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Enrollment Declines and Permanent Closures in Public Schools

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1 Introduction

The consequences of the COVID-19 pandemic are still palpable across children, parents, teachers, and schools. The pandemic-related restrictions on traditional classroom instruction and the alternative learning arrangements families explored during COVID-19 have led to widespread enrollment declines post-pandemic (Flanders, 2023). Family dissatisfaction and the decline in school enrollment among traditional public schools create financial and operational pressure for many schools (Burtis & Goulas, 2023; Goulas, 2024; Goulas & Pula, 2024).

An increasing number of districts across the nation are exploring options such as re-districting, district right-sizing, or permanent school closures to address the challenges associated with declining school enrollment (Peetz, 2024). This study explores the prevalence of permanent school closures before and after the COVID-19 pandemic and investigates their association with enrollment trajectories.

This analysis is valuable for three key reasons. First, it provides a pre-pandemic benchmark of permanent school closures. This reference point is a useful gauge as we navigate current trends in school system adjustment to current needs. Second, it offers insights into the variation in permanent school closures by school characteristics and across states. Third, investigating the association between permanent school closures and enrollment trajectories allows us to understand school vulnerability to declining enrollment before and after COVID-19.

2 Data

I use enrollment information on brick-and-mortar non-alternative traditional public and charter schools from the Common Core of Data of the National Center for Education Statistics between 2013-14 and 2023-24. I also identify school characteristics such as school sector (i.e., traditional, charter), locale (i.e., urban, suburban, town, rural), and grade level (i.e., elementary, middle, high, or multi-grade school). For each year, I flag the schools that were coded as closed by NCES and record the last year of operation for the closed schools.

3 Results

Panel A of Figure 1 shows the closure rate, defined as the share of schools open in the prior year that close in the current year, over time. The school closure rate shows a slight downward trend overall, with a spike between 2017-18 and 2019-20. In 2014-15, the closure rate was 1.3 percent, decreasing to 0.8 percent by 2023-24. Between 2022-23 and 2023-24, it rose slightly from 0.7 to 0.8 percent. For traditional public schools,

the closure rate declined from 1.1 percent in 2014-15 to 0.6 percent in 2022-23, before rising modestly to 0.7 percent in 2023-24.

Panel B of Figure 1 shows the average closure rate over the study period by school characteristics. Across all years, the average closure rate stands at 1 percent. Charter schools have a higher closure rate than traditional public schools (2.8 percent vs. 0.8 percent). Multi-level schools have an average closure rate higher than schools serving other grades (1.4 percent), followed by elementary and middle schools schools (0.8 and 0.9 percent, respectively). High schools have the lowest average closure rate (0.7 percent). Schools in town locales have the highest average closure rate relative to schools in other locales (1.2 percent), closely followed by schools in urban locales (1.1 percent). Schools in suburban and rural locales have the lowest average closure rate (0.8 percent).

Panel C of Figure 1 reveals substantial variation in the average permanent closure rate of public schools across states. States like Idaho, Montana, and Nevada have a relatively low average rate of permanent school closures (less than 0.5 percent per year). In contrast, states and territories such as Alabama, Arkansas, the District of Columbia, Iowa, Louisiana, Michigan, Minnesota, Mississippi, Nebraska, Ohio, Tennessee, West Virginia, and Wyoming have relatively high average permanent closure rates of public schools (more than 1.2 percent per year).

Table 1 uses Poisson regression analysis to investigate the association between enrollment trajectories and permanent school closures.[1] Panel A reports results across years, while Panel B focuses on permanent school closures in the most recent year, 2023-24. Columns (1) through (3) progressively augment the specification to include the change in enrollment up to five years prior to the current year. The results reveal that permanent school closures are more strongly positively associated with recent enrollment declines than with enrollment declines further in the past. Specifically, using data across years, a 10 percent enrollment decline in the prior year significantly increases the likelihood of permanent school closure by 0.3 percent.[2] For the most recent year of data, a 10 percent enrollment decline in 2021-22 significantly increases the likelihood of permanent school closure in 2023-24 by 0.2 percent. These estimates remain largely robust when the enrollment changes of more past years are considered. A 10 percent enrollment decline five years prior significantly increases the likelihood of permanent school closure in the current year by 0.1 percent.

