

CAUSE NO. D-1-GN-11-003130

TEXAS TAXPAYER & STUDENT  
FAIRNESS COALITION, *et al.*,

Plaintiffs,

VS.

MICHAEL WILLIAMS, TEXAS  
COMMISSIONER OF EDUCATION, *et al.*,

Defendants

*Consolidated Case:*

FORT BEND INDEPENDENT SCHOOL  
DISTRICT, *et al.*,

Plaintiffs,

VS.

MICHAEL WILLIAMS, TEXAS  
COMMISSIONER OF EDUCATION, *et al.*

Defendants.

IN THE DISTRICT COURT OF

TRAVIS COUNTY, TEXAS

200<sup>TH</sup> JUDICIAL DISTRICT

**JOINT MOTION FOR LEAVE TO OFFER SUPPLEMENTAL  
EXPERT REPORT AND TO RE-CALL DR. WILLIAM DUNCOMBE**

TO THE HONORABLE JUDGE DIETZ:

Plaintiffs in this case, FORT BEND ISD, et al., THE TEXAS TAXPAYER & STUDENT FAIRNESS COALITION, et al., and CALHOUN COUNTY ISD, et al., (“Moving Plaintiffs”), jointly file this Motion for Leave to Offer Supplemental Expert Report and to Re-Call Dr. William Duncombe to testify at trial. In support thereof, the Moving Plaintiffs would show as follows:

**PROCEDURAL BACKGROUND**

The Moving Plaintiffs retained Dr. William Duncombe, a professor in the department of Public Administration at the Maxwell School at Syracuse University, to

conduct a “costing out” study using the cost-function approach. Dr. Duncombe has extensive experience with and expertise in cost-functions studies, which use a widely accepted statistical methodology and actual historical data to identify and estimate the relationship between per pupil spending, student performance, student characteristics, the characteristics of each school district, and resource prices.

On November 7 and 8, 2012, Dr. Duncombe testified before the Court regarding the results of his cost function model and the basis for his expert opinions regarding the same. On cross examination, the State identified an inadvertent coding error in Dr. Duncombe’s software program used to run the cost-function model, as well as an inadvertent data error, in which Dr. Duncombe used the incorrect spending data for one of the years covered by his study.

The State did not confront Dr. Duncombe with either of these errors at his deposition, which was conducted on October 3, 2012, nor were these errors brought to his or the Moving Plaintiffs’ attention at any time prior to the State’s cross-examination of Dr. Duncombe. Neither error implicates the validity of the cost-function methodology itself nor calls into question Dr. Duncombe’s expertise in this area, his qualifications as an expert witness, or his ability to conduct an accurate and reliable cost-function study.

Dr. Duncombe has revised his cost-function model and produced a supplemental report, attached to this Motion as Exhibit A. In doing so:

- Dr. Duncombe corrected the coding and data errors identified by the State.
- Out of an abundance of caution, Dr. Duncombe double-checked the accuracy of each of the data files used in the cost-function study and corrected the following additional data variables: teacher

salary for the 2010-11 year (some teachers had been dropped for that one year because of change in data format), state revenue for 2007 and 2010 for some districts, and recoded special education for one district in each year.

- As the State has pointed out, changing any element of the cost-function impacts the other elements. Therefore, after making the above corrections to the data variables, Dr. Duncombe reconstructed elements of the model to ensure that the instrumental variables, efficiency variables, cost variables, and cost deflator produce the model with the greatest forecasting accuracy and the least forecasting bias. As a result of this process, Dr. Duncombe substituted the percentage of economically disadvantaged for the census poverty rate as an instrumental variable, substituted the percentage of the population between 5 and 17 years of age for the square of the percent 65 years of age or older as an efficiency variable, removed FSP facilities-related aid from the state aid efficiency variable, used the State and Local Government Deflator instead of the Consumer Price Index as his price deflator, and dropped the percent of students with speech and learning disabilities as a cost variable.

In his supplemental report, Dr. Duncombe explains in detail the steps he took to correct and modify his cost-function model and the impact of these changes on his opinions and analysis. *See* Ex. A. **The results of the corrected model closely mirror the results of Dr. Duncombe's original model.** The corrected model and the data used are attached hereto as Exhibit B.

#### ARGUMENT

Rule 193.6 which governs the timeliness of supplemental discovery, including expert reports, allows supplementation after the default deadline of 30 days before trial if the plaintiffs show that there was good cause for its failure to timely supplement OR that the failure to timely supplement will not cause unfair surprise or unfair prejudice. *See* Tex. R. Civ. P. 193.6, 195.5, and 193.5.

Similarly, Rule 270 provides that “[w]hen it clearly appears to be necessary to the due administration of justice, the court may permit additional evidence to be offered at any time . . . .” Tex. R. Civ. P. 270, even *after* the close of evidence. *Hernandez v. Lautensack*, 201 S.W.3d 771 (Tex. App.—Fort Worth 2006, pet denied). The decision to permit additional evidence is committed to the trial court’s sound discretion, based on factors such as (1) whether the moving party showed due diligence, (2) the importance of the evidence, (3) whether the submission of the evidence will cause undue delay or (4) whether submission of the evidence will cause an injustice. *See Hernandez*, 201 S.W.3d at 779; *Naguib v. Naguib*, 137 S.W.3d 367, 373 (Tex. App.—Dallas 2004, pet. denied). The trial court should exercise its discretion liberally in the interest of permitting both sides to fully develop the case in the interest of justice. *See Word of Faith World Outreach Ctr. Church v. Oechsner*, 669 S.W.2d 364, 366-67 (Tex. App.—Dallas 1984, no writ).

