IES Institute of Education Sciences

APPENDIXES
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Regional Educational Laboratory Southwest
At American Institutes for Research

Effects of a District-Managed Restart Strategy for Low-Performing Schools in Texas

See https://go.usa.gov/xSTKH for the full report.

Appendix A. Data and methods

This appendix describes the data sources and analysis methods for the study.

Data elements

The study team used administrative data on program implementation shared by the Texas Education Agency and school staffing data shared by the Texas Education Research Center. The study team also accessed publicly available data from the Texas Education Agency (including data on student characteristics, achievement, and attendance aggregated to the school level, and school accountability ratings) and from the Common Core of Data (Department of Education, n.d.). Finally, the study team used data from interviews with district and school leaders conducted by the study team. Data elements and their sources are in table A1.

Program records about schools implementing the restart strategy

The study team identified restart schools using program records provided by the Texas Education Agency. These records included school name, a unique identification number, and the first year of implementation of the restart model. The study team restricted the file to the 29 schools in the first three implementation cohorts (7 in 2015/16, 11 in 2017/18, and 11 in 2018/19) and linked the file to the analytic files used to address all of the study's research questions that relied on extant data.

Data and methods for research questions 1 and 2

Study population of principals and teachers at schools in the year before restart implementation. The study team used longitudinal employment records from the Texas Education Agency's Public Education Information Management System collections to identify the population of principals and teachers for the study. The files contain information on staff role, school assignment, number of classes and students taught, percentage of their full-time-equivalent associated with a given role and school, demographic characteristics, professional experience, and salary information. Staff records are collected by the Texas Education Agency from districts in the fall of each school year; thus, a teacher who arrived after the fall collection period would not be included in the study sample of teachers at schools in the last year before restart implementation.

Table A1. Data elements and sources by research question

Agency	Data source	Years	Key variables	Research question
Texas Education Agency	Program records	2015/16, 2017/18, 2018/19	Schools (names and identification numbers) implementing the district-managed restart strategy; years of the restart	1-5
Texas Education Research Center	School staffing records from the Public Education Information Management System	2005/06-2019/20	Staff role; school of assignment; educator characteristics (salary, years of professional experience, highest degree earned, gender, race/ethnicity)	1-3
Texas Education Agency	Academic Excellence Indicator System; Texas Academic Performance Reports[a]	2005/06-2019/20	School average student attendance rates; school average student mobility rates; percentage of students eligible for the National School Lunch Program; percentage of students in racial/ethnic groups	3, 4
U.S. Department of Education, National Center for Education Statistics	Common Core of Data	2005/06-2019/20	District locale (urban, suburban, town, or rural)	3, 4
Texas Education Agency	Texas Education Agency aggregate testing files	2005/06-2018/19	School average scores on the Texas Assessment of Knowledge and Skills (2005/06-2010/11) and the State of Texas Assessments of Academic Readiness (2011/12-2018/19) standardized assessments in reading and math, by grade level	4
Texas Education Agency	Texas Accountability Rating System	2005/06-2018/19[b]	School accountability rating[c]	5
Regional Educational Laboratory Southwest	Interviews with district and school leaders	2021	Processes and decisions to select schools for restart implementation; timing and sequence of key activities in the first two years of the restart	6

a. The study period spanned two state performance reporting systems: the Academic Excellence Indicator System (2005/06-2011/12) and Texas Academic Performance Reports (2012/13-2019/20).
b. In 2019/20, because of Covid-19, all schools received the rating Not Rated: Declared State of Disaster (Texas Education Agency, 2020).
c. Texas transitioned to a school accountability system that assigned letter grades beginning with the 2018/19 school year. Schools that received a letter grade of D or F in 2018/19 ratings and that missed accountability targets for three consecutive years were subject to intervention and monitoring and for this study were considered to have not met standards. Before 2018/19, schools rated as Improvement Required were considered to have not met standards.
Source: Authors' compilation.

Data and methods for research questions 1 and 2

Study population of principals and teachers at schools in the year before restart implementation. The study team used longitudinal employment records from the Texas Education Agency's Public Education Information Management System collections to identify the population of principals and teachers for the study. The files contain information on staff role, school assignment, number of classes and students taught, percentage of their full-time-equivalent associated with a given role and school, demographic characteristics, professional experience, and salary information. Staff records are collected by the Texas Education Agency from districts in the fall of each school year; thus, a teacher who arrived after the fall collection period would not be included in the study sample of teachers at schools in the last year before restart implementation.

The staff records contained duplicate entries for schools and role assignments within a school year for some employees. For instance, a teacher might have multiple roles within and across schools in the same year. The study team assigned principals and teachers to a unique role and school within a year by selecting the school and

role to which they devoted the largest percentage of their full-time equivalent, which ranged from 0 percent to 100 percent. Thus, teachers with two school assignments within a year, where 25 percent of their full-time-equivalent was associated with School A, and 75 percent with School B, were assigned to School B. This resulted in a sample of 1,195 unique teachers and principals at schools in the last year before restart implementation across all three cohorts.

Study population of principals and teachers who arrived at restart schools in the first postimplementation year. To identify arrivers, the study team used the same data files and decision rules for deduplicating staff records. Arrivers were identified by comparing their school and role during the first year after implementation of the restart strategy with their school and role in the last year before implementation. Arrivers were principals or teachers who were not employed at the same school at the fall collection period in the last baseline year before restart implementation but who were employed at the restart school at the subsequent fall collection in the first year of implementation. The sample of arrivers in the first restart year included 890 unique principals and teachers.

Construction of the teacher mobility indicator. For research question 1, the study team calculated the percentage of teachers employed at schools in the year before restart implementation who stayed at the school or who left the school the following fall, before the restart strategy was implemented. The study team used staffing records collected by the Texas Education Agency and provided to the study team by the Texas Education Research Center to classify teachers into four mutually exclusive categories:

- Teachers who remained teaching at the same school during the first restart school year.
- Teachers who left the school before the start of the restart school year to teach at another school in the same district.
- Teachers who left the school before the start of the restart school year to teach at another school in a different district.
- Teachers who were no longer employed in a public school in Texas.[1]

For research question 2, the study team collapsed the three categories of principals and teachers who left restart schools into a single category (leavers). The study team also identified principals and teachers who arrived at the school at the start of the restart school year (arrivers). Using school staffing records, the study team calculated the average salary and total years of professional experience for stayers, leavers, and arrivers.[2] Standardized mean differences between stayers and leavers and arrivers and leavers of greater than .25 standard deviation were considered meaningful. The study team also calculated the percentage of stayers, leavers, and arrivers who had more than three years of professional experience; who had an advanced degree; who were female; and who were Black, Hispanic, or White. Differences between stayers and leavers and arrivers and leavers of 5 percentage points or greater were considered meaningful.

Characteristics of teachers at restart schools. For stayers and leavers, average characteristics were calculated using data from the year before implementation of the restart strategy. For arrivers, average characteristics were calculated using data from the first year of implementation because some arriving principals and teachers could not be found in the staffing data during the last year before restart implementation.

[1] These teachers were not found in school staffing records. They might have left K–12 education, continued as an educator in another state, or continued as an educator in a private school in Texas.

[2] Total years of professional experience was defined as total years as a licensed teacher or principal in an elementary, secondary, or postsecondary setting.