Columns (4) and (5) of Table 1 show the association between two-year and five-year cumulative enrollment changes and permanent school closures. A 10 percent decline over two years and five years is significantly

[1] As a robustness exercise, Table S2 reports results from logistic regressions. The estimated marginal effects are largely unchanged.

[2] Table S3 shows that when we focus on traditional public schools, the estimated effect of the prior-year enrollment change on permanent school closure decreases by roughly 10 percent in magnitude and remains statistically significant.

associated with a 0.3 percent and 0.2 percent increase in the likelihood of a subsequent permanent school closure, respectively. These findings indicate that more recent enrollment declines are stronger predictors of eventual permanent school closures than historically older enrollment declines. Additionally, permanent school closures in 2023-24 are more weakly associated with enrollment declines than closures in prior years.

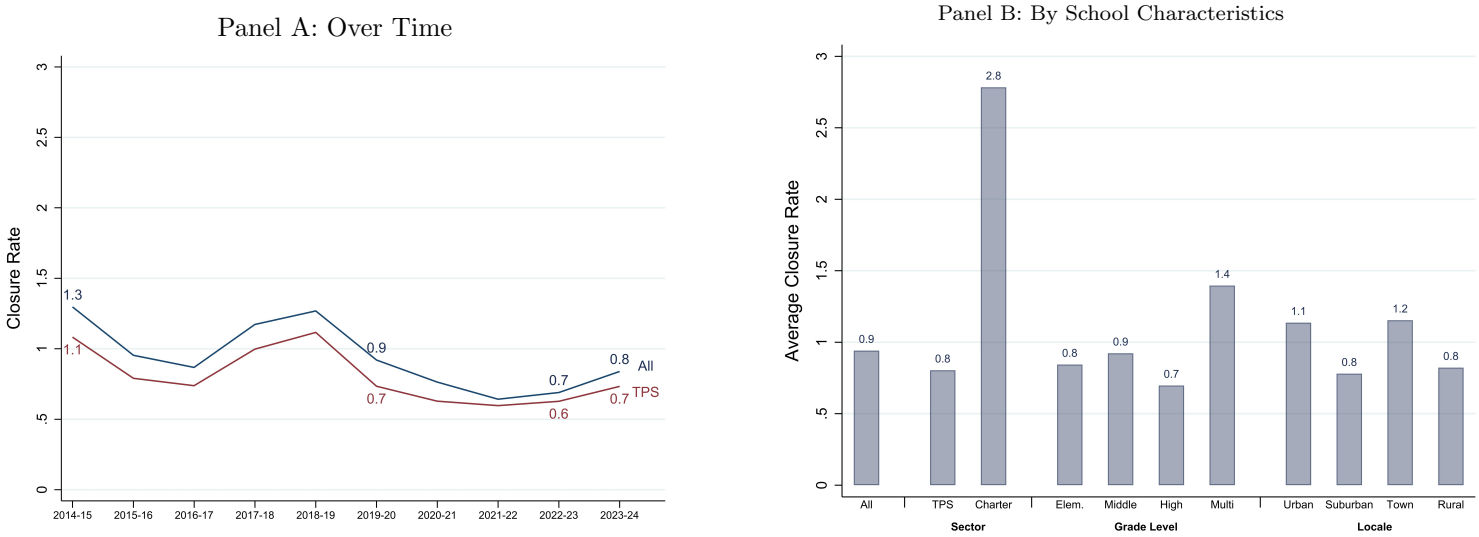
4 Conclusion

Enrollment declines may threaten some schools' financial and operational sustainability because federal and state financial aid to public schools is typically proportional to student enrollment, while costs remain relatively fixed. Schools with declining enrollment may have to lay off teachers or shut down entirely, which can disrupt students' learning journeys and cause distress to families (Tieken & Auldridge-Reveles, 2019).

