Low-poverty districts are those with fewer than 11.47 percent of students in those districts living in poverty, reported in SAIPE data. Medium-poverty districts had between 11.47 percent and 19.22 percent of students in poverty, and high-poverty districts had greater than 19.22 percent of students in poverty. District poverty rate was calculated as a weighted average of district poverty rate from 2016 to 2019.

Table S4: PROPORTION OF NON-TPS STUDENTS BY DISTRICT POVERTY

School Year	Low Poverty	Medium Poverty	High Poverty
2016-17	12.54	14.73	19.38
2017-18	12.18	15.06	19.98
2018-19	11.88	15.41	20.57
2019-20	11.32	15.36	20.98
2020-21	14.17	18.56	23.83
2021-22	16.96	19.95	26.06
2022-23	15.25	18.70	24.93
2023-24	15.93	19.90	26.02

Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Author Calculations

Notes: Low-poverty districts are those with fewer than 11.47 percent of students in those districts living in poverty, reported in SAIPE data. Medium-poverty districts had between 11.47 percent and 19.22 percent of students in poverty, and high-poverty districts had greater than 19.22 percent of students in poverty. District poverty rate was calculated as a weighted average of district poverty rate from 2016 to 2019.

Table S5: NON-TPS ENROLLMENT BY DISTRICT POVERTY

School Year	Low Poverty	Medium Poverty	High Poverty
2016-17	2,218,495	2,375,760	3,823,604
2017-18	2,154,829	2,435,949	3,934,964
2018-19	2,100,601	2,492,765	4,029,704
2019-20	1,998,324	2,483,961	4,091,064
2020-21	2,504,374	3,010,683	4,639,945
2021-22	3,116,607	3,293,852	5,123,711
2022-23	2,757,703	3,049,070	4,818,033
2023-24	2,901,985	3,276,425	5,058,821

Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Author Calculations

Notes: Low-poverty districts are those with fewer than 11.47 percent of students in those districts living in poverty, reported in SAIPE data. Medium-poverty districts had between 11.47 percent and 19.22 percent of students in poverty, and high-poverty districts had greater than 19.22 percent of students in poverty. District poverty rate was calculated as a weighted average of district poverty rate from 2016 to 2019.

Table S6: STUDENT POPULATION, TPS ENROLLMENT, AND PROJECTIONS BY YEAR, IN MILLIONS

	Average		Linear			
Year	Pre-Covid	Post-Covid	Pre-Covid	Post-Covid	CCD	Pop.
2011					45.18	53.77
2012					45.22	53.73
2013					45.27	53.72
2014					45.33	53.70
2015					45.30	53.74
2016					45.28	53.71
2017					45.17	53.71
2018					44.96	53.59
2019					44.89	53.46
2020					43.36	53.52
2021					43.17	54.74
2022					43.26	53.91
2023					43.06	54.32
2025	43.90	41.72	43.46	41.16		52.63
2030	42.26	40.16	41.62	38.85		50.67
2035	41.25	39.19	40.41	37.16		49.45
2040	41.25	39.19	40.20	36.42		49.45
2045	41.24	39.18	39.98	35.66		49.44
2050	40.84	38.80	39.38	34.57		48.96

Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), U.S. Census Bureau; Population Division, Census Bureau; Author calculations

Notes: Population estimates up to 2023 are from SAIPE dataset, and years 2025 and later are Census projections. Average columns are computed by taking the average proportion of students in TPS pre- (2019 and earlier) or post- (2020 and later) pandemic and multiplying by the population for that year. Linear columns are computed by taking the linear trend, extended to a given year, and multiplied by the population for that year.

Table S7: YEARLY SCHOOL CLOSURE RATE BY SCHOOL SECTOR

School Year	All Schools	Traditional	Charter
2012-13	0.96	0.87	2.56
2013-14	1.17	1.02	3.37
2014-15	0.98	0.84	2.93
2015-16	0.88	0.70	3.31
2016-17	0.81	0.67	2.60
2017-18	0.93	0.74	3.44
2018-19	0.90	0.73	3.04
2019-20	0.86	0.67	3.18
2020-21	0.72	0.60	2.27
2021-22	0.61	0.56	1.21
2022-23	0.63	0.56	1.40
2023-24	0.77	0.67	1.93

Source: Common Core of Data (CCD), National Center for Education Statistics; Author calculations

Notes: School sector is defined as given by CCD data. A school is considered permanently closed if it reports status code 2 and was open in the prior year.