The study team conducted the analyses with a combined sample of principals and teachers to protect the anonymity of the small number of principals in the sample.

Data and methods for research questions 3 and 4

Study population of restart schools and comparison schools. The study team compiled program records and publicly available data from the Texas Education Agency and the Common Core of Data (U.S. Department of Education, n.d.) to create a panel of all regular instruction elementary schools and middle schools[3] in Texas between 2005/06 and 2019/20. Before matching was conducted to discard dissimilar non-restart schools, the data file contained 5,860 schools. For research question 3, the study team used staff role and school of employment records from the Texas Education Research Center to calculate teacher and principal mobility for the 2005/06–2019/20 school years.

For research question 4, the study team obtained student annual testing data from files that are published by the Texas Education Agency and available for download through its website. The data were reported at the school-grade level, by year, and spanned two testing regimes: the Texas Assessment of Knowledge and Skills, which was administered before the 2011/12 school year, and the State of Texas Assessment of Academic Readiness, which was administered beginning with the 2011/12 school year, though assessments were not administered in the 2019/20 school year because of the Covid-19 pandemic. The team downloaded school-level attendance and demographic data from the annual Academic Excellence Indicator System (available until 2011/12) and the Texas Academic Performance Report (available beginning in the 2012/13 school year), which are available on the Texas Education Agency website.

Methods for estimating the effect of the restart strategy. The study team used a multilevel comparative interrupted time series model with a matched comparison group. Comparative interrupted time series is a quasi-experimental design that can be used for causal inference when a comparison or control series can be constructed (Shadish et al., 2001). This method compares the outcomes for an intervention group with the outcomes for a comparison group relative to the preintervention period to determine the effect of the intervention, after controlling for prior trends. This method is appropriate for contexts in which an abrupt policy change occurs and in which preintervention and postintervention data are available. The intervention group comprised 29 urban and suburban elementary and middle schools in four Texas districts that implemented the restart strategy in 2015/16, 2017/18, and 2018/19 (table A2) and 87 matched comparison elementary and middle schools in 29 Texas districts that did not implement the restart strategy.[4]

[3] Because all restart schools were elementary or middle schools, high schools were not eligible for inclusion in the matching procedure to ensure comparability in grade levels between study conditions.

[4] The study team did not match schools within districts because of concerns about potential equilibrium effects on other schools within the same district, introducing the risk of violating the stable unit value treatment value assumption (Rubin, 1980). For example, if high-performing teachers or administrators from non-restart schools within a participating district transferred to a restart school and these teachers were replaced at the non-restart school by lower quality staff, differences between restart schools and comparison schools within participating districts could be exaggerated by the decline in performance in non-restart schools caused by the departure of high-quality teachers. In addition, some components of the restart strategy might have been present in other schools in the same district that were not implementing the restart strategy, such as the introduction, or expansion, of the social-emotional learning curriculum and the development of strong partnerships with community and parent organizations.

Table A2. Number of Texas schools that implemented the district-managed restart strategy, by school level and cohort, 2015/16–2018/19 cohorts

Cohort	Elementary schools	Middle schools	Total schools
2015/16 cohort	4	3	7
2017/18 cohort	9	2	11
2018/19 cohort	10	1	11
Total	23	6	29

Source: Authors' analysis of program records from the Texas Education Agency.

To construct the comparison group, the study team used propensity score matching to match schools participating in the restart strategy to schools in districts that were not participating in the restart strategy based on their characteristics before implementing the strategy (Rubin, 1997). The propensity score provides a single, unidimensional measure that summarizes the conditional log odds of a school implementing the restart strategy. The study team performed the matching process separately by cohort year (2015/16, 2017/18, 2018/19) and school level (elementary and middle).

The study team used a 3:1 optimal matching algorithm without replacement to select three comparison schools for each intervention school. The study team selected an optimal solution using the logit of the propensity score[5] estimated from a logistic regression model that regressed a binary indicator of restart participation (coded 1 for restart schools and 0 for eligible non-restart schools) on a vector of covariates in the last preintervention year (the year before implementation).[6] The covariates measured at the school level included average principal mobility, average teacher mobility, average standardized test scores in reading and math, average student attendance, average student mobility, percentage of students who were Black or Hispanic, percentage of students eligible for the National School Lunch Program, number of students, and whether the school had missed accountability standards in multiple school years prior to the restart strategy. In addition, district locale (urban, suburban, town, or rural) was included as a covariate.

The study team calculated principal and teacher mobility as the percentage of principals and teachers at each school in the preintervention year who remained at the same school at the start of the restart school year.[7]

To ease comparisons across time and grade levels, the study team standardized achievement test scores by subject, school year, and grade level using statewide means and standard deviations to have a mean of 0 and a standard deviation of 1.[8] This adjusted the school-grade level comparisons to be relative to all students who took the tests each school year.

[5] See Rosenbaum and Rubin (1985) for a discussion of the superior statistical properties and performance of the logit compared with the propensity score for bias reduction.

[6] The study team included covariates measured in the last preintervention year only in the model used to estimate the propensity score. This was done to ensure that schools were equivalent according to the most temporally proximate baseline outcome measure. One potential concern with this choice is that schools were chosen to implement the restart strategy based on their performance in prior school years (say, two years before implementing restart), not the year before implementation. However, the study team also conditioned the propensity score on the percentage of years before implementation (the denominator is truncated at 10) that a school met accountability targets since, according to evidence from the qualitative interviews, schools' accountability ratings before implementation, and discussions with Texas Education Agency program staff, schools that chronically missed accountability standards were targeted for the restart strategy.

[7] Educator school assignment was determined at the fall accountability snapshot of each school year, which was customarily the last Friday in October.

[8] Reading and math assessments were administered to students in grades 3–8 in each school year. Analyses included scores only from the first test administration in a given year. Test scores were standardized by school year, subject area, and grade level to ease pooling of tests

The study team examined 10 years of preintervention data and two years of postintervention data in this analysis (table A3). The characteristics of restart schools and comparison schools in the last preintervention year by cohort are in table A4.

Table A3. Preintervention and postintervention data available for Texas restart schools and comparison schools, 2015/16–2018/19 cohorts

Cohort	First year of preintervention data (T-10)	Last year of preintervention data (T-1)	First intervention year (T)	Second intervention year (T+1)	Number of years of preintervention data available	Number of years of postintervention data available
2015/16	2005/06	2014/15	2015/16	2016/17	10	2
2017/18	2007/08	2016/17	2017/18	2018/19	10	2
2018/19	2008/09	2017/18	2018/19	2019/20	10	2[a]

T is time.

a. Postintervention data for reading achievement, math achievement, and student attendance were available for only one year for the 2018/19 cohort.

Source: Authors' analysis of program records from the Texas Education Agency.

