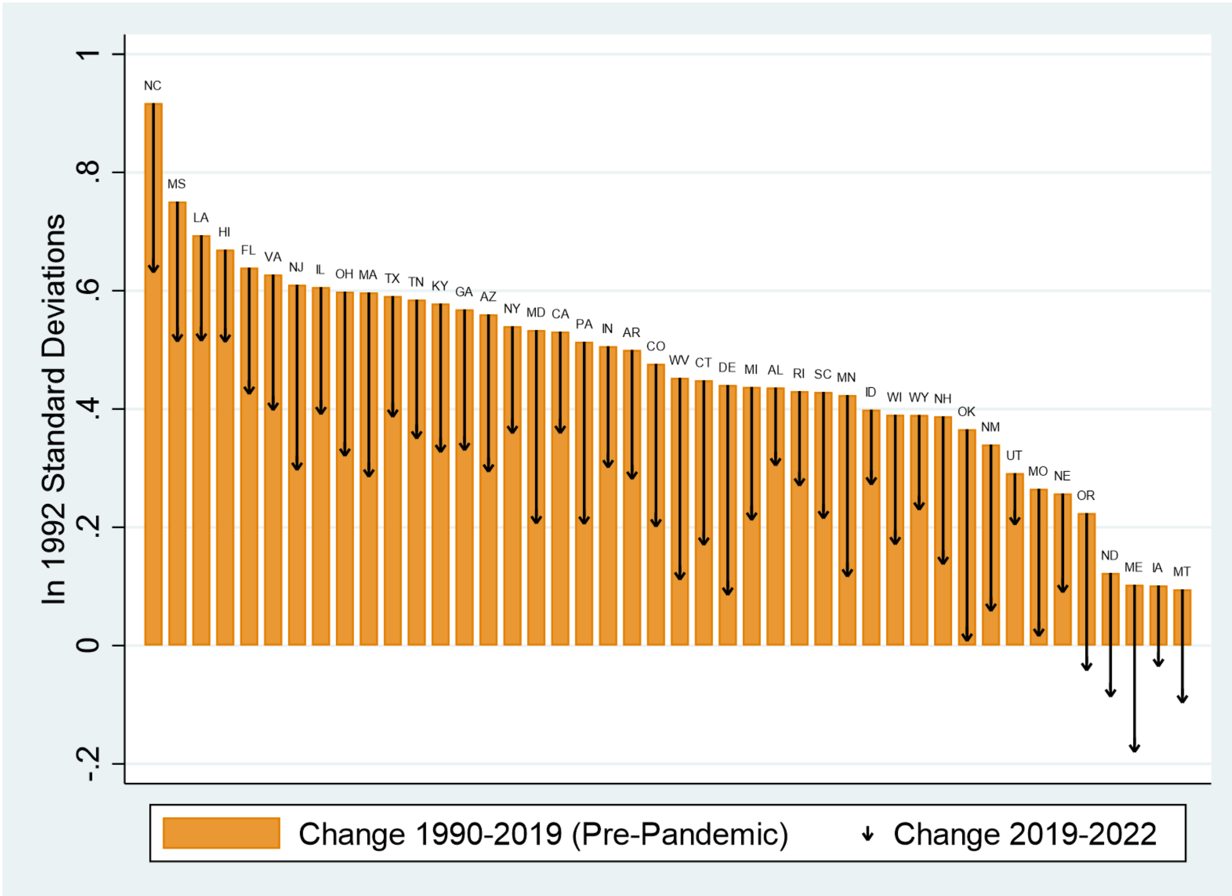
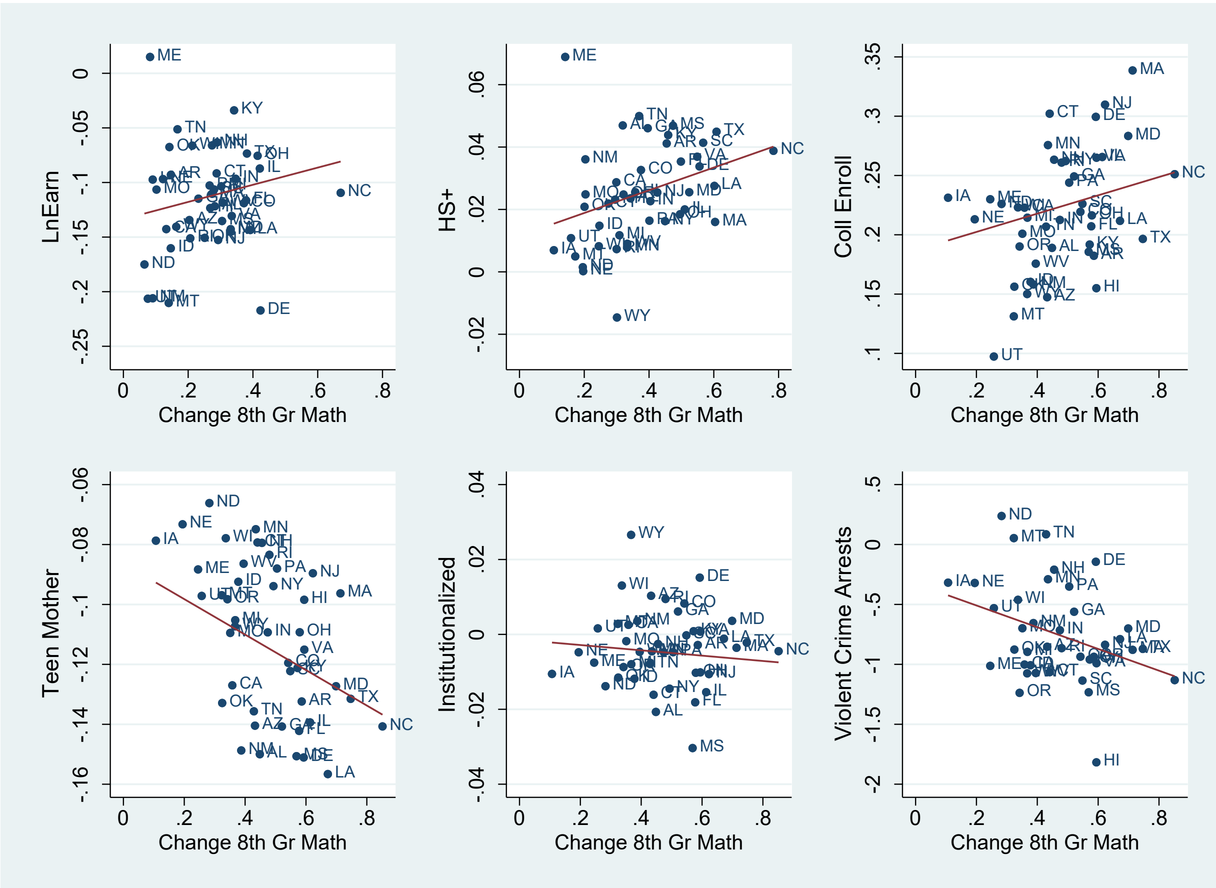
Figure 1. Changes in 8th grade Math Achievement Before and After Pandemic by State