Dr. Duncombe’s supplemental report and testimony should be admitted under either of these tests.

**Importance of the Evidence.** Dr. Duncombe’s opinions are critically relevant to the issues involved in this case—namely to whether districts have adequate resources to meet increased performance standards. The evidence contained in Exhibit A and Dr. Duncombe’s testimony regarding the same is highly probative and not cumulative. Dr. Duncombe is the only witness to present a costing out study based on the cost-function methodology aimed at measuring the costs of meeting increased Texas performance standards.<sup>2</sup> This evidence is highly probative of the constitutional question of whether

the school finance system provides districts with adequate funding to provide the legislatively defined general diffusion of knowledge.

Just as “[th]e goal of discovery is to seek the truth, to ensure that disputes are decided by the facts revealed, not those concealed,” *Steenbergen v. Ford Motor Co.*, 814 S.W.2d 755, 758 (Tex. App.—Dallas 1991, writ denied) (citing *Jampole v. Touchy*, 673 S.W.2d 569, 573 (Tex. 1984)), the goal of trial is to seek and illuminate the truth, and to ensure that relevant facts are not withheld from the trier of fact due to inadvertent mistakes revealed only upon cross-examination. In other words, “[a] trial should be based upon the merits of the parties’ claims and defenses rather than on an advantage obtained by one side through a surprise attack.” *Exxon*, 868 S.W.2d at 305 (quoting *Smith v. Southwest Feed Yards*, 835 S.W.2d 89, 90 (Tex. 1992)).

**Good cause/diligence.** The Moving Plaintiffs have good cause for not supplementing Dr. Duncombe’s report more than 30 days before trial. Neither Dr. Duncombe nor counsel for the Moving Plaintiffs were aware of the data and coding errors until counsel for the State identified them in cross-examination. Immediately upon learning of the errors in the original model, Dr. Duncombe began the process of correcting his model and the Moving Plaintiffs informed the Court and the other parties of their intent to supplement. The Moving Plaintiffs then provided the corrected report and data as soon as it was available, and within 7 days of learning of the errors. The Plaintiffs’ presentation of their case-in-chief will not be complete for another 18 days. Furthermore, the Court has previously indicated that the record will be kept open for several weeks after the close of trial to ensure that this Court and the reviewing court

have as complete and accurate of a record as possible. *See* 11/6 Tr. (Rough) at 253-54. The admission of Exhibit A and Dr. Duncombe's testimony will advance that goal.

**No undue surprise, prejudice or delay.** The admission of Exhibit A and Dr. Duncombe's testimony regarding the same will not cause unfair surprise or prejudice to the State in this case, nor will it unduly delay the trial. Exhibit A clearly lays out the changes that have been made to the model and the impact of the same. Dr. Duncombe's basic methodology has not changed. Rule 193.6 "requires parties to reveal the 'substance of the testimony concerning which [their] expert witness is expected to testify' no less than 30 days before trial," but "do[es] not prevent experts from refining calculations and perfecting reports through the time of trial." *Exxon Corp. v. West Texas Gathering Co.*, 868 S.W.2d 299, 304 (Tex. 1993) (holding that expert report on damages was admissible when based on new data using previously disclosed calculation methodology); *see also Navistar Intern. Transp. Corp v. Crim Truck & Tractor Co.*, 883 S.W.2d 687, 691 (Tex. App.—Texarkana 1994, writ denied) (allowing expert testimony at trial, without supplementation of report, where testimony constituted, not a "new opinion" but simply an "expansion of an already disclosed subject").

Furthermore, the back-up data and model have been provided to the State and Dr. Duncombe is available to be deposed regarding the new model prior to testifying before the Court. The State therefore has the opportunity and ability to test Dr. Duncombe's corrected model, as it did his previous model, and to cross-examine Dr. Duncombe on the changes to his data and variables and the impact on his opinions. In other words, the State "possesse[s] all of the information necessary both for preparing to discredit his methodology and reconstructing their own" calculations, *Exxon Corp.*, 868 S.W.2d at

304, and therefore would not be unfairly surprised or prejudiced by his testimony. It is worth noting that, under Rule 193.6(c), even if the moving party fails to show good cause or lack of unfair surprise or prejudice, the Court may nonetheless “grant a continuance or temporarily postpone the trial to allow a response to be made, amended, or supplemented, and to allow opposing parties to conduct discovery regarding any new information presented by that response.” Tex. R. Civ. P. 196.3(c). Here, the discovery regarding the supplemental report has already been provided to the State, and there is ample time, even without a continuance, for the State to re-depose Dr. Duncombe.

### **CONCLUSION**

For the foregoing reasons, the Fort Bend ISD Plaintiffs, the TTSCF Plaintiffs, and the Calhoun County ISD Plaintiffs respectfully request that they be granted leave to offer the Supplemental Report of Dr. William Duncombe, attached as Exhibit A, into evidence and to re-call Dr. Duncombe to testify regarding the opinions contained in the same.

Respectfully submitted,

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**CERTIFICATE OF CONFERENCE**

The undersigned hereby certifies that he conferred with all the Plaintiffs' attorneys, Intervenor attorneys, and Defendants attorneys on November 15, 2012. Counsel for the Edgewood Plaintiffs, the Texas Charter School Association Plaintiffs, and the Intervenor are not opposed to the foregoing motion. Counsel for Defendants are opposed.