Table A4. Characteristics of Texas restart schools and comparison schools in the last preintervention year, 2015/16–2018/19 cohorts

Preintervention characteristic	Restart schools (n = 29)		Comparison schools (n = 87)		Absolute value of the effect size
	Mean	Standard deviation	Mean	Standard deviation	
Percentage of students eligible for the National School Lunch Program	90.8	5.8	91.6	6.5	0.12
Percentage of students in special education	8.3	3.5	9.5	3.4	0.33
Percentage of students who are English learner students	32.2	19.1	23.7	18.7	0.46
Percentage of students who are Asian	1.4	2.2	0.6	0.8	0.67
Percentage of students who are Black	52.6	23.4	34.0	27.9	0.69
Percentage of students who are Hispanic	41.6	22.0	60.2	28.6	0.68
Percentage of students who are White	2.7	2.3	3.9	4.0	0.32
School enrollment	594.0	172.9	605.7	219.5	0.06
District enrollment	122,665.9	48,528.5	74,882.9	73,878.5	0.70
Percentage of schools that met state accountability standards	34.5	48.4	39.1	49.1	0.09
Percentage of years during the baseline period that schools met accountability standards	62.9	23.6	68.9	20.8	0.28
Percentage of schools in an urban locale	93.1	25.8	94.3	23.4	0.05

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency and the U.S. Department of Education.

Baseline equivalence. The study team assessed baseline equivalence by examining the effect size of preintervention outcome measures for restart schools and comparison schools, correcting for small-sample bias. For a quasi-experimental study to meet the requirements of the What Works Clearinghouse Group Design Standards with Reservations (Version 4.1) without including a preintervention outcome in the analysis, the effect size of baseline differences between an intervention and comparison group must be less than 0.05 (What Works Clearinghouse, 2020). If the effect size is 0.05–0.25, the analytic design must include a measure of the

across years and grades. Formally, $STDScore_{git} = {Y_{igst} - \mu_{gst}}/{\sigma_{gst}}$, where Y_{igt} is the average scale score for school i, in grade g, in subject s, in year t; μ_{gst} is the statewide average scale score in grade g, in subject s, in year t; and σ_{gst} is the statewide standard deviation for scale scores in grade g, in subject s, in year t.

preintervention outcome to meet standards. The baseline equivalence analysis found differences of .09 to .24 standard deviation, indicating that analyses must include measures of preintervention outcomes to have the potential of meeting What Works Clearinghouse Group Design Standards with Reservations. Meeting these standards is accomplished using the comparative interrupted time series design, which relies on preintervention outcomes to project performance postimplementation (table A5).

Table A5. Outcomes in Texas restart schools and comparison schools in the last preintervention year, 2015/16–2018/19 cohorts

	Restart schools (n = 29)		Comparison schools (n = 87)		Absolute value of the effect size
Preintervention outcome	Mean	Standard deviation	Mean	Standard deviation	
Principal mobility (percentage)	37.9	47.5	42.5	49.1	0.09
Teacher mobility (percentage)	38.4	10.0	36.7	17.5	0.10
Reading achievement (standardized)	-1.5	0.4	-1.4	0.5	0.14
Math achievement (standardized)	-1.4	0.5	-1.2	0.5	0.24
Attendance rate (percentage)	94.8	1.7	95.1	1.1	0.23

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency and staffing data from the Texas Education Research Center.

Missing data. Some restart schools and comparison schools closed during the study window or immediately after the study window, limiting the availability of some outcome data (table A6). For attendance, these closures also affected the availability of data in the first year of implementation. In the Texas Education Agency reporting system, student attendance data lag by one year. In addition, the Texas state assessment was not administered during the 2019/20 school year because of the Covid-19 pandemic; analyses of reading and math achievement data therefore were not possible for implementation year two of the 2018/19 cohort.

Table A6. Number of Texas schools in the first and second years of implementation for restart schools and comparison schools, 2015/16–2018/19 cohorts

	2015/16 cohort				2017/18 cohort				2018/19 cohort			
	First year of implementation (2015/16)		Second year of implementation (2016/17)		First year of implementation (2017/18)		Second year of implementation (2018/19)		First year of implementation (2018/19)		Second year of implementation (2019/20)	
Postimplementation outcome	R	C	R	C	R	C	R	C	R	C	R	C
Principal mobility	7	21	7	19[a]	11	33	9[b]	33	11	33	11	32[c]
Teacher mobility	7	21	7	19[a]	11	33	9[b]	33	11	33	11	32[c]
Math achievement	7	21	7	19[a]	11	33	9[b]	33	11	33	–	–
Reading achievement	7	21	7	19[a]	11	33	9[b]	33	11	33	–	–
Attendance rate	7	19[a]	7	18[a]	9[b]	33	9[b]	32	11	32	–	–

– is not available. Student achievement and attendance data were not collected by the Texas Education Agency during the 2019/20 school year because of the Covid-19 pandemic.

R is restart schools. C is comparison schools.

a. Two comparison schools closed following the 2015/16 school year, limiting the availability of student attendance data in the 2015/16 school year and all outcome data in the 2016/17 school year.

b. Two restart schools closed following the 2017/18 school year, limiting the availability of student attendance data in the 2017/18 school year and all outcome data in the 2018/19 school year.

c. One comparison school closed following the 2018/19 school year, limiting the availability of outcome data in the 2019/20 school year.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency and staffing data from the Texas Education Research Center.

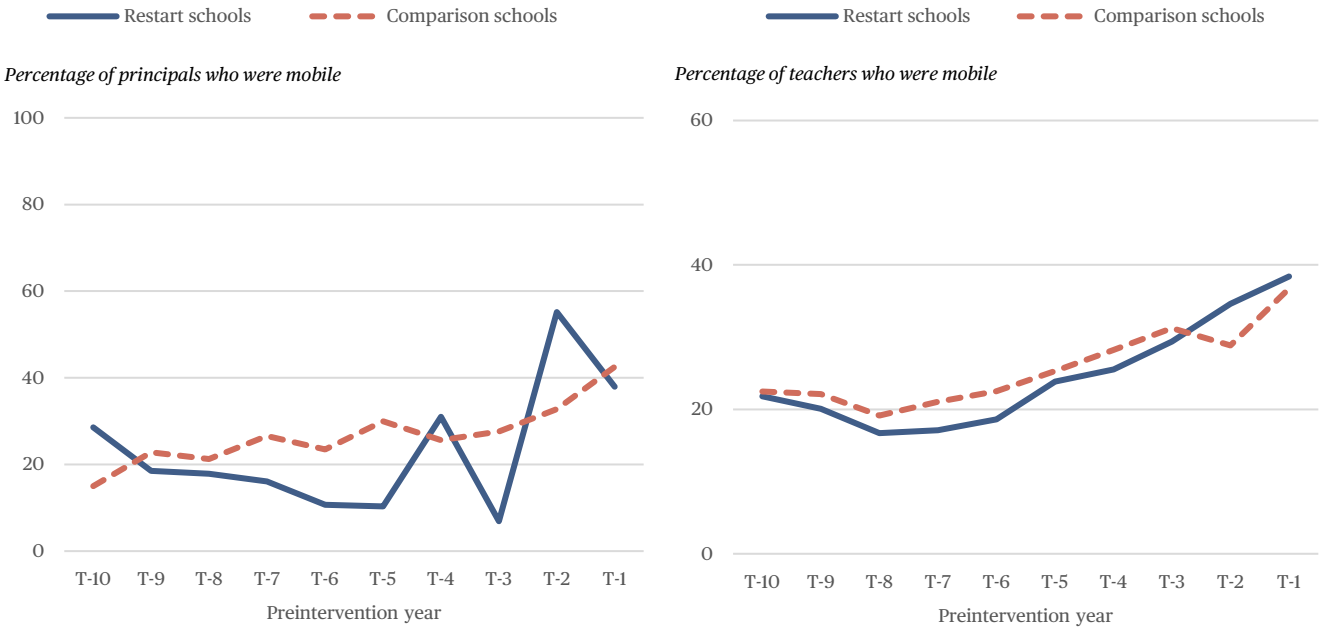
Assumption of parallel trends. To confirm that the assumption of parallel trends was met for each outcome variable in the preintervention period, the study team conducted two analyses. Both analyses found that the assumption of parallel trends across restart schools and comparison schools was met.