Table S8: PROJECTED TPS ENROLLMENT BY STATE

State	2025	2030	2035	2040	2045	2050
AL	676,202	635,469	605,130	590,130	575,029	554,648
AK	110,973	108,247	106,926	108,108	109,161	109,062
AZ	822,310	764,489	719,311	692,192	664,562	630,543
AR	412,927	384,122	361,828	348,780	335,648	319,453
CA	4,731,092	4,279,663	3,916,811	3,665,127	3,420,727	3,154,274
CO	660,467	609,083	567,978	541,146	513,796	481,443
CT	431,352	389,677	355,540	330,964	306,489	279,520
DE	109,856	106,913	105,454	106,549	107,596	107,589
DC	44,109	44,584	45,329	46,893	48,189	48,761
FL	2,274,236	2,141,432	2,033,830	1,968,370	1,893,028	1,791,108
GA	1,608,073	1,560,256	1,534,417	1,545,864	1,556,651	1,552,246
HI	149,559	136,123	125,216	117,612	110,006	101,454
ID	261,680	251,512	243,786	240,822	236,506	228,701
IL	1,620,604	1,463,771	1,335,853	1,244,431	1,153,976	1,054,686
IN	915,584	857,227	813,128	789,753	766,275	735,827
IA	466,430	450,531	441,142	442,555	443,814	440,795
KS	432,368	408,151	390,539	382,828	375,098	363,950
KY	594,963	555,266	524,837	507,751	490,517	468,763
LA	568,209	539,635	519,462	512,253	504,894	492,778
ME	151,260	138,460	128,283	121,568	114,954	107,441
MD	811,470	790,956	781,562	791,274	800,851	802,777
MA	752,997	693,289	646,486	617,062	588,179	554,668
MI	1,124,660	1,022,940	941,383	885,764	831,248	770,664
MN	733,934	695,253	666,703	654,054	640,408	619,975
MS	395,934	353,029	318,154	292,829	268,489	242,877
MO	797,547	749,365	713,594	696,060	678,554	654,961
MT	145,480	142,222	140,717	142,428	143,894	143,770
NE	308,778	305,159	305,519	313,200	320,776	325,200
NV	385,013	356,916	333,447	317,069	299,116	277,008
NH	146,145	129,016	114,978	104,499	94,449	84,050
NJ	1,121,578	1,051,610	999,289	972,647	946,133	911,239
NM	251,402	223,428	200,633	183,929	167,895	151,129
NY	2,066,611	1,845,460	1,665,835	1,535,871	1,410,790	1,278,714
NC	1,306,960	1,216,679	1,145,986	1,103,610	1,059,995	1,005,763
ND	116,694	118,406	121,063	126,149	130,781	133,705
OH	1,413,983	1,307,926	1,225,559	1,175,720	1,126,640	1,068,358
OK	585,477	552,048	526,507	513,270	498,922	478,994
OR	477,725	442,809	415,374	398,471	381,345	360,634
PA	1,417,693	1,310,581	1,227,286	1,176,613	1,126,729	1,067,682
RI	112,662	102,455	94,282	88,718	83,278	77,241
SC	699,097	677,285	664,341	666,847	668,332	662,595