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Philip D. Fraissinet

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**CERTIFICATE OF SERVICE**

The undersigned hereby certifies that a true and correct copy of the foregoing document has been served on this 15th day of November, 2012 to counsel of record in accordance with Rule 21a of the Texas Rules of Civil Procedure, the parties Rule 11 agreement, as follows:

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# EXHIBIT A

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# **Estimating the Cost of Meeting Student Performance Standards in Texas School Districts**

## **Second Supplemental Report**

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Texas Taxpayer and Student Fairness Coalition

November 2012

FB0003803

**Estimating the Cost of Meeting Student Performance Standards  
in Texas School Districts  
Second Supplemental Report**

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## **1. Introduction**

The primary objectives of the Second Supplemental Report are to discuss corrections that have been made to the data used in the first Supplemental Report and to report results of cost function analysis using the corrected data. Since the Second Supplemental Report does not change the underlying data sources or measures and no change to the underlying methodology, I will not repeat most of the discussion of data, measures, and methodology presented in the original report or first Supplemental Report. I will begin with a brief discussion of the modifications that have been made to the data and model. Section 3 will present the new cost function estimates and Section 4 will discuss the implications of these new estimates for the cost of reaching performance standards. I will conclude with a brief summary of the results.

## **2. Modifications**

During cross examination on November 8<sup>th</sup> 2012, the State identified several errors in how the dataset used in estimating the cost function was constructed. In this section, I first will discuss the steps taken to correct these errors and to examine the accuracy of all the datasets used in the analysis. Because changing any data used in the estimation of a cost function can affect its results, I have re-examined a number of possible models to identify models passing the appropriate statistical tests and with the best forecasting accuracy. I will present diagnostic results for several of these models.

### **2a. Data Corrections**

The errors identified during cross examination were twofold. First, I had inadvertently repeated spending from 2008 for 2007. Second, I had made mistakes in constructing the district-level summary measures of percent of students reaching

commended and the district-level value-added for percent commended. Both sets of errors have been corrected. I then double-checked the accuracy of each of the data files used in the cost-function study as well as the programs used to combine the information.

As part of this process I identified and corrected the other data and coding problems listed below.

- As part of setting up the individual teacher data to create a teacher salary variable, a number of teachers during the 2010-11 academic year were inadvertently dropped due to a change in data format in this year.
- I had used an earlier version of local revenue data, which had inappropriately classified as zero the variable, “other state aid” for some districts in 2007 and 2010.
- Information on disabled students in one district in each year was miscoded.

Table S2-1 reports the descriptive statistics for the information used in the cost function with the variables with data corrections highlighted in yellow.

## **2b. Modifications to the Model**

The corrections made to the data for key variables, particularly spending, teacher salaries, and value-added, imply that the cost function results using the revised data are likely to be different from those reported in the first Supplemental Report. In addition, the model with the best forecasting accuracy in the first Supplemental Report may not have the best forecasting using the corrected data. To test for this, I reran a number of cost function regressions using the corrected data. Changes were made in instrumental variables, efficiency variables, and price deflators.

**Table S2-1 Descriptive Statistics for Variables Used in Cost Models,  
Texas School Districts (2011)**

| Variables   | Standard |           |          |          |
|---|----------|-----------|----------|----------|
|   | Average  | Deviation | Minimum  | Maximum  |
| Per pupil operating spending  | \$9,070  | \$2,018   | \$5,702  | \$24,389 |
| Value added for percent commended in TAKS math and reading:   |          |           |          |          |
| District-level data   | -0.637   | 2.695     | -12.563  | 12.313   |
| Student-level data  | -0.813   | 2.441     | -12.223  | 9.581    |
| <b>Cost variables</b>   |          |           |          |          |
| Teacher salaries  | \$43,528 | \$4,177   | \$26,748 | \$56,628 |
| Student poverty (percent economically disadvantaged students)   | 57.5     | 18.0      | 0.0      | 100.0    |
| Urban student poverty (Percent economically disadvantaged multiplied by percent of the population in urban areas) | 21.5     | 26.3      | 0.0      | 98.4     |
| Percent special education students  | 9.8      | 2.3       | 3.0      | 18.0     |
| Percent special education students with speech and learning disabilities  | 6.3      | 2.0       | 0.0      | 14.8     |
| Percent special education students with other disabilities  | 3.5      | 1.3       | 0.0      | 11.2     |
| Percent of students in high school  | 28.7     | 3.4       | 18.8     | 50.4     |
| Square miles  | 263.2    | 363.3     | 5.1      | 4865.7   |
| <b>Enrollment categories</b>  |          |           |          |          |
| 250 students and less   | 0.102    | 0.302     | 0.000    | 1.000    |
| 251 to 500 students   | 0.150    | 0.357     | 0.000    | 1.000    |
| 501 to 750 students   | 0.125    | 0.331     | 0.000    | 1.000    |
| 751 to 1,000 students   | 0.092    | 0.289     | 0.000    | 1.000    |
| 1,001 to 1,500 students   | 0.112    | 0.316     | 0.000    | 1.000    |
| 1,501 to 2,000 students   | 0.071    | 0.257     | 0.000    | 1.000    |
| 2,001 to 3,000 students   | 0.075    | 0.263     | 0.000    | 1.000    |
| 3,001 to 5,000 students   | 0.091    | 0.287     | 0.000    | 1.000    |
| 5,001 to 10,000 students  | 0.075    | 0.263     | 0.000    | 1.000    |
| 10,001 to 25,000 students   | 0.057    | 0.232     | 0.000    | 1.000    |
| 25,0001 to 50,000 students  | 0.031    | 0.174     | 0.000    | 1.000    |
| Over 50,000 students  | 0.019    | 0.138     | 0.000    | 1.000    |
| <b>Efficiency-related variables</b>   |          |           |          |          |
| Per pupil state aid   | \$5,019  | \$2,043   | \$552    | \$19,324 |
| Percent commercial/industrial property  | 13.0     | 11.7      | 0.6      | 78.4     |
| Herfindahl enrollment index (labo market)   | 0.854    | 0.115     | 0.000    | 0.944    |
| Percent of population 65 years or older (2000)  | 13.7     | 5.2       | 2.3      | 32.2     |
| Percent of adults who are college graduates (2000)  | 17.8     | 8.9       | 3.2      | 80.5     |
| Percent of population 5 to 17 years old   | 19.0     | 3.1       | 5.5      | 31.3     |
| <b>Instruments</b>  |          |           |          |          |
| Predicted salary  | \$43,821 | \$3,140   | \$39,019 | \$53,625 |
| Average for other districts in enrollment/property value category:  |          |           |          |          |
| Child poverty rate (Census)   | 23.6     | 3.0       | 8.5      | 30.1     |
| Percent economic disadvantage   | 57.5     | 6.7       | 9.3      | 70.2     |
| Percent of students in high school  | 27.7     | 2.5       | 14.3     | 34.3     |
| Percent Black students  | 7.3      | 3.6       | 0.1      | 17.3     |
| Percent Hispanic students   | 36.8     | 10.5      | 13.7     | 68.8     |
| Average for other districts in labor market area:   |          |           |          |          |
| Percent Black students  | 7.2      | 5.9       | 0.1      | 28.8     |
| Percent Hispanic students   | 35.9     | 21.4      | 5.1      | 98.2     |
| Sample Size   | 926      |           |          |          |