For research question 3 about principal and teacher mobility, the study team visually analyzed average values for restart schools and comparison schools during the preintervention period (figure A1). Next, the study team estimated two regression models with the outcome variables (the percentage of principals who were mobile and the percentage of teachers who were mobile) regressed on a continuous indicator of preintervention year ($Year_{ctd}$), participation in the restart strategy ($Treatment_{td}$), and the interaction of time and restart participation ($\beta_5 Year_{ctd} \times Treatment_{ctd}$) during the preintervention period (T-10 to T-1; equation A1).

$$Y_{ctd} = \beta_0 + \beta_1 \boldsymbol{S_{ctd}} + \beta_2 \boldsymbol{D_{td}} + \beta_3 \boldsymbol{Cohort_{ctd}} + \beta_4 Year_{ctd} + \beta_5 Year_{ctd} \times Treatment_{ctd} + \beta_6 Treatment_{td} + w_d + v_{td} + e_{ctd} \quad \text{(A1)}$$

where Y_{ctd} is the outcome of interest in school *c* in year *t* in district *d;* $\boldsymbol{S_{ctd}}$ is a vector of time-varying and -invariant school covariates (elementary or middle school, percentage of years in the preintervention period in which the school met accountability standards, and number of students); and $\boldsymbol{D_{td}}$ is a vector of time-varying and -invariant district characteristics (district locale).

Figure A1. Preintervention trends in principal and teacher mobility were consistent across Texas restart schools and comparison schools, 2015/16–2018/19 cohorts



Note: T is time and refers to the first implementation year (2015/16, 2017/18, or 2018/19). T-1 refers to the year before implementation. The sample included 29 restart schools and 87 comparison schools.
Source: Authors' analysis of program records and publicly available data from the Texas Education Agency and staffing data from the Texas Education Research Center.

The interaction of time and restart participation represented the differences in slopes across time for both restart schools and comparison schools. In both models, interaction effects were not statistically significant (table A7).

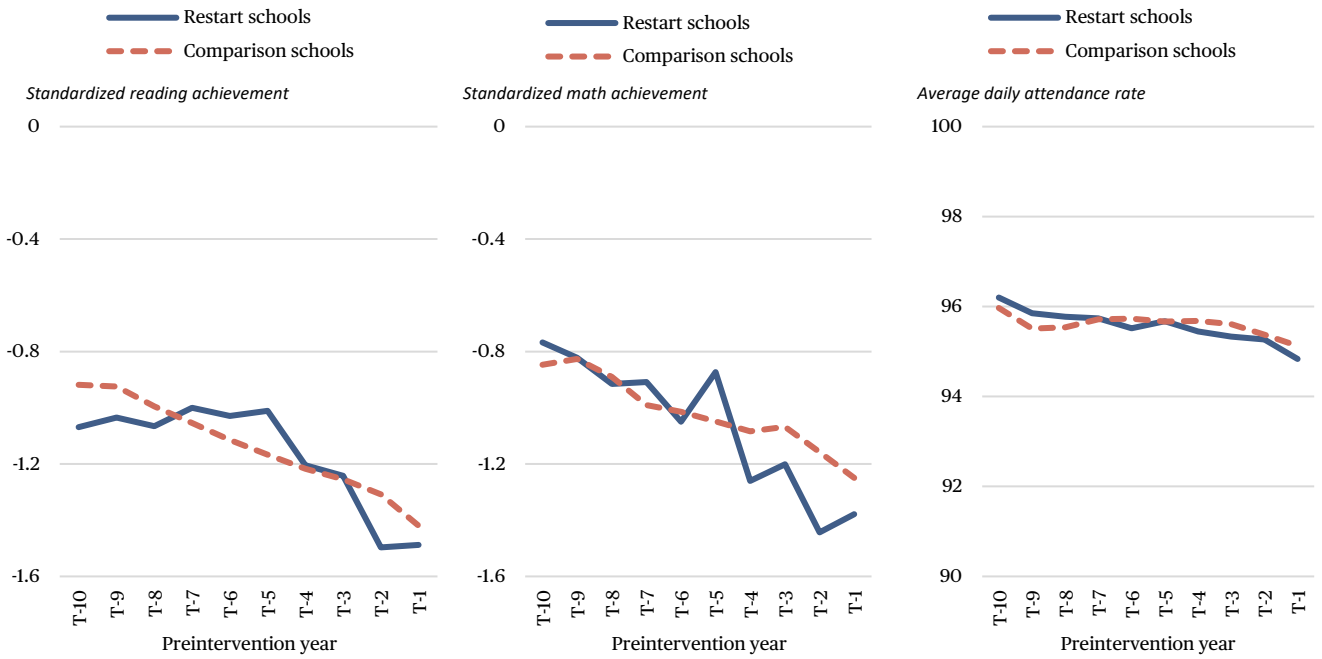
Table A7. Model estimates of the interaction of time and intervention group during the preintervention period, 2015/16–2018/19 cohorts

Outcome model	Estimate (standard error)	95% confidence interval	*p*-value
Percentage of principals who were mobile	0.63 (3.15)	-5.89-7.17	0.848
Percentage of teachers who were mobile	1.34 (0.91)	-0.44-3.13	0.141

Note: Estimates represent the interaction of time and intervention status during the preintervention period (T-10 to T-1).
Source: Authors' analysis of program records and publicly available data from the Texas Education Agency and staffing data from the Texas Education Research Center.

For research question 4 on student achievement and attendance, the study team conducted the same two analyses, first visually analyzing average values for restart schools and comparison schools during the preintervention period (figure A2). Next the study team estimated two regression models with the outcome variables (reading achievement, math achievement, and student attendance) regressed on a continuous indicator of preintervention year ($Year_{ctd}$), participation in the restart strategy ($Treatment_{ctd}$), and the interaction of time and restart participation ($\beta_5 Year_{ctd} \times Treatment_{ctd}$) during the preintervention period (T-10 to T-1; see equation A1).

Figure A2. Preintervention trends in reading performance, math performance, and attendance rate were consistent across Texas restart schools and comparison schools, 2015/16–2018/19 cohorts



Note: T is time and refers to the first implementation year (2015/16, 2017/18, or 2018/19). T-1 refers to the year before implementation. The sample included 29 restart schools and 87 comparison schools.
Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

The interaction of time and restart participation represented the differences in slopes across time for both restart schools and comparison schools. In the reading achievement and math achievement models, interaction effects were not statistically significant (table A8).