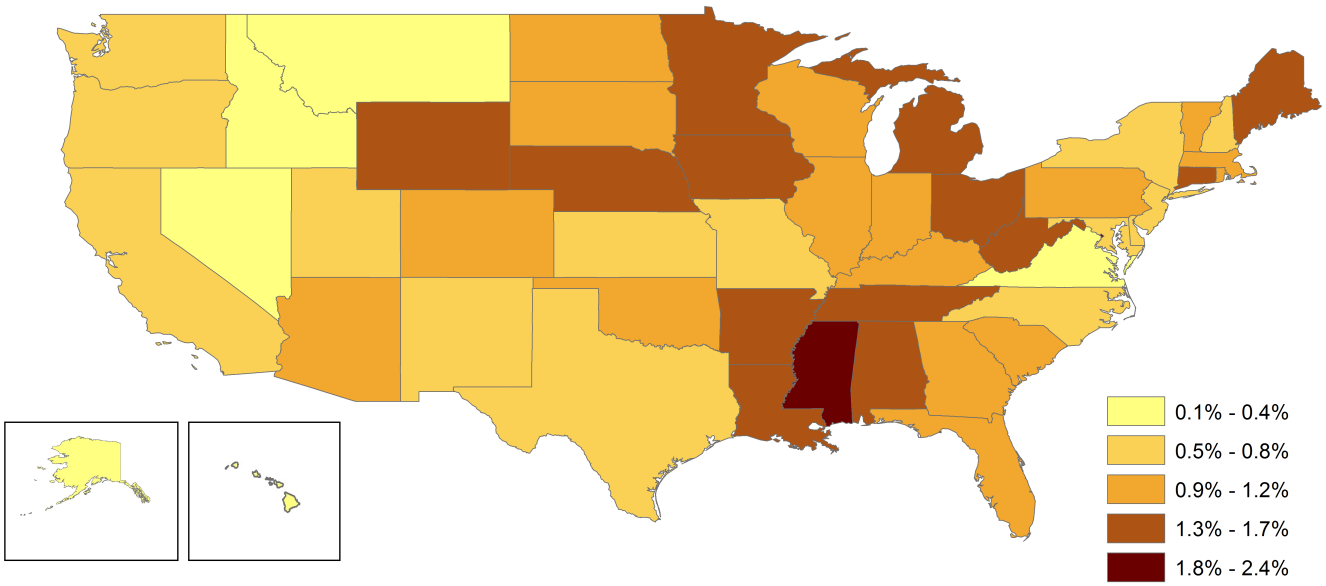
This study documents the historical prevalence of permanent school closures and their association with preceding enrollment trajectories. The results reveal that school closure rates have generally decreased over time, with the most recent rates in 2023-24 being among the lowest on record. Charter schools and schools in urban areas exhibit higher closure rates compared to traditional public schools and suburban schools. The analysis also shows that recent enrollment declines are stronger predictors of permanent school closures, with more recent declines having a greater impact on the likelihood of closure compared to older declines.

Since the factors driving enrollment declines and permanent school closures may differ across communities, these challenges cannot be addressed by one-size-fits-all policies.

Figure 1: Permanent School Closures Over Time, by School Characteristics, and Across the Nation



Panel C: Across the Nation



Source: Common Core of Data, National Center for Education Statistics; author's calculations.

Notes: Alternative and exclusively virtual schools have been excluded. TPS stands for traditional public schools.

