TXSmartSchools Methodology

Executive Summary

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Apples to Apples

The key to understanding and improving schools and school districts is being able to make fair and helpful comparisons among them. It is not especially useful to tell schools with a high proportion of English Language Learners (ELL) to emulate the best practices of schools that do not have any ELL students. It also does not help much to tell a district with fewer than 1,000 students to adopt staffing practices that work well in a district with 75,000 students. For schools to improve, they need to learn from the best practices of similarly situated schools, not be told to adopt some one-size-fits-all notion of the academic ideal.

Two key dimensions for comparison include academic progress and real expenditures. The TXSmartSchools methodology aims to identify schools and districts where:

- Students perform better than would be expected given their demographics and previous performance;
- Educational expenditures are lower than would be expected given their cost environment.

Schools and districts that stand out in both dimensions—high performing and low spending—are highlighted as best practitioners.

Because raw data seldom provide sufficient insight for effective decision-making and differences in educational context have to be taken into consideration to transform data into information, TXSmartSchools uses recognized statistical methods to create better, more apples-to-apples, comparison measures for spending and academic growth. Those methods are described below.

Academic Progress Measures

Capturing how much schools and districts have contributed to the learning growth of their students is as complex as the number and variety of students served by those schools. Some students test very well with little effort, while other students struggle. If a very high-achieving student and a very low-achieving student each bring home the identical average test result, it would be a source of concern for one of them and a reason to celebrate for the other. There are many non-school factors—like family income, language proficiency, and prior

achievement—that also contribute to student performance. It can be challenging to separate the school effects from non-school effects.

For the TXSmartSchools academic progress calculations, we follow the scholarly literature by using a value-added model to generate our academic progress measures. A value-added model measures the extent to which student performance in a school (or district) differs systematically from what would have been expected had the students attended school somewhere else. Schools where students perform better than expected, given their prior performance and demographic characteristics, have high academic progress. Schools where students perform worse than expected have low academic progress. For example, a school where none of the students are passing standardized tests would have high academic progress if the students are improving more rapidly than similar students elsewhere in the state. Similarly, a school where all of the students are passing standardized tests would have low academic progress if the students are failing to improve as much as their peers in other schools.

To generate the academic progress measures, we use HLM (a form of regression analysis) to predict the math and reading performance of each individual student. Those predictions are based on the personal characteristics and prior performance in reading and math for each individual student. The demographic characteristics include sex, race, socio-economic status, limited English proficiency (LEP) status, special education status, and grade level. Furthermore, the prediction model allows for interactive effects, so that being both economically disadvantaged and LEP can have a compound effect on student performance, above and beyond the impact of either one alone. Students who are excluded from the "accountability subset" when the Texas Education Agency (TEA) calculates its performance measures are also excluded here.

The predictions capture the share of student performance that can be explained by non-school factors. The average gap between actual test scores and predicted test scores represents the best available measure of the school's or district's current contribution to academic performance (which we report as Z-scores). The academic progress score in math for a school is the average gap between actual math scores and predicted math scores for the students in that school; the academic progress score in reading is the average gap in reading scores. Our composite index of academic progress is an average of the academic progress scores in math and reading.

An academic progress score greater than zero indicates that the students in a school or district are performing better than students with similar characteristics statewide (on average), while an academic progress score below zero indicates that the students are performing worse than students with similar characteristics statewide. To ease interpretation, TXSmartSchools converts the academic progress scores into academic progress percentiles. The academic

progress percentiles range from 0 to 99. Schools in the 99th percentile had academic progress scores that were better than 99 percent of Texas schools.

How does TSS differ from FAST?

The value-added approach used in TXSmartSchools (TSS) improves on the value-added approach used in the Financial Allocation Study for Texas (FAST) in two key ways. First, the TSS researchers recognized that the available measure of socio-economic status (mainly participation in the National School Lunch Program) could have very different meaning for high school students than for elementary school students. Younger children are more likely to consume the offerings in the school cafeteria and therefore more likely to sign up for free or reduced price lunches. High school students are less likely to sign up and therefore less likely to be identified as economically disadvantaged. As a result, high school students who are not identified as economically disadvantaged may be needier than they appear. FAST presumed that being identified as economically disadvantaged has the same effect on test performance at the high school level as it does at the middle school or grade school levels. The refined and more flexible TSS value-added model makes no such restriction. It allows being identified as economically disadvantaged to have a different effect on test performance for elementary, middle, and high school grades. This change improves the statistical quality of the HLM model and leads to better estimates of school effects.