Sources: Texas Education Agency, Texas Comptroller of Public Accounts, U.S. Bureau of Economic Analysis and U.S. Census Bureau.

Models were first tested on whether they passed statistical tests for instrumental variables. Only models passing the instrument tests were considered for further analysis. Then models were compared on forecasting accuracy and forecasting bias in 2011 using the approach discussed in the previous reports. Table S2-2 presents the results of diagnostic tests for Model 2 in the first Supplemental Report (column 1) and compares them with the same model using the corrected data (column 2). All models presented in Table S2-2a pass instrument tests. The correction of the data has resulted in substantially less forecasting bias and better forecasting accuracy than what was reported in the first Supplemental report.

**S2-2a. Comparison of Results in First Supplemental Report With Models Using Corrected Data, District-Level Value-Added (Model 2)**

|   | Corrected Data                              |  |                                       |                            |                     |  |
|---|---|--|---------------------------------------|----------------------------|---------------------|--|
|   | Results in first Supplemental Report<br>(1) | Original Model (Child poverty instrument)<br>(2) | Economically Disadvantaged Instrument |                            |                     | Model With Best Forecasting Accuracy <sup>1</sup><br>(6) |
|   |   |  | Original Model<br>(3)                 | Operating State Aid<br>(4) | SLG Deflator<br>(5) |  |
| <b>Diagnostic Tests:</b>                            |   |  |                                       |                            |                     |  |
| <b>Instrument Tests</b>                             |   |  |                                       |                            |                     |  |
| Weak instrument test                                | PASS  | PASS   | PASS                                  | PASS                       | PASS                | PASS   |
| Overidentification test                             | PASS  | PASS   | PASS                                  | PASS                       | PASS                | PASS   |
| <b>Forecasting bias:</b>                            |   |  |                                       |                            |                     |  |
| Average   | 1.85  | 0.95   | 0.51                                  | 0.373                      | 0.646               | 0.11   |
| Median  | 2.29  | 1.37   | 0.91                                  | 0.705                      | 1.04                | 0.539  |
| <b>Forecasting error:</b>                           |   |  |                                       |                            |                     |  |
| Average   | 9.6   | 9.42   | 9.29                                  | 9.23                       | 9.26                | 9.125  |
| Median  | 7.54  | 7.55   | 7.35                                  | 7.20                       | 7.27                | 7.15   |
| <b>Key Results:</b>                                 |   |  |                                       |                            |                     |  |
| Regression coefficient on VA                        | 0.01128                                     | 0.00612  | 0.01557                               | 0.01499                    | 0.01287             | 0.01161  |
| (p-value)   | 0.002                                       | 0.103  | 0.008                                 | 0.01                       | 0.044               | 0.035  |
| <b>Percent change in spending to reach standard</b> |   |  |                                       |                            |                     |  |
| 40  | 18.2  | 9.8  | 22.0                                  | 21.9                       | 19.0                | 16.2   |
| 50  | 32.3  | 16.8   | 42.0                                  | 41.6                       | 35.3                | 30.5   |
| 60  | 48.0  | 24.1   | 65.3                                  | 64.5                       | 53.9                | 46.6   |
| 70  | 65.6  | 32.0   | 92.4                                  | 91.1                       | 75.1                | 64.6   |

<sup>1</sup> This model includes the following changes in the original model: 1) use modified measure of state aid to remove debt service payments; 2) monetary values are deflated by the state and local GDP deflator for consumption and gross investment; 3) modified enrollment-property value peer groups so there were at least 10 members per group; 4) replaced the square of population 65 years or older with percent of population 5 to 17 years old as efficiency variable; and 5) the percent of students with speech and learning disabilities was removed because it was insignificant.