Table A8. Model estimates of the interaction of time and intervention group during the preintervention period, 2015/16–2018/19 cohorts

Outcome model	Estimate (standard error)	95% confidence interval	*p*-value
Reading achievement	0.02 (0.04)	-0.06–0.09	0.696
Math achievement	-0.09 (0.04)	-0.18–0.00	0.056
Attendance rate (percent)	-0.18 (0.08)	-0.35–0.01	0.041

Note: Estimates represent the interaction of time and intervention group during the preintervention period (T-10 to T-1).
Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

Analytic approach. To estimate the effect of the restart strategy on principal and teacher mobility, the study team fit a three-level hierarchical linear model to account for the nonindependence of schools within years and within districts. The effect of the restart strategy was estimated for two years after implementation by including a series of interaction terms between intervention condition (restart school versus comparison school) and dummy variables capturing each postintervention year.

A formal description of the three-level mixed comparative interrupted time series model is in equation A2. The specification mirrors the baseline mean model discussed and formalized in Bloom (2003) and Hallberg et al. (2018), with some alterations to account for the staggered timing of the intervention across cohorts.[9]

$$Y_{ctd} = \beta_0 + \beta_1 \boldsymbol{S_{ctd}} + \beta_2 \boldsymbol{D_{td}} + \beta_3 \boldsymbol{Cohort_{ctd}} + \beta_4 \boldsymbol{Post_{ctd}} + \beta_5 \boldsymbol{Post_{ctd}} \times \boldsymbol{Treatment_{ctd}} + \beta_6 Treatment_{ctd} + w_d + v_{td} + e_{ctd} \quad \text{(A2)}$$

where Y_{ctd} is the outcome of interest for school c in year t in district d; $\boldsymbol{S_{ctd}}$ is a vector of time-varying and -invariant school covariates (elementary or middle school, the percentage of years in the preintervention period in which the school met accountability standards, and the number of students); and $\boldsymbol{D_{td}}$ is a vector of time-varying and -invariant district characteristics (district locale); $\boldsymbol{Post_{ctd}}$ is a vector of dummy variable for years in which the restart strategy was implemented for each restart school and its respective matched comparison schools; and $\boldsymbol{Cohort_{ctd}}$ is a vector of dummy variables for cohort membership year (2015/16, 2017/18, and 2018/19) for restart schools and comparison schools to account for time-invariant mean heterogeneity across cohorts.

The indicators of substantive interest, $\beta_5 \boldsymbol{Post_{ctd}} \times \boldsymbol{Treatment_{ctd}}$, represent a vector of indicator variables estimating the effect of restart strategy implementation in each year of implementation for school c in year t in district d. For example, for each postintervention year (year 1 and, where available, year 2), a dummy variable was coded 0 for each year that a school did not implement the restart strategy (including preintervention and postintervention years) and 1 for each year that a school did implement the restart strategy. The estimated parameters for these dummy variables reflect the average difference in outcomes between the preintervention and postintervention period for restart schools relative to comparison schools for each postintervention year. The residuals reflect the nested structure of the data, with random effects at the school (e_{ctd}), year (v_{td}), and district (w_d) levels. The study team used random effects rather than three-way fixed effects for several reasons, including statistical efficiency and for the inclusion of time-invariant school and district characteristics.

To estimate the effect of the restart strategy on student achievement and attendance, the study team used a similar approach. A formal description of the three-level mixed comparative interrupted time series model is in equation A3.

[9] See St. Clair et al. (2014) and Somers et al. (2013) for validation studies using comparative interrupted time series designs to recover experimental estimates and demonstrating the importance of specifications that formally incorporate baseline trends.

$$Y_{ctd} = \beta_0 + \beta_1 \boldsymbol{S_{ctd}} + \beta_2 \boldsymbol{D_{td}} + \beta_3 \boldsymbol{Cohort_{ctd}} + \beta_4 \boldsymbol{Test_{ctd}} + \beta_5 \boldsymbol{Post_{ctd}} + \beta_6 \boldsymbol{Post_{ctd}} \times \boldsymbol{Treatment_{ctd}} + \beta_7 Treatment_{ctd} + w_d + v_{td} + e_{ctd} \quad \text{(A3)}$$

where Y_{ctd} is the outcome of interest in school *c* in year *t* in district *d*; $\boldsymbol{S_{ctd}}$ is a vector of time-varying and -invariant school covariates (elementary or middle school, percentage of years in the preintervention period in which the school met accountability standards, and number of students); $\boldsymbol{D_{td}}$ is a vector of time-varying and -invariant district characteristics (district locale); $\boldsymbol{Test_{ctd}}$ is a vector of dummy variables for grade-level state achievement test (for example, grade 3 reading); $\boldsymbol{Post_{ctd}}$ is a vector of dummy variables for years in which the restart strategy was implemented for each school and its respective matched comparison schools; and $\boldsymbol{Cohort_{ctd}}$ is a vector of dummy variables for the cohort membership year (2015/16, 2017/18, and 2018/19) for restart schools and comparison schools to account for time-invariant mean heterogeneity across cohorts.

The indicators of substantive interest, $\beta_6 \boldsymbol{Post_{ctd}} \times \boldsymbol{Treatment_{ctd}}$, represent a vector of indicator variables estimating the effect of restart strategy implementation in each year of implementation for school *c* in year *t* in district *d*. The estimated parameters for these dummy variables reflect the average difference in outcomes between the preintervention and postintervention period for restart schools relative to comparison schools for each postintervention year. The residuals reflect the nested structure of the data, with random effects at the school (e_{ctd}), year (v_{td}), and district (w_d) levels.

Conversion of attendance rates to days of instruction. For ease of interpretation, average daily attendance rates were converted into days of instruction. To calculate the average change in days of instruction, the study team multiplied the approximate number of days of instruction provided in Texas (180 days) by the estimated change in average daily attendance rates.

Data and methods for research question 5

Study population of restart schools. To obtain restart schools' baseline accountability ratings, the study team linked annual accountability rating data from the publicly available Texas Academic Rating System reports for 2014/15 for cohort 1, 2016/17 for cohort 2, and 2017/18 for cohort 3 and the schools' postimplementation ratings for up to three years of the restart strategy (2015/16 to 2017/18 for cohort 1, 2017/18 to 2018/19 for cohort 2, and 2018/19 for cohort 3). The number of postimplementation accountability rating years available differed by cohort due to censoring (fewer postintervention years were available for schools that implemented the restart strategy in the 2017/18 and 2018/19 cohorts) and the suspension of state standardized testing and accountability determinations as a result of the Covid-19 pandemic during the 2019/20 and 2020/21 school years.

Because the study spanned two accountability systems in Texas, the study team standardized the accountability ratings across the two regimes. Before 2018/19, schools were classified as having met accountability standards if they obtained a rating of Met Standard. During 2018/19, schools were classified as having met accountability standards if they obtained a letter grade of A, B, C, or D.[10] Before 2018/19, schools were classified as not having met standards if they received a rating of Improvement Required, and in 2018/19, a letter grade of F.

Calculation of the percentage of schools that met accountability standards. The study team examined changes in school accountability ratings from the preintervention school year up to three years of implementation, depending on the cohort. The study team calculated the percentage of restart schools that met accountability standards each year.