Note: Based on mean 8th grade math achievement in National Assessment. For the seven states that had a valid score for 1992, but not 1990 (Massachusetts, Maine, Missouri, Mississippi, South Carolina, Tennessee, and Utah), we report the change since 1992. Six states had neither a 1990 nor a 1992 NAEP score (Alaska, Kansas, Nevada, South Dakota, Vermont, and Washington) and are excluded from the graph. Mean achievement had increased in all states over the 29 years preceding the pandemic. Every state lost ground between 2019 and 2022, with 5 states scoring below their 1990 (or 1992) means. On average, the U.S. forfeited 41 percent of the pre-pandemic improvement (1990 to 2019) between 2019 and 2022.

Figure 2.Within-State Changes in Birth Cohort Outcomes and Corresponding Changes in 8th Grade Math Achievement



Note: We use the longest span in birth year possible for each of the outcomes. For instance, we measure log earnings for those aged 28 and above. Thus, the earliest birth cohort, the 8th graders in 1990, was born in 1977 and was age 42 in 2019. The latest birth cohort for whom we could measure earnings was born in 1990 and were in 8th grade in 2003. The cohorts used for high school completion (which we measure at ages 23 to 42) were born between 1977 and 1994; college enrollment (which we measure between ages 19 and 24) was measured for the 1977 to 1998 birth cohorts; teen motherhood (which we measure between ages of 18 to 30) includes the 1977 to 1998 birth cohorts; institutionalization (which we measure between ages 18 and 24) includes the 1977 to 1998 birth cohorts; violent crime arrests (which we measure for those aged 15 to 24) includes the 1977 to 1998 birth cohorts.