I also looked at several alternative models to identify whether they would improve forecasting accuracy. First, average percent economically disadvantaged students in other districts in the same enrollment-property value categories is substituted for the child poverty rate as an instrument, since it is an alternative measure of student poverty. As

indicated in column 3 of Table S2-2a, the forecasting accuracy improves and forecasting bias is reduced significantly when this substitution is made. Another alternative examined was to adjust the state aid variable to better match operating spending by removing facilities-related aid from the FSP. As reported in column 4 in Table S2-2a, forecasting accuracy improved slightly. To address criticism of the use of CPI-U as a deflator, financial values were deflated by the GDP price index for state and local government (SLG) consumption expenditures and gross investments. Using this deflator has relatively little effect on forecasting accuracy (column 5) but it did lower projected spending increases somewhat.

Besides the changes discussed above I also looked at other modifications to the instruments and efficiency variables to determine if any changes might improve forecasting accuracy. The last column in Table S2-2a reports results for the model with the best forecasting accuracy of the models I looked at. Besides incorporating the changes just discussed (economically disadvantaged instrument, operating state aid, and SLG price index), efficiency variables were adjusted by dropping the square of the share of population 65 years and older and adding the percent of the population between 5 and 17 years old. Finally, the percent of students with speech and learning disabilities was dropped because it was not close to being statistically significant. These changes result in substantial improvements in forecasting accuracy and very little forecasting bias on average. This model also lowers the projected spending increases compared to other models with percent economic disadvantage as an instrument. In general, the forecasting accuracy of the models using student level value-added are about the same or even a little better than the models using district-level value-added. As expected, the projected

spending increases are lower than when district-level value-added is used as the performance measure.

**S2-2b. Comparison of Results in First Supplemental Report With Models Using Corrected Data, Student-Level Value-Added (Model 2)**

|   | Corrected Data                       |   |                                       |                     |                  |   |
|---|--------------------------------------|---|---------------------------------------|---------------------|------------------|---|
|   | Results in first Supplemental Report | Original Model (Child poverty instrument) | Economically Disadvantaged Instrument |                     |                  | Model With Best Forecasting Accuracy <sup>1</sup> |
|   |                                      |   | Original Model                        | Operating State Aid | SLG Deflator     |   |
|   | (1)                                  | (2)                                       | (3)                                   | (4)                 | (5)              | (6)   |
| <b>Diagnostic Tests:</b>                            |                                      |   |                                       |                     |                  |   |
| <b>Instrument Tests</b>                             |                                      |   |                                       |                     |                  |   |
| Weak instrument test                                | PASS                                 | PASS                                      | PASS                                  | PASS                | PASS             | PASS  |
| Overidentification test                             | PASS                                 | PASS                                      | PASS                                  | PASS                | PASS             | PASS  |
| <b>Forecasting bias:</b>                            |                                      |   |                                       |                     |                  |   |
| Average   | 1.95                                 | 0.95                                      | 0.46                                  | 0.32                | 0.60             | 0.03  |
| Median  | 2.31                                 | 1.29                                      | 0.797                                 | 0.572               | 0.98             | 0.47  |
| <b>Forecasting error:</b>                           |                                      |   |                                       |                     |                  |   |
| Average   | 9.64                                 | 9.42                                      | 9.27                                  | 9.22                | 9.25             | 9.12  |
| Median  | 7.58                                 | 7.52                                      | 7.26                                  | 7.26                | 7.24             | 7.19  |
| <b>Key Results:</b>                                 |                                      |   |                                       |                     |                  |   |
| Regression coefficient on VA (p-value)              | 0.00957<br>0.001                     | 0.00457<br>0.119                          | 0.01186<br>0.006                      | 0.01171<br>0.003    | 0.00957<br>0.043 | 0.06630<br>0.037                                  |
| <b>Percent change in spending to reach standard</b> |                                      |   |                                       |                     |                  |   |
| 40  | 16.2                                 | 7.9                                       | 17.4                                  | 17.3                | 14.8             | 12.3  |
| 50  | 23.0                                 | 13.0                                      | 32.1                                  | 31.9                | 23.4             | 22.5  |
| 60  | 41.0                                 | 18.2                                      | 48.3                                  | 48.3                | 39.3             | 33.6  |
| 70  | 55.3                                 | 23.8                                      | 67.5                                  | 66.7                | 53.4             | 49.2  |

<sup>1</sup> This model includes the following changes in the original model: 1) use modified measure of state aid to remove debt service payments; 2) monetary values are deflated by the state and local GDP deflator for consumption and gross investment; 3) modified enrollment-property value peer groups so there were at least 10 members per group; 4) replaced the square of population 65 years or older with percent of population 5 to 17 years old as efficiency variable; and 5) the percent of students with speech and learning disabilities was removed because it was insignificant.