[10] Accountability rating data were not available for the 2019/20 school year because of the interruption caused by Covid-19. That year, all schools in Texas were designated Not Rated: Declared State of Disaster (Texas Education Agency, 2020). Thus, only one year of postintervention accountability rating data (2018/19) was available for the 11 restart schools in the 2018/19 cohort.

Sample and methods for research question 6

The sample for qualitative interviews included four district leaders and three current or former school leaders in three districts that implemented the district-managed restart strategy. The team selected interview participants purposively with input from the Texas Education Agency and district leaders.

To understand how districts selected the restart schools and what key activities they implemented in the first and second years, the study team conducted 60-minute virtual interviews using a semistructured interview protocol (appendix D). The interviews included questions about the school selection process for the district-managed restart strategy; activities the districts implemented in the preintervention year and during the first two years of implementation; funding, timing, and sequence of key activities; and the benefits and challenges of implementing the restart strategy.

Using NVivo software, the study team developed codes for major and minor themes that were based on the literature on the restart strategy, recruitment and retention of high-performing teachers and school administrators for high-need schools, principal and teacher stipends for working at high-need schools, and other relevant literature. In addition, the team coded interview transcripts based on emerging themes and met to reconcile findings and determine the final themes across individuals and districts.

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Appendix B. Supporting analyses

This appendix details additional results and analyses that support the findings addressed in the study.

For research question 3, the study team analyzed the effect of implementing the restart strategy on principal and teacher mobility (the percentage of principals or teachers who left the school before the restart strategy was implemented). The findings for principals are in table B1, and the findings for teachers are in table B2. For research question 4, the study team analyzed the effect of implementing the restart strategy on student achievement in reading and math and on student attendance. These findings are in tables B3–B5.

Table B1. Impact of the restart model in Texas schools on the percentage of principals who were mobile, comparative interrupted time series model estimates, 2015/16–2018/19 cohorts

Covariate	Estimate (standard error)
Year 1 * restart school	60.95 (9.87)***
Year 2 * restart school	-0.12 (10.17)
Restart schools vs. matched comparison schools	-3.72 (3.63)
Year 1 vs. all other years	-4.46 (5.39)
Year 2 vs. all other years	-5.69 (5.59)
Elementary schools vs. middle schools	2.86 (3.39)
Cohort 2 vs. all other cohorts	-2.82 (3.36)
Cohort 3 vs. all other cohorts	-2.28 (3.66)
Urban locales vs. suburban locales	2.39 (5.41)
Percentage of years during the baseline period that schools met accountability standards	-3.89 (1.40)**
School enrollment	-0.39 (1.38)
District enrollment	-2.03 (1.51)
Intercept	26.41 (6.35)***
Random effects	
Standard deviation in school	0.00
Standard deviation in local education agency	2.27
Standard deviation in year	4.29
Residual standard deviation	43.12

** Significant at $p < .01$; *** significant at $p < .001$.

Note: The sample included 1,291 school-year observations.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency and staffing data from the Texas Education Research Center.

Table B2. Impact of the restart model in Texas schools on the percentage of teachers who were mobile, comparative interrupted time series model estimates, 2015/16–2018/19 cohorts

Covariate	Estimate (standard error)
Year 1 * restart school	46.29 (2.49) ***
Year 2 * restart school	-2.41 (2.57)
Restart schools vs. matched comparison schools	-1.51 (3.12)
Year 1 vs. all other years	-0.43 (1.66)
Year 2 vs. all other years	-1.43 (2.02)
Elementary schools vs. middle schools	4.24 (1.51) **
Cohort 2 vs. all other cohorts	0.01 (1.38)
Cohort 3 vs. all other cohorts	-1.25 (1.49)
Urban locales vs. suburban locales	-2.97 (3.19)
Percentage of years during the baseline period that schools met accountability standards	-2.81 (0.63) ***
School enrollment	-2.34 (0.52) ***
District enrollment	0.63 (1.53)
Intercept	29.48 (3.96) ***
Random effects	
Standard deviation in school	4.26
Standard deviation in local education agency	4.58
Standard deviation in year	6.12
Residual standard deviation	10.88

** Significant at $p < .01$; *** significant at $p < .001$.

Note: The sample included 1,291 school-year observations.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency and staffing data from the Texas Education Research Center.

Table B3. Impact of the restart model in Texas schools on standardized reading performance, comparative interrupted time series model estimates, 2015/16–2018/19 cohorts

Covariate	Estimate (standard error)
Year 1 * restart school	0.43 (0.07) ***
Year 2 * restart school	0.71 (0.09) **
Restart schools vs. matched comparison schools	0.28 (0.28)
Year 1 vs. all other years	-0.02 (0.04)
Year 2 vs. all other years	-0.06 (0.06)
Grade 4 test vs. all other tests	-0.02 (0.03)
Grade 5 test vs. all other tests	0.05 (0.02)
Grade 6 test vs. all other tests	0.19 (0.04) ***
Grade 7 test vs. all other tests	0.27 (0.05) ***
Grade 8 test vs. all other tests	0.32 (0.05) ***
Cohort 2 vs. all other cohorts	0.21 (0.05) ***
Cohort 3 vs. all other cohorts	0.21 (0.05) ***
Urban locales vs. suburban locales	-0.28 (0.26)
Percentage of years during the baseline period that schools met accountability standards	0.21 (0.03) ***
School enrollment	-0.08 (0.02) ***
District enrollment	-0.57 (0.11) ***
Intercept	-1.47 (0.28) ***
Random effects	
Standard deviation in school	0.28
Standard deviation in local education agency	0.27
Standard deviation in year	0.17
Residual standard deviation	0.47

** Significant at $p < .01$; *** significant at $p < .001$.

Note: The sample included 3,880 school-year observations.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

Table B4. Impact of the restart model in Texas schools on standardized math performance, comparative interrupted time series model estimates, 2015/16–2018/19 cohorts

Covariate	Estimate (standard error)
Year 1 * restart school	0.49 (0.07) ***
Year 2 * restart school	0.63 (0.09) ***
Restart schools vs. matched comparison schools	0.42 (0.28)
Year 1 vs. all other years	0.11 (0.05) *
Year 2 vs. all other years	0.26 (0.06) ***
Grade 4 test vs. all other tests	-0.02 (0.02)
Grade 5 test vs. all other tests	-0.05 (0.03)
Grade 6 test vs. all other tests	0.29 (0.04) ***
Grade 7 test vs. all other tests	0.38 (0.05) ***
Grade 8 test vs. all other tests	0.56 (0.05) ***
Algebra test vs. all other tests	1.71 (0.06) ***
Cohort 2 vs. all other cohorts	0.18 (0.06) **
Cohort 3 vs. all other cohorts	0.20 (0.06) ***
Urban locales vs. suburban locales	-0.10 (0.25)
Percentage of years during the baseline period that schools met accountability standards	0.20 (0.04) ***
School enrollment	-0.14 (0.02) ***
District enrollment	-0.60 (0.11) ***
Intercept	-1.54 (0.27) ***
Random effects	
Standard deviation in school	0.32
Standard deviation in local education agency	0.47
Standard deviation in year	0.15
Residual standard deviation	0.55

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

Note: The sample included 4,053 school-year observations.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

Table B5. Impact of the restart model in Texas schools on attendance rate, comparative interrupted time series model estimates, 2015/16–2018/19 cohorts