Table 1: Effect of Enrollment Declines on Permanent School Closures

	(1)	(2)	(3)	(4)	(5)
Panel A: Permanent School Closure (1=Yes), All Years					
$\Delta(Enrollment)_{t-1}$	-0.035***	-0.034***	-0.027***		
	(0.002)	(0.002)	(0.002)		
$\Delta(Enrollment)_{t-2}$		-0.022***	-0.020***		
		(0.002)	(0.002)		
$\Delta(Enrollment)_{t-3}$			-0.018***		
			(0.002)		
$\Delta(Enrollment)_{t-4}$			-0.012***		
			(0.002)		
$\Delta(Enrollment)_{t-5}$			-0.011***		
			(0.002)		
Two-year Cumul. $\Delta(Enrollment)_{t-1}$				-0.027***	
				(0.001)	
Five-year Cumul. $\Delta(Enrollment)_{t-1}$					-0.020***
					(0.001)
Obs.	733,346	691,451	397,542	704,048	426,193
Panel B: Permanent School Closure (1=Yes), 2022-23					
$\Delta(Enrollment)_{t-1}$	-0.021***	-0.024***	-0.022***		
	(0.005)	(0.004)	(0.004)		
$\Delta(Enrollment)_{t-2}$		-0.018***	-0.020***		
		(0.004)	(0.004)		
$\Delta(Enrollment)_{t-3}$			-0.014***		
			(0.005)		
$\Delta(Enrollment)_{t-4}$			-0.002		
			(0.004)		
$\Delta(Enrollment)_{t-5}$			-0.006		
			(0.005)		
Two-year Cumul. $\Delta(Enrollment)_{t-1}$				-0.017***	
				(0.004)	
Five-year Cumul. $\Delta(Enrollment)_{t-1}$					-0.014***
					(0.002)
Obs.	82,644	78,258	67,664	80,166	72,210

Notes: This table reports marginal effects from Poisson regressions. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

References

Burtis, E., & Goulas, S. (2023). *Declining school enrollment since the pandemic*. The Hamilton Project, Brookings Institution.

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Supplementary Appendix

Enrollment Declines and Permanent Closures in Public Schools

Methods

Analytical Sample

The analytical sample was designed using the following inclusion criteria:

- **Brick-and-mortar schools.** I focus on brick-and-mortar schools. Schools were identified using the NCES School ID. Fully, primarily, or exclusively virtual schools were excluded. For schools whose virtual status changed over time, a manual search of the web was conducted to infer whether the school's virtual status changed or whether the newer virtual status value reflects updated information. The Common Core of Data classified schools that were normally brick-and-mortar schools but operated remotely during the COVID-19 pandemic as supplemental virtual.

- **Year span.** I start with all schools that were labeled as operational in the Common Core of Data and had non-zero enrollment in the years between 2013-14 and 2023-24. I explore permanent school closures in the years between 2014-15 and 2023-24.

- **Same grade span over time.** It is difficult to disentangle typical variation in enrollment over time from enrollment changes related to adding or dropping grades taught for schools that added or dropped a grade. When calculating changes in enrollment between school years, I focus on schools with the same grade span served in the start and end year.

- **Traditional public schools or charter schools.** I focus on traditional public schools and charter schools. Alternative schools/programs, adult centers, and exclusively virtual have been excluded.

Variable Construction

The following variables to capture school information were constructed for the analysis.

- *Enrollment.* School enrollment refers to the total number of students enrolled in a given school year.

- *Permanent School Closure.* I flag school that NCES reports as permanently closed (Status=2) in a given year. Open schools are schools that NCES reports as open and operational in a given year (i.e, Status not equal to 2, 6, or 7). The permanent school closure rate in a given year is calculated as the number of schools closed in a given year while they were open and operational in the prior year over the number of all open and operational schools in the prior year.

- *School grade level.* Schools serving any grade span between PK and 6 were identified as elementary. Schools serving any grade span between 7 and 8 were identified as middle schools. Schools serving any grade span between 9 and 12 were identified as high schools. Schools serving any grade span that covers elementary and high school grades or middle and high school grades were identified as multi-grade schools.