Tables S2-2a and S2-2b also report key results with regard to predictions of spending to reach particular standards. The regression coefficients on the district-level or student-level value-added measures along with hypothesis testing results are presented. After the data was corrected, the coefficient on the value-added variable in the original model (2) is about half of size of the coefficient in first Supplemental Report (column 1). Based on the hypothesis testing results I am 89% confident there is a relationship between performance and spending for district-level VA and 88% confident using student-level VA. The projected spending increases with the revised model are 10% for a standard of 40 and 17% for a standard of 50 compared to 16% and 28% (student-level VQ) in the first Supplemental Report. Using student-level value-added the projected

spending increase with the corrected data is 8% to reach a standard of 40 and 13% to reach a standard of 50.

As indicated above, substituting percent economically disadvantaged for census child poverty as an instrument in the model significantly improves the forecasting accuracy. It also results in larger coefficients on the performance measure, which are more statistically significant. The coefficients on value-added in the models reported in columns (3) to (6) are fairly similar despite other modifications to the model. The projected spending increase to reach a standard of 40 ranges between 16% and 22% and between 31% and 42% for a standard of 50 using district-level VA. The ranges are similar for student-level value-added but the projected spending increases are lower. These increases are comparable to the projected spending increases reported in the first Supplemental Report.

### **3. Cost Function Estimates**

In this section, I present the cost function estimates using a district-level value-added (VA) measure and a student-level value-added measure for the original model using corrected data (Table S-3a) and using the model with the best forecasting accuracy reported Table S2-2 (Table S2-3b). These tables are replacing Table S-3 in the first Supplemental Report.

**Table S2-3a. Cost Function Estimates for Texas School Districts (2007-2011)**  
**Original Model With Corrected Data**

| Variables   | Model 2 (District-level Value-added) |         | Model 2 (Student-level Value-added) |         |
|---|--------------------------------------|---------|-------------------------------------|---------|
|   | Coefficient                          | p-value | Coefficient                         | p-value |
| Intercept   | -6.71021                             | 0.001   | -6.60029                            | 0.001   |
| Value added for percent commended in TAKS math and reading  | 0.00612                              | 0.108   | 0.00457                             | 0.119   |
| <b>Cost variables</b>   |                                      |         |                                     |         |
| Teacher salaries <sup>a</sup>   | 1.73683                              | 0.000   | 1.72939                             | 0.000   |
| Student poverty (percent economically disadvantaged students)   | 0.00159                              | 0.000   | 0.00159                             | 0.000   |
| Urban student poverty (Percent economically disadvantaged multiplied by percent of the population in urban areas) | 0.00138                              | 0.000   | 0.00138                             | 0.000   |
| Percent special education students with speech and learning disabilities  | 0.00147                              | 0.439   | 0.00145                             | 0.447   |
| Percent special education students with other disabilities  | 0.01124                              | 0.000   | 0.01103                             | 0.000   |
| Percent of students in high school  | 0.00267                              | 0.059   | 0.00262                             | 0.064   |
| Square miles <sup>a</sup>   | 0.04937                              | 0.000   | 0.04937                             | 0.000   |
| <b>Enrollment categories</b>  |                                      |         |                                     |         |
| 251 to 500 students   | -0.12142                             | 0.000   | -0.12327                            | 0.000   |
| 501 to 750 students   | -0.21230                             | 0.000   | -0.21389                            | 0.000   |
| 751 to 1,000 students   | -0.26017                             | 0.000   | -0.26091                            | 0.000   |
| 1,001 to 1,500 students   | -0.34427                             | 0.000   | -0.34462                            | 0.000   |
| 1,501 to 2,000 students   | -0.41335                             | 0.000   | -0.42371                            | 0.000   |
| 2,001 to 3,000 students   | -0.47022                             | 0.000   | -0.47109                            | 0.000   |
| 3,001 to 5,000 students   | -0.54613                             | 0.000   | -0.54668                            | 0.000   |
| 5,001 to 10,000 students  | -0.63376                             | 0.000   | -0.63431                            | 0.000   |
| 10,001 to 25,000 students   | -0.69906                             | 0.000   | -0.70001                            | 0.000   |
| 25,001 to 50,000 students   | -0.74997                             | 0.000   | -0.75094                            | 0.000   |
| Over 50,000 students  | -0.79859                             | 0.000   | -0.79791                            | 0.000   |
| <b>Efficiency-related variables</b>   |                                      |         |                                     |         |
| Per pupil state aid <sup>a</sup>  | -0.79848                             | 0.000   | -0.80337                            | 0.000   |
| Per pupil state aid squared <sup>a</sup>  | 0.05173                              | 0.000   | 0.05192                             | 0.000   |
| Percent commercial/industrial property  | 0.00145                              | 0.000   | 0.00145                             | 0.000   |
| Herfindahl enrollment index (labor market)  | -0.05657                             | 0.147   | -0.05657                            | 0.147   |
| Percent of population 65 years or older (2000)  | 0.01353                              | 0.003   | 0.01345                             | 0.003   |
| Percent of population 65 years or older (2000) squared  | -0.00030                             | 0.021   | -0.00029                            | 0.022   |
| Percent of adults who are college graduates (2000)  | 0.00328                              | 0.000   | 0.00324                             | 0.000   |
| Sample Size   | 4631                                 |         | 4631                                |         |
| Centered R-square   | 0.53                                 |         | 0.54                                |         |
| <b>Weak instrument test:</b>  |                                      |         |                                     |         |
| F-statistic (value added for percent commended)   | 68.25                                |         | 110.05                              |         |
| F-statistic (teacher salaries)  | 39.1                                 |         | 38.89                               |         |
| Kleibergen-Paap rk Wald F statistic   | 54.23                                |         | 68.85                               |         |
| Overidentification test (value)   | 0.42                                 |         | 0.39                                |         |

Note: Estimated with linear 2SLS regression with the log of per pupil operating cost as the dependent variables. Variables expressed in dollar values are adjusted to be 2011 dollars using the CPI-U. The student performance measure (value added for percent commended) and teacher salaries are treated as endogenous variables with instruments presented in Table S2-1 and discussed in original report. Robust standard errors are used for hypothesis testing (controlling for clustering at the district level).