The second key way in which TSS improves on the FAST measures of student performance is with regards to LEP students. Research shows that it becomes increasingly difficult to learn a new language as a child gets older. As a result, students who are LEP at the high school level typically have less year-to-year progress in test scores than students who are LEP at the grade school level. Where the FAST model presumed that being LEP has the same effect on test performance at every grade level (a common assumption among researchers) the TSS model allows for being identified as LEP to have a different effect on test performance at the elementary, middle, and high school grades. This change from FAST also improves the statistical quality of the HLM model, and therefore the reliability of the school effects estimates.

Fiscal Measures

Schools that operate in high cost-of-living communities must spend more dollars to provide the same level of real resources as other schools. Similarly, schools that serve more challenging student bodies must deploy more real resources to accomplish the same results as other schools. Economies of scale make the per-pupil cost of education lower in large school districts than in small ones. All of these factors—labor cost, student need, and size—combine to form an educational environment that shapes the decisions school districts make.

Any evaluation of school district efficiency must take differences in this educational environment into account. TXSmartSchools accounts for the educational cost environment by

evaluating the fiscal performance of each school or district in comparison to that of its fiscal peers. Fiscal peers are schools or districts that operate in a similar labor market, are of similar size, and serve similar students. Our method for identifying Fiscal Peers is described in more detail in the section below labelled *Identifying Fiscal Peers*.

The Fiscal Index for a school district is constructed in three steps.

1. The first step uses data on actual expenditures (which districts self-report to TEA) to calculate the level of core operating expenditures per pupil. Core operating expenditures are current operating expenditures as defined by TEA, but excluding student transportation (function 34), food service (function 35), the incremental costs associated with the chapter 41 purchase or sale of Weighted Average Daily Attendance (WADA) related to school district wealth sharing (function 92), and payments to juvenile justice alternative education programs (function 95). These categories of spending are not considered core operating expenditures because they represent additional functions of local school districts not directly related to student achievement. Notably, core operating expenditures do not include spending on construction or debt service.
2. The second step is to adjust core operating expenditures. There are two adjustments. First, the payroll part of core operating expenditures is adjusted for regional differences in labor costs. Adjustments for labor cost differences are like adjustments for inflation—they reflect the real purchasing power of school districts when prices are different. Second, core operating expenditures are adjusted to account for the impact of shared service agreements. Shared service agreements are a partnership of sorts among school districts. An agreement might cover a jointly operated special education program or a consulting teacher who works for more than one district. Typically, one district in a shared service agreement acts as a fiscal agent for the group, collecting funds from the other member districts, and making purchases or paying salaries with those shared funds on behalf of the other member districts. Without proper adjustments, the spending by fiscal agents looks artificially high while the spending by member districts looks artificially low. These adjustments are described in more detail in the section below labelled *Adjusting Core Operating Expenditures.*
3. Finally, a three-year average of the adjusted core spending of a school district is compared with a three-year average of the adjusted core spending of its fiscal peers. Districts that spend more than 80% of the districts in their peer group are identified as very high spending districts. Districts that spend more than 60% of the districts in their peer group are identified as high spending districts, and so on. Districts in the lowest-spending 20% are identified as very low spending districts.

The Fiscal Index for a campus is constructed the same way as the Fiscal Index for a district, except that the campus-level index is based on a narrower definition of core operating expenditures—campus-related core operating expenditures—which is defined as operating

expenditures for instruction, instructional resources, instructional leadership, school leadership and student support services (the total of all spending in functions 11-33). Unlike district core operating expenditures, campus-related core operating expenditures *exclude* extracurricular activities, general administration, facility maintenance and operations, security and monitoring services, and data processing services.

How does TSS differ from FAST?

There are two key ways that TSS differs from FAST on the fiscal side. First, school districts told us that student mobility (i.e. the fraction of students who missed six or more weeks at a particularly school) was an important cost factor that was missing from the FAST analysis. It has been included as a cost factor in the TSS fiscal peer matching strategy for both school districts and campuses. Strengthening the matching strategy by including student mobility should lead to even better fiscal peers. Second, the Census Bureau has updated the geography of the place-of-work areas to better reflect commuting patterns and labor market boundaries. Those geographic improvements should improve the accuracy of the American Community Survey Comparable Wage Index (ACS-CWI). TSS uses an ACS-CWI that uses the updated geography; FAST used an ACS-CWI that was based on geographic patterns that are now outdated.