Covariate	Estimate (standard error)
Year 1 * restart school	0.38 (0.17) *
Year 2 * restart school	0.46 (0.22) *
Restart schools vs. matched comparison schools	0.02 (0.41)
Year 1 vs. all other years	-0.05 (0.11)
Year 2 vs. all other years	0.10 (0.14)
Elementary schools vs. middle schools	-1.16 (0.17)
Cohort 2 vs. all other cohorts	0.24 (0.12)
Cohort 3 vs. all other cohorts	0.21 (0.12)
Urban locales vs. suburban locales	-0.13 (0.40)
Percentage of years during the baseline period that schools met accountability standards	0.19 (0.07) *
School enrollment	0.06 (0.04)
District enrollment	-0.17 (0.19)
Intercept	95.71 (0.44) ***
Random effects	
Standard deviation in school	0.59
Standard deviation in local education agency	0.63
Standard deviation in year	0.38
Residual standard deviation	0.70

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

Note: The sample included 1,248 school-year observations.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

Appendix C. Supplemental analyses

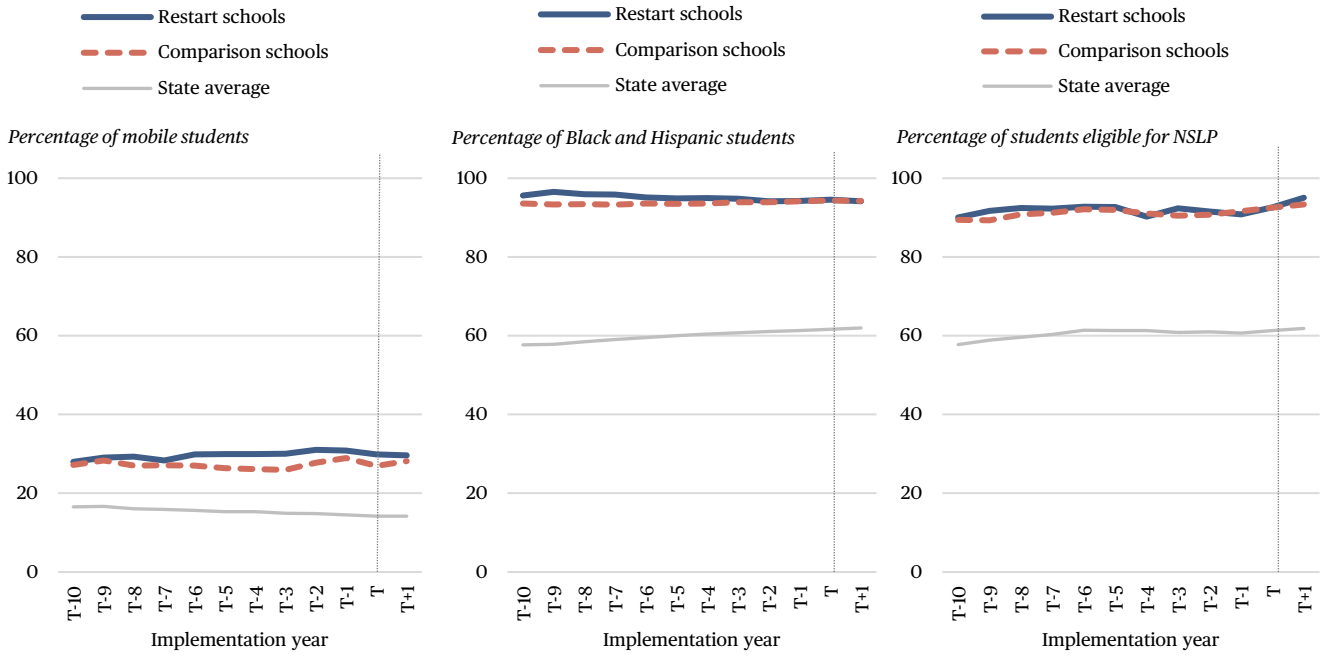
This appendix presents additional findings about changes in school-level student composition after the district-managed restart strategy was implemented. In addition, this appendix presents disaggregated findings related to the percentage of restart schools that met accountability standards.

Because a primary threat to the validity of the comparative interrupted time series design would be that the district-managed restart strategy resulted in a change in the composition of students in the school, the study looked for changes in student composition in restart schools after implementation of the restart strategy. For example, if the restart strategy induced higher performing students to transfer into the school, positive effects might reflect the change in student composition rather than the restart strategy. The study team estimated the effect of implementing the district-managed restart strategy on student compositional characteristics (percentage of mobile students,[11] percentage of students eligible for the National School Lunch Program, and percentage of Black or Hispanic students), and the findings of these supplemental analyses are in this appendix.

Implementing the district-managed restart strategy was not associated with a statistically significant change in student composition in the restart schools after accounting for district locale, district enrollment count, school level (elementary school or middle school), school enrollment count, and the percentage of years in which accountability standards were met during the baseline period. There were no statistically significant changes in the percentage of students who were mobile, Black or Hispanic, or eligible for the National School Lunch Program one year after implementing the district-managed restart strategy (figure C1 and tables C1 and C2). Two years after implementation, there was a small but statistically significant decrease in the percentage of Black or Hispanic students enrolled in restart schools of 1.3 percentage points (table C3).

[11] Student mobility captures student movement within a school year, rather than between school years. The operational definition is the percentage of students who were at a school for less than 83 percent of the school year.

Figure C1. Implementing the district-managed restart strategy was not associated with a statistically significant change in student composition in Texas restart schools, after district and school characteristics were accounted for, 2015/16–2018/19 cohorts



NSLP is the National School Lunch Program.

Note: T is time and refers to the first implementation year (2015/16, 2017/18, or 2018/19). T-1 refers to the year before implementation, and T+1 refers to the year following implementation. The sample included 29 restart schools and 87 comparison schools.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

Table C1. Change in percentage of students who were mobile in Texas restart schools, comparative interrupted time series model estimates, 2015/16–2018/19 cohorts

Covariate	Estimate (standard error)
Year 1 * restart schools	0.37 (0.92)
Year 2 * restart schools	-1.54 (1.20)
Restart schools vs. matched comparison schools	0.96 (2.22)
Year 1 vs. all other years	-0.52 (0.54)
Year 2 vs. all other years	-0.15 (0.70)
Elementary schools vs. middle schools	-2.40 (1.41)
Cohort 2 vs. all other cohorts	-0.66 (0.77)
Cohort 3 vs. all other cohorts	-0.97 (0.73)
Urban locales vs. suburban locales	-1.82 (2.82)
Percentage of years during the baseline period that schools met accountability standards	0.47 (0.58)
School enrollment	-0.70 (0.25)**
District enrollment	1.56 (0.96)
Intercept	30.19 (2.99)***
Random effects	
Standard deviation in school	5.43
Standard deviation in local education agency	2.74
Standard deviation in year	0.68
Residual standard deviation	3.87

** Significant at $p < .01$; *** significant at $p < .001$.

Note: The sample included 1,248 school-year observations.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

Table C2. Change in percentage of students eligible for the National School Lunch Program in Texas restart schools, comparative interrupted time series model estimates, 2015/16–2018/19 cohorts