<sup>a</sup> Expressed as a natural logarithm.

**Table S2-3b. Cost Function Estimates for Texas School Districts (2007-2011)  
Model With Best Forecasting Accuracy and Corrected Data**

| Variables   | Model 2 (District-level Value-added) |         | Model 2 (Student-level Value-added) |         |
|---|--------------------------------------|---------|-------------------------------------|---------|
|   | Coefficient                          | p-value | Coefficient                         | p-value |
| Intercept   | -5.533                               | 0.005   | -5.386                              | 0.006   |
| Value added for percent commended in TAKS math and reading  | 0.01161                              | 0.035   | 0.00868                             | 0.037   |
| <b>Cost variables</b>   |                                      |         |                                     |         |
| Teacher salaries <sup>a</sup>   | 1.67695                              | 0.000   | 1.66477                             | 0.000   |
| Student poverty (percent economically disadvantaged students)   | 0.00170                              | 0.000   | 0.00174                             | 0.000   |
| Urban student poverty (Percent economically disadvantaged multiplied by percent of the population in urban areas) | 0.00135                              | 0.000   | 0.00134                             | 0.000   |
| Percent special education students with non-speech and learning disabilities                                      | 0.01080                              | 0.000   | 0.01043                             | 0.000   |
| Percent of students in high school  | 0.00264                              | 0.056   | 0.00254                             | 0.065   |
| Square miles <sup>a</sup>   | 0.04864                              | 0.000   | 0.04869                             | 0.000   |
| <b>Enrollment categories</b>  |                                      |         |                                     |         |
| 251 to 500 students   | -0.11266                             | 0.000   | -0.11622                            | 0.000   |
| 501 to 750 students   | -0.20169                             | 0.000   | -0.20486                            | 0.000   |
| 751 to 1,000 students   | -0.24927                             | 0.000   | -0.25087                            | 0.000   |
| 1,001 to 1,500 students   | -0.33095                             | 0.000   | -0.33189                            | 0.000   |
| 1,501 to 2,000 students   | -0.41158                             | 0.000   | -0.41256                            | 0.000   |
| 2,001 to 3,000 students   | -0.45393                             | 0.000   | -0.45595                            | 0.000   |
| 3,001 to 5,000 students   | -0.53144                             | 0.000   | -0.53289                            | 0.000   |
| 5,001 to 10,000 students  | -0.61874                             | 0.000   | -0.62026                            | 0.000   |
| 10,001 to 25,000 students   | -0.68152                             | 0.000   | -0.68383                            | 0.000   |
| 25,0001 to 50,000 students  | -0.73948                             | 0.000   | -0.74184                            | 0.000   |
| Over 50,000 students  | -0.78898                             | 0.000   | -0.78817                            | 0.000   |
| <b>Efficiency-related variables</b>   |                                      |         |                                     |         |
| Per pupil state aid <sup>a</sup>  | -0.90718                             | 0.000   | -0.90742                            | 0.000   |
| Per pupil state aid squared <sup>a</sup>  | 0.05842                              | 0.000   | 0.05824                             | 0.000   |
| Percent commercial/industrial property  | 0.00148                              | 0.000   | 0.00147                             | 0.000   |
| Herfindahl enrollment index (labor market)  | -0.05049                             | 0.190   | -0.05088                            | 0.189   |
| Percent of population 65 years or older (2000)  | 0.00396                              | 0.002   | 0.00395                             | 0.001   |
| Percent of population 5 to 17 years old   | -0.00174                             | 0.337   | -0.00168                            | 0.349   |
| Percent of adults who are college graduates (2000)  | 0.00299                              | 0.000   | 0.00293                             | 0.000   |
| Sample Size   | 4631                                 |         | 4631                                |         |
| Centered R-square   | 0.50                                 |         | 0.52                                |         |
| <b>Weak instrument test:</b>  |                                      |         |                                     |         |
| F-statistic (value added for percent commended)   | 39.93                                |         | 62.89                               |         |
| F-statistic (teacher salaries)  | 42.54                                |         | 40.54                               |         |
| Kleibergen-Paap rk Wald F-statistic   | 29.47                                |         | 38.31                               |         |
| Overidentification test (p-value)   | 0.69                                 |         | 0.63                                |         |

Note: Estimated with linear 2SLS regression with the log of per pupil operating cost as the dependent variables. Variables expressed in dollar values are adjusted to be 2011 dollars using the GDP Price Index for SLG consumption expenditures and gross investments. The student performance measure (value added for percent commended) and teacher salaries are treated as endogenous variables with instruments presented in Table S2-1 and discussed in original report. Robust standard errors are used for hypothesis testing (controlling for clustering at the district level).

<sup>a</sup> Expressed as a natural logarithm.

#### **4. Estimated Spending Increases to Reach Performance Standards**

Cost function results were used to project spending to reach several standards with regard to the percent commended on reading and math TAKS exams. Presented below are tables showing these projected spending increases using the original model and corrected data (Table S2-4a) and using the model with the best forecasting accuracy using corrected data (Table S2-4b). These tables replace Table S-4 in the first Supplemental Report.