- *School locale.* The urbanicity information from the Common Core of Data was used to infer school locale. Urbanicity codes 11, 12, and 13 were labeled as "urban." Codes 21, 22, and 23 were labeled as "suburban." Codes 31, 32, and 33 were labeled as "town." Urbanicity codes 41, 42, and 43 were labeled as "rural."

- *School sector.* I use the charter school indicator infer whether a school is charter school or traditional public school.

Regression Analysis

I estimate two types of specifications. The first type investigates the effect of prior-year change in enrollment (time $t-1$) on the likelihood of a permanent school closure in the current year (time t). The change in year-over-year enrollment at year $t-1$ (the prior year) is defined as:

$$\Delta(Enrollment)_{t-1} = \frac{Enrollment_{t-1} - Enrollment_{t-2}}{Enrollment_{t-2}} \tag{1}$$

I progressively augment the specification to include the change in year-over-year school enrollment at time $t-2$, $t-3$, $t-4$, $t-5$. The full specification for school i in year t is as follows:

$$Y_{it} = \beta_0 + \sum_{j=1}^{5} \beta_j \Delta(Enrollment)_{t-j} + \epsilon_{it} \tag{2}$$

The second type of specification investigates the effect of two-year and five-year change in enrollment at time $t-1$ on the likelihood of a permanent school closure at time t. The two-year and five-year change in enrollment at time $t-1$ are defined as follows:

$$Two\text{–}year\ \Delta(Enrollment)_{t-1} = \frac{Enrollment_{t-1} - Enrollment_{t-3}}{Enrollment_{t-3}} \tag{3}$$

$$Five\text{–}year\ \Delta(Enrollment)_{t-1} = \frac{Enrollment_{t-1} - Enrollment_{t-5}}{Enrollment_{t-5}} \tag{4}$$

The specification for the two-year change is the following:

$$Y_{it} = \beta_0 + \beta_1 Two\text{–}year\ \Delta(Enrollment)_{t-1} + \epsilon_{it} \tag{5}$$

The specification for the five-year change replaces the two-year change with the five-year change. I report a set of results with all the years (2014-15 through 2023-24) pooled together (Panel A on Table 1) and another set of results only for 2023-24 (Panel B on Table 1). Heteroskedasticity-robust standard errors are reported throughout. I exclude each regressor's top and bottom one percent to minimize the influence of potential outliers on the estimated effects. Statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Table S1 reports summary statistics for every enrollment change variable used as independent variable in the regression analysis.

Additional Tables

Table S1: Summary Statistics of Enrollment Change Variables

	Mean	Std. Dev.	N
Panel A: All Years			
$\Delta(Enrollment)_{t-1}$	-0.641	7.061	733,346
$\Delta(Enrollment)_{t-2}$	-0.597	6.922	724,319
$\Delta(Enrollment)_{t-3}$	-0.142	6.676	636,296
$\Delta(Enrollment)_{t-4}$	-0.111	6.645	549,367
$\Delta(Enrollment)_{t-5}$	-0.054	6.605	465,196
Two-year Cumul. $\Delta(Enrollment)_{t-1}$	-1.327	9.784	704,048
Five-year Cumul. $\Delta(Enrollment)_{t-1}$	-2.561	15.157	426,193
Panel B: 2023-24			
$\Delta(Enrollment)_{t-1}$	-0.177	7.822	82,644
$\Delta(Enrollment)_{t-2}$	-4.095	7.484	81,425
$\Delta(Enrollment)_{t-3}$	-0.284	6.615	81,338
$\Delta(Enrollment)_{t-4}$	-0.417	6.649	79,508
$\Delta(Enrollment)_{t-5}$	-0.267	6.524	78,737
Two-year Cumul. $\Delta(Enrollment)_{t-1}$	-4.461	9.873	80,166
Five-year Cumul. $\Delta(Enrollment)_{t-1}$	-5.529	15.209	72,210

Notes: Enrollment change variables have been multiplied by 100.