Covariate	Estimate (standard error)
Year 1 * restart schools	-0.91 (0.85)
Year 2 * restart schools	0.95 (0.88)
Restart schools vs. matched comparison schools	5.00 (4.57)
Year 1 vs. all other years	0.24 (0.56)
Year 2 vs. all other years	0.33 (0.67)
Elementary schools vs. middle schools	-3.63 (0.98)***
Cohort 2 vs. all other cohorts	-0.49 (0.66)
Cohort 3 vs. all other cohorts	0.14 (0.66)
Urban locales vs. suburban locales	1.42 (3.18)
Percentage of years during the baseline period that schools met accountability standards	-0.58 (0.41)
School enrollment	-0.33 (0.22)
District enrollment	-7.40 (1.58)***
Intercept	83.68 (3.54)***
Random effects	
Standard deviation in school	3.28
Standard deviation in local education agency	8.01
Standard deviation in year	1.67
Residual standard deviation	3.71

*** Significant at $p < .001$.

Note: The sample included 1,298 school-year observations.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

Table C3. Change in percentage of Black and Hispanic students in Texas restart schools, comparative interrupted time series model estimates, 2015/16–2018/19 cohorts

Covariate	Estimate (standard error)
Year 1 * restart schools	-1.30 (0.47)**
Year 2 * restart schools	-1.69 (0.49)***
Restart schools vs. matched comparison schools	3.23 (4.49)
Year 1 vs. all other years	0.64 (0.25)*
Year 2 vs. all other years	0.46 (0.25)
Elementary schools vs. middle schools	-1.20 (0.76)
Cohort 2 vs. all other cohorts	-0.53 (0.41)
Cohort 3 vs. all other cohorts	-0.23 (0.39)
Urban locales vs. suburban locales	-0.14 (2.75)
Percentage of years during the baseline period that schools met accountability standards	-1.10 (0.32)***
School enrollment	-0.02 (0.13)
District enrollment	-3.62 (0.93)***
Intercept	90.27 (3.03)***
Random effects	
Standard deviation in school	2.68
Standard deviation in local education agency	8.12
Standard deviation in year	0.11
Residual standard deviation	2.07

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

Note: The sample included 1,298 school-year observations.

Source: Authors' analysis of program records and publicly available data from the Texas Education Agency.

Appendix D. Interview sample and protocol

The study team conducted semistructured interviews with a sample of district and school staff from three districts implementing the restart strategy.

The sample

The study team invited the four districts that had data for the quantitative analysis to participate in the interviews; however, one district declined to participate. The sample included seven current district and school leaders. The participants were deputy chiefs or deputy superintendents, directors, and school leaders. The study team reviewed minutes from board meetings and other publicly available documents to select staff who were deeply involved with the districts' implementation of the restart strategy.

Interview protocol

Hello, I am _____ with the Regional Educational Laboratory Southwest. Thank you for deciding to participate in this interview. The purpose of this interview is to provide TEA [Texas Education Agency] and other stakeholders information about your districts' decision-making regarding the district-managed restart strategy. The information collected from the interviews will be reported to TEA and shared publicly, but no identifying information about your name, school, or district will be attached to the reports.

The interview will last approximately 40–60 minutes. Your participation in this interview is completely voluntary, and any information you provide will be confidential. As a reminder, this conversation is being recorded, and after the transcription of our conversation, the digital file will be destroyed. All identifying information will be kept confidential. Do I have permission to record you? [*Note: If the respondent wishes not to be recorded, take notes but do not proceed with recording. If the respondent consents to being recorded, please record the interview.]* Do you have any questions before we begin?

We are interested in understanding the process your district went through to select schools for participation and to fund the restart strategy, as well as the first two years of implementation of the restart strategy.

Selection of schools

1. Why was your district interested in implementing the district-managed restart strategy?
2. What was the district's process for selecting schools to participate in the restart?
3. What factors helped you and other district leaders to determine which schools were selected, or not selected, to participate in the restart? *[If necessary, probe to understand the degree to which state accountability ratings were, or were not, a factor in decision-making. Probe about data that the district used to identify schools and other factors the district considered for school selection].*
4. Tell me about including families, students, and the community in the school selection process. How did you seek their support of restarting schools?

Initial implementation

5. What was the district's process for identifying leaders and teachers for the restart schools?
    a. Did your district use a principal and/or teacher evaluation system to identify teachers and principals for the restart schools?

6. Please describe the timing of key activities in the year prior to implementation. Tell me about the sequence of events the year prior to implementation, after the schools had been selected. *[If necessary, probe to identify if any internal documents that detail implementation can be shared; probe about internal and external communications.]*

7. How were teachers and principals recruited to work at the restart schools? How many teachers and principals applied to work at those schools? How many of the staff stayed at the school after the restart? *[Probe on challenges with teachers and principal recruitment.]*

8. Please describe the timing of key activities during the first two years of implementation. [*If necessary, probe to identify if any internal documents that detail implementation can be shared.*]

As you know, the district-managed restart strategy includes five components: strategic staffing, extended learning, SEL [social-emotional learning], data-driven instruction, and partnerships with parents and community organizations. I'll ask you a few questions on each component.

9. When was the strategic staffing component fully implemented at the restart schools?

10. How did your district cover the staff stipends at the restart schools? [*If using state funds*] Did the state grant cover all of the stipend costs? How will your district continue to cover the stipends? Will the district discontinue stipends once the schools improve?

11. Do you think the benefits of the district-managed restart strategy will continue after the staff stipends are discontinued? Do you think principals and teachers will be retained at the restart schools?

12. When was extended learning time fully implemented at the restart schools?

13. How did the schools extend learning time? How much extra time was given? Tell me about the tutoring and extracurricular activities offered at the restart schools. How is this different from what non-restart schools are doing in your district?

14. When was the SEL [social-emotional learning] program fully implemented at the restart schools?

15. What SEL program did the restart schools adopt? Tell me about each school's approach to this component. How is this different from what non-restart schools are doing in your district?

16. How do teachers and staff use data to modify instruction? Was using data to modify instruction a new practice at the restart schools? If yes, when was this practice fully implemented at the restart schools? Does this vary by grade level? Did the district purchase software or other equipment for this component of the program?

17. How did the restart schools approach partnerships with parents and community organizations? How is this different from what non-restart schools are doing in your district? How was it different from what schools were doing before implementation of the restart strategy? When was this component fully implemented at the restart schools?

18. Of the five components of the restart strategy, which one(s) are easier/more challenging to implement? Why?

Supports

19. How was the district-managed restart funded in your district? Did the funding source change over time?

20. In what ways did TEA support the implementation of restart strategy in your district?

Our next set of questions are related to your community's reactions to the school restart, specifically students and families of students.

Community reactions to the restart strategy

21. Can you describe students' and families' reactions to rolling out the district-managed restart strategy? What about their reactions to the principal and teaching staff being replaced with new staff? *[If necessary, probe to understand the degree to which students' and families' reactions were varied, or not.]*

22. Did students transfer to other schools before the restart implementation or in the first year? Did students transfer into restart schools?

This is our final set of questions. We'd like for you to reflect on the benefits and challenges to your district's implementation of the restart strategy.

Implementation benefits and challenges

23. What were the greatest benefits and challenges of your district's approach to implementing the district-managed restart strategy?

Thank you for your time and thoughtful responses!