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**Table S2-4a: Increase in Spending to Reach Standard for Percent Commended on TAKS Math and Reading Exams (Model 2)—Original Model With Corrected Data**

|   | All Districts        |                | Plaintiff-focus Districts |                |      |
|---|----------------------|----------------|---------------------------|----------------|------|
|   | Billions of 2011 \$s | Percent Change | Billions of 2011 \$s      | Percent Change |      |
| <b>District-Level Data</b>  |                      |                |                           |                |      |
| Change to reach standard  |                      |                |                           |                |      |
|   | 40                   | \$3.7          | 9.8                       | \$1.4          | 11.4 |
|   | 50                   | \$6.4          | 16.8                      | \$2.2          | 18.4 |
|   | 60                   | \$9.2          | 24.1                      | \$3.1          | 25.9 |
|   | 65                   | \$10.6         | 28.0                      | \$3.5          | 29.8 |
|   | 70                   | \$12.1         | 32.0                      | \$4.0          | 33.9 |
| Change to reach standard for districts below standard   |                      |                |                           |                |      |
|   | 40                   | \$4.3          | 11.4                      | \$1.5          | 12.4 |
|   | 50                   | \$6.7          | 17.6                      | \$2.2          | 18.8 |
|   | 60                   | \$9.3          | 24.6                      | \$3.1          | 26.0 |
|   | 65                   | \$10.7         | 28.4                      | \$3.5          | 29.8 |
|   | 70                   | \$12.2         | 32.3                      | \$4.0          | 33.9 |
| Change to reach standard or a 3 percentage increase above present performance for districts above the standard <sup>1</sup> |                      |                |                           |                |      |
|   | 40                   | \$4.5          | 11.8                      | \$1.5          | 12.6 |
|   | 50                   | \$6.7          | 17.6                      | \$2.2          | 18.8 |
| Change to reach standard or a 5 percentage increase above present performance for districts above the standard <sup>2</sup> |                      |                |                           |                |      |
|   | 40                   | \$4.5          | 12.0                      | \$1.5          | 12.7 |
|   | 50                   | \$6.7          | 17.6                      | \$2.2          | 18.8 |
| <b>Student-Level Data</b>   |                      |                |                           |                |      |
| Change to reach standard  |                      |                |                           |                |      |
|   | 40                   | \$3.0          | 7.9                       | \$1.1          | 9.6  |
|   | 50                   | \$4.9          | 13.0                      | \$1.7          | 14.7 |
|   | 60                   | \$6.9          | 18.2                      | \$2.4          | 20.1 |
|   | 65                   | \$8.0          | 21.0                      | \$2.7          | 22.9 |
|   | 70                   | \$9.0          | 23.8                      | \$3.1          | 25.7 |
| Change to reach standard for districts below standard   |                      |                |                           |                |      |
|   | 40                   | \$3.7          | 9.7                       | \$1.3          | 10.7 |
|   | 50                   | \$5.2          | 13.6                      | \$1.8          | 14.9 |
|   | 60                   | \$6.7          | 17.7                      | \$2.3          | 19.2 |
|   | 65                   | \$7.5          | 19.9                      | \$2.5          | 21.5 |
|   | 70                   | \$8.4          | 22.1                      | \$2.8          | 23.7 |
| Change to reach standard or a 3 percentage increase above present performance for districts above the standard <sup>1</sup> |                      |                |                           |                |      |
|   | 40                   | \$3.8          | 9.9                       | \$1.3          | 10.8 |
|   | 50                   | \$5.3          | 14.0                      | \$1.8          | 15.2 |
| Change to reach standard or a 5 percentage increase above present performance for districts above the standard <sup>2</sup> |                      |                |                           |                |      |
|   | 40                   | \$3.8          | 10.1                      | \$1.3          | 10.9 |
|   | 50                   | \$5.3          | 14.0                      | \$1.8          | 15.2 |

Note: Spending estimates are inflation-adjusted to 2011 dollars using the CPI-U.

<sup>1</sup>Three percentage points are added to present performance for districts above the standard or within three percentage of the standard. The maximum of this estimate or present spending is used.

<sup>2</sup>Five percentage points are added to present performance for districts above the standard or within five percentage of the standard. The maximum of this estimate or present spending is used.

**Table S2-4b: Increase in Spending to Reach Standard for Percent Commended on TAKS Math and Reading Exams (Model 2)–Model With Best Forecasting Accuracy and Corrected Data**

|   | All Districts        |                | Plaintiff-focus Districts |                |      |
|---|----------------------|----------------|---------------------------|----------------|------|
|   | Billions of 2011 \$s | Percent Change | Billions of 2011 \$s      | Percent Change |      |
| <b>District-Level Data</b>  |                      |                |                           |                |      |
| Change to reach standard  | 40                   | \$6.1          | 16.2                      | \$2.0          | 16.5 |
|   | 50                   | \$11.6         | 30.5                      | \$3.7          | 30.8 |
|   | 60                   | \$17.7         | 46.6                      | \$6.6          | 46.9 |
|   | 65                   | \$21.0         | 55.3                      | \$6.6          | 55.7 |
|   | 70                   | \$24.5         | 64.6                      | \$7.7          | 65.0 |
| Change to reach standard for districts below standard   | 40                   | \$6.8          | 18.0                