Identifying Fiscal Peers

TSS uses a well-regarded research strategy to identify the fiscal peers for each school district—propensity score matching. Propensity score matching is a statistical strategy used to construct a control group for experiments that do not use random assignment. For example, if you want to know the effect of a jobs training program, you need to compare the program participants to a group of nonparticipants who are as similar as possible to the participant group, so that you can be reasonably confident that differences in employment outcomes are the result of the training, and not a result of some other difference between the two groups. Propensity score matching identifies the best available potential controls for any given member of the treatment group. The TSS research team used propensity-score matching to identify the 40 school districts that are most similar to each Texas school district with respect to the common determinants of school district cost—labor costs, school district size, and student demographics. The team used a similar methodology and campus-level data to identify the fiscal peers for individual campuses.

The key to identifying fiscal peers is developing reliable data on the fiscal environment in which each school district operates. Guided by conversations with Texas stakeholders and the scholarly literature on educational productivity, the TSS research team matched school and districts on the basis of two labor cost indicators, two size measures, and four measures of student needs.

Labor Costs. The education sector is labor-intensive, requiring professional staff such as teachers and administrators as well as nonprofessional staff such as clerks, educational aides

and maintenance workers. To capture regional differences in the prices paid for professional staff, the TSS research team used a Comparable Wage Index (CWI) that measures regional variations in the prevailing wage for college graduates. The basic premise of a CWI is that all types of workers demand higher wages in areas with a higher cost of living or a lack of amenities. Thus, if Dallas accountants are paid 15 percent more than the state average accounting wage, Dallas engineers are paid 15 percent more than the state average engineering wage, Dallas nurses are paid 15 percent more than the state average nursing wage, and so on, then a CWI predicts that Dallas teachers would need to be paid 15 percent more than the state average teacher salary, and that Dallas principals would need to be paid 15 percent more than the state average principal salary.

Because the wages of workers without a college degree may have a different geographic pattern than do the wages of college graduates, the TSS research team used a CWI that measures regional variations in the prevailing wage for high school graduates who do not have a bachelor's degree as the indicator for regional differences in the prices paid for non-professional staff.

Size Measures. Differences in school district size are a primary determinant of variations in the cost of education. Districts with small enrollments are much more expensive to operate (on a per pupil basis) than are larger school districts, for a host of reasons. Small enrollment districts have higher administrative costs per pupil and may have classrooms that are too small to be cost effective, simply because there aren't enough students in a grade level to fill all the seats. On the other hand, districts with large geographic areas may be more expensive to administer because the students, teachers and schools are highly dispersed. The school finance formula of the state of Texas recognizes the inherent cost differences of small enrollment districts by providing additional revenue to small and midsized school districts. Additional funding adjustments are also provided to small districts that serve a geographic area of more than 300 square miles. To reflect these potential cost drivers, our analysis includes two measures of school district size—the number of students in fall enrollment, and the number of square miles in the district.

Student Need. To capture variations in costs that derive from variations in student needs, districts were matched based on five measures of student demographics, the percentages of students in each district who were:

- High needs special education students (available only at the district level)
- Other special education students
- Limited English proficient (LEP) students
- Economically disadvantaged students
- High mobility students (those who missed six or more weeks at a particular school)

Schools are expected to need more resources (for example, specialized teachers and supplies, or smaller required class sizes) as the share of students in each category increases.

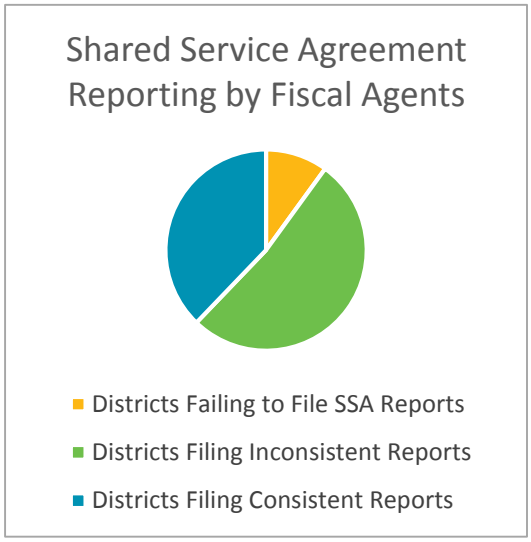
Matches are based on a three-year average of school and district characteristics. Using a three-year average reduces the influence of one-time events on the selection of fiscal peers.