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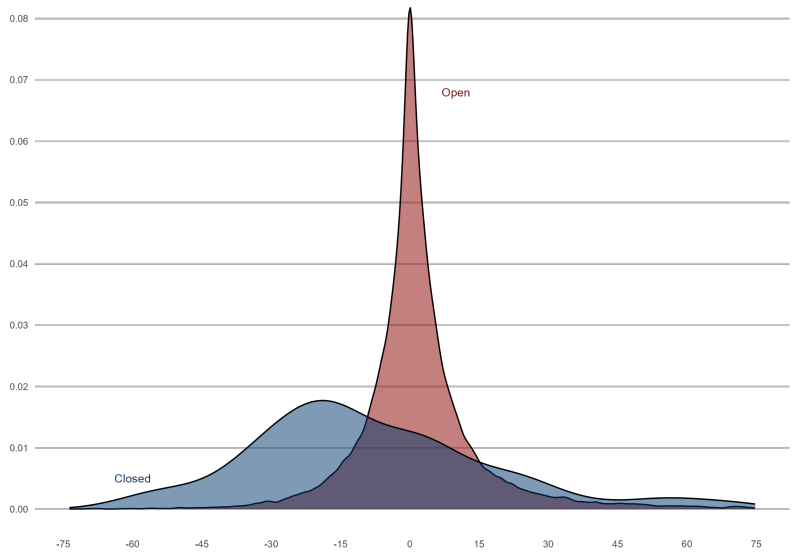
Table S8 – *Continued from previous page*

State	2025	2030	2035	2040	2045	2050
SD	136,431	136,067	137,304	141,707	145,963	148,680
TN	874,905	819,553	776,442	751,781	725,659	691,627
TX	4,669,403	4,505,122	4,392,316	4,373,596	4,339,428	4,250,081
UT	559,917	545,365	536,955	540,169	541,742	536,654
VT	67,309	60,837	55,612	51,954	48,383	44,488
VA	1,190,398	1,134,435	1,095,520	1,083,501	1,070,801	1,047,628
WA	994,721	955,059	927,728	921,470	913,066	894,156
WI	690,519	638,462	597,997	573,422	549,227	520,561
WV	219,627	196,147	177,079	163,289	150,018	136,002
WY	88,364	84,559	82,030	81,531	81,007	79,713

Sources: Common Core of Data (CCD), National Center for Education Statistics; Private School Universe Survey (PSS), National Center for Education Statistics; Small Area Income and Population Estimates (SAIPE), Census Bureau; Population Division, Census Bureau

Notes: State projections calculated in the following manner: (1) Using SAIPE data we computed the proportion of the national population each state represented from 2011 through 2023. (2) We used the linear trend in each state's proportion of the national population to predict the future proportions for each state through 2050. (3) We multiplied the projections for state proportion by the Census population projections, giving us a projected school-age population for each state. (4) Using CCD data and SAIPE data we computed the proportion of school-age population enrolled in TPS for each state. (5) We projected these proportions to 2050. (6) We multiplied these projected proportions by the projected school-age population for each state.

Figure S2: DENSITY OF Δ ENROLLMENT$_{t-1}$ BY CLOSURE STATUS, CHARTER



Source: Common Core of Data (CCD), National Center for Education Statistics; Small Area Income and Poverty Estimates (SAIPE), Census Bureau; Author Calculations

Notes: $\Delta\text{Enrollment}_{t-1} = \frac{\text{Enrollment}_{t-1} - \text{Enrollment}_{t-2}}{\text{Enrollment}_{t-2}}$. Schools are defined as closed if they were open in the previous year and reported permanent school closure (status 2) in CCD data. This figure is limited to charter schools.

Table S9: LOGISTIC REGRESSION RESULTS, CHARTER SCHOOLS

	Dependent variable:				
	Closure				
	(1)	(2)	(3)	(4)	(5)
Δ Enrollment$_{t-1}$	-0.045^{**}	-0.078^{***}	-0.099^{***}		
	(0.019)	(0.014)	(0.025)		
Δ Enrollment$_{t-2}$		-0.006	-0.040		
		(0.014)	(0.028)		
Δ Enrollment$_{t-3}$			0.006		
			(0.020)		
Δ Enrollment$_{t-4}$			-0.013		
			(0.019)		
Δ Enrollment$_{t-5}$			0.030^{***}		
			(0.007)		
Δ Two-Year				-0.035^{***}	
				(0.012)	
Δ Five-Year					-0.007
					(0.012)
Observations	34,056	28,858	9,258	29,403	12,904

Source: Common Core of Data (CCD), National Center for Education Statistics; Author Calculations

Notes: *p<0.1; **p<0.05; ***p<0.01. Results reported for logistic regression using enrollment change variables to predict closure. School year fixed effects included. Excluded the top and bottom half-percent of each regressor to minimize the effect of extreme outliers.