Table 1. The relationship between log income and math achievement by state birth cohort

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Math Achievement	0.111***						
	(0.022)						
Adjusted Math Achievement		0.096***	0.074**	0.062*	0.083**	0.077*	0.087
		(0.025)	(0.024)	(0.024)	(0.030)	(0.033)	(0.058)
Either Parent College Graduate			0.175***	0.180***	0.105	0.112*	0.038
			(0.037)	(0.037)	(0.057)	(0.056)	(0.061)
Fixed Effects:							
Gender	X	X	X	X	X	X	X
Race/Ethnicity	X	X	X	X	X	X	X
Age	X	X	X	X	X	X	X
Year	X	X	X	X	X	X	X
Year of Birth	X	X	X	X	X	X	X
State of Birth	X	X	X	X	X	X	X
State of Residence				X	X	X	X
Division of Birth X YOB					X	X	X
State of Resid. X Year						X	
Trends by YOB and State of Birth							X
N	906,767	906,608	906,608	906,608	906,608	906,608	906,608

Note: Dependent variable is natural log of income for those aged 28 and above. The sample is drawn from the 2000 Decennial Census (1 percent sample) and the 2001-2019 American Community Survey from IPUMS. We measure math achievement for each birth cohort in a state using the mean achievement of 8th graders on the National Assessment of Educational Progress 13 years later. "Adjusted math achievement" has been adjusted for race/ethnicity and parental education. (See equation (1).) Column (5) reflects our preferred specification. Standard errors are calculated after clustering by year and state of birth.

Table 2. The relationship between other later life outcomes and math achievement by state birth cohort

	Adjusted Math Score	% Either Parent College Graduate	Age when Observed	Birth Cohorts Used	Sample Size
Ln(Earned Income)	0.083**	0.101	28-42	1977-1992	906,608
	(0.030)	(0.058)			
Occupational Prestige Score	0.126	-0.786	28-42	1977-1992	1,177,134
	(0.401)	(0.742)			
Educational Attainment:					
HS+	0.014*	0.011	23-42	1977-1996	2,270,247
	(0.006)	(0.013)			
Some College +	0.018	0.064**	23-42	1977-1996	2,270,247
	(0.010)	(0.025)			
BA +	0.011	0.112***	23-42	1977-1996	2,270,247
	(0.010)	(0.024)			
Graduate Degree	0.006	0.031**	23-42	1977-1996	2,270,247
	(0.005)	(0.011)			
Unemployed	-0.020*	0.007	28-42	1977-1992	1,031,871
	(0.008)	(0.016)			
Receiving Food Stamps/SNAP	0.027*	-0.009	28-42	1977-1992	1,241,219
	(0.014)	(0.027)			
Usual Hours Worked	0.737*	-0.831	28-42	1977-1992	1,002,229
	(0.316)	(0.698)			
Ever Married	-0.022	0.014	28-42	1977-1992	1,237,417
	(0.016)	(0.031)			
Own Home	-0.011	0.000	28-42	1977-1992	1,193,585
	(0.017)	(0.033)			
Teenage Mother	-0.018*	0.035*	18-30	1977-2002	1,583,294
	(0.009)	(0.014)			
Institutionalized/Incarcerated	-0.017***	0.010	18-24	1977-2002	1,076,101
	(0.004)	(0.006)			
Enrolled in College	0.051***	0.045	19-24	1977-2000	1,770,373
	(0.012)	(0.024)			
Working FT/Enrolled in College	0.027**	0.015	19-24	1977-2000	1,677,135
	(0.009)	(0.018)			

Note: All of the above specifications also included fixed effects for age, state of birth, state of residence, census division of birth by year of birth and year. The sample is drawn from the 2000 Decennial Census (1 percent sample) and the 2001-2019 American Community Survey, downloaded from IPUMS. Standard errors are calculated after clustering by state and year of birth.

Table 3. Age Specific Arrests and 8th Grade Math Achievement

	Violent Crime	Property Crime
Adjusted Math Achievement	-0.357***	-0.201*
	(0.088)	(0.087)
Either Parent College Graduate	0.098	-0.116
	(0.178)	(0.163)
State	X	X
Age X Year	X	X
Geographic Division X Year of Birth	X	X
N	4,130	4,130

Note: The dependent variable is the log of arrests by state, age and year. The data on arrests were provided by Donohue and Levitt (2021). "Adjusted Math Achievement" consists of state by year fixed effects, after using student-level data from the Main NAEP to adjust for parental education and student race-ethnicity. (See model (1).) Standard errors are calculated clustering by state and year of birth.