Table S2: Effect of Enrollment Declines on Permanent School Closures, Logistic Regression, All Schools

	(1)	(2)	(3)	(4)	(5)
	Panel A: Permanent School Closure (1=Yes), All Years				
$\Delta(Enrollment)_{t-1}$	-0.035***	-0.034***	-0.027***		
	(0.002)	(0.002)	(0.002)		
$\Delta(Enrollment)_{t-2}$		-0.022***	-0.020***		
		(0.002)	(0.002)		
$\Delta(Enrollment)_{t-3}$			-0.018***		
			(0.002)		
$\Delta(Enrollment)_{t-4}$			-0.012***		
			(0.002)		
$\Delta(Enrollment)_{t-5}$			-0.011***		
			(0.002)		
Two-year Cumul. $\Delta(Enrollment)_{t-1}$				-0.027***	
				(0.001)	
Five-year Cumul. $\Delta(Enrollment)_{t-1}$					-0.020***
					(0.001)
Obs.	733,346	691,451	397,542	704,048	426,193
	Panel B: Permanent School Closure (1=Yes), 2022-23				
$\Delta(Enrollment)_{t-1}$	-0.021***	-0.024***	-0.022***		
	(0.003)	(0.003)	(0.003)		
$\Delta(Enrollment)_{t-2}$		-0.018***	-0.020***		
		(0.003)	(0.004)		
$\Delta(Enrollment)_{t-3}$			-0.014***		
			(0.004)		
$\Delta(Enrollment)_{t-4}$			-0.002		
			(0.004)		
$\Delta(Enrollment)_{t-5}$			-0.006		
			(0.004)		
Two-year Cumul. $\Delta(Enrollment)_{t-1}$				-0.017***	
				(0.003)	
Five-year Cumul. $\Delta(Enrollment)_{t-1}$					-0.014***
					(0.002)
Obs.	82,644	78,258	67,664	80,166	72,210

Notes: This table reports marginal effects from logistic regressions. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table S3: Effect of Enrollment Declines on Permanent School Closures, Poisson Regression, Traditional Public Schools

	(1)	(2)	(3)	(4)	(5)
Panel A: Permanent School Closure (1=Yes), All Years					
$\Delta(Enrollment)_{t-1}$	-0.031***	-0.030***	-0.023***		
	(0.002)	(0.002)	(0.002)		
$\Delta(Enrollment)_{t-2}$		-0.023***	-0.018***		
		(0.002)	(0.002)		
$\Delta(Enrollment)_{t-3}$			-0.018***		
			(0.002)		
$\Delta(Enrollment)_{t-4}$			-0.014***		
			(0.002)		
$\Delta(Enrollment)_{t-5}$			-0.013***		
			(0.002)		
Two-year Cumul. $\Delta(Enrollment)_{t-1}$				-0.026***	
				(0.001)	
Five-year Cumul. $\Delta(Enrollment)_{t-1}$					-0.019***
					(0.001)
Obs.	693,242	658,253	383,629	669,945	410,554
Panel B: Permanent School Closure (1=Yes), 2023-24					
$\Delta(Enrollment)_{t-1}$	-0.016***	-0.020***	-0.020***		
	(0.005)	(0.004)	(0.004)		
$\Delta(Enrollment)_{t-2}$		-0.018***	-0.019***		
		(0.004)	(0.004)		
$\Delta(Enrollment)_{t-3}$			-0.012***		
			(0.005)		
$\Delta(Enrollment)_{t-4}$			-0.003		
			(0.004)		
$\Delta(Enrollment)_{t-5}$			-0.009*		
			(0.005)		
Two-year Cumul. $\Delta(Enrollment)_{t-1}$				-0.018***	
				(0.003)	
Five-year Cumul. $\Delta(Enrollment)_{t-1}$					-0.013***
					(0.002)
Obs.	77,161	73,400	64,914	75,175	69,189

Notes: This table reports marginal effects from Poisson regressions. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.