Adjusting Core Operating Expenditures

As described above, the core operating expenditures used to construct the TSS Fiscal Index are adjusted for the fact that some school districts act as a fiscal agent for another district or group of districts. Fiscal agents collect funds from the member districts in a shared service agreement, and make purchases or pay salaries with those shared funds on behalf of the other member districts. As a result, the spending of fiscal agents is artificially inflated while the spending by member districts is artificially suppressed.

To correct for this pattern, we rely on TEA data about shared service agreements (SSAs). School districts that serve as fiscal agents are required to indicate the amounts they spent on behalf of the member districts each year. We use this information to allocate the spending by fiscal agents to the member districts on a proportional basis. For example, in 2014-15, Hudson ISD spent $317,820 from shared service funds on instruction, $157,849 on school leadership, $89,841 on facilities maintenance and operations, and $83,892 on miscellaneous other functions. Hudson's SSA report indicates that it spent 18% of those funds ($119,090) on its own behalf, 58% ($377,004) on behalf of Lufkin ISD, 13% ($84,089) on behalf of Diboll ISD and 11% ($69,219) on behalf of Central ISD. Therefore, we allocate 18% of Hudson ISD's shared service spending for instruction, 18% of its shared service spending for school leadership, 18% of its shared service spending on maintenance and 18% of its shared service spending for other functions to Hudson ISD. We similarly allocate 58% of Hudson ISD's shared service spending in each category to Lufkin ISD, 13% to Diboll ISD and 11% to Central ISD.

Unfortunately, the SSA reports from nearly two-thirds of the fiscal agents are either missing or do not balance with their actual financial reports. (See Figure 1.) For example, South San Antonio ISD reported on the Public Education Information Management System (PEIMS) actual financial report for 2014-15 that it spent a total of $156,356 from shared service fund 435 on behalf of its member districts. However, South San Antonio ISD's SSA report for the same year indicates that it spent a total of $729,285 from shared service fund 435 on behalf of 10 member districts. Either the actual financial report or the SSA report must be wrong.



Because the actual financial report is audited and the SSA report is generally not, we treat the actual financial report as the more reliable source of information. Whenever the SSA data are off by more than 2% and by more than $2,000, we conclude that it was not possible to reliably determine how those funds should be distributed and do not allocate the shared service spending. This means that despite our best efforts, total spending will be overstated for fiscal agents that file inconsistent SSA reports (or fail to file any SSA report at all), and will be somewhat understated for their corresponding member districts.

The payroll component of core operating expenditures has also been adjusted for regional differences in labor cost using a comparable wage index (CWI) based on the most recent data available from the American Community Survey (ACS). The ACS, which is conducted annually by the U.S. Census Bureau, has replaced the decennial census as the primary source of demographic information about the U.S. population. It provides information about the earnings, age, occupation, industry, and other demographic characteristics for millions of U.S. workers. The Census data were used to estimate the prevailing wage for college-educated workers in each Census place-of-work area in the United States, which in turn was used to generate the ACS-CWI. Adjusting payroll expenditures for differences in the ACS-CWI ensures that the Fiscal Index reflects the real resources each district is using to produce academic progress.

Smart Scores

The final step is to combine the TSS composite academic progress score with the fiscal spending index to create a Smart Score. Smart Scores run from one to five stars. As shown in the table below, a five star score indicates high academic progress and very low spending. One star indicates low academic progress combined with very high spending.

Composite Academic Progress Percentile	Spending Index				
	Very High	High	Average	Low	Very Low
80-99	3 stars	3½ stars	4 stars	4½ stars	5 stars
60-79	2½ stars	3 stars	3½ stars	4 stars	4½ stars
40-59	2 stars	2½ stars	3 stars	3½ stars	4 stars
20-39	1½ stars	2 stars	2½ stars	3 stars	3½ stars
Less than 20	1 star	1½ stars	2 stars	2½ stars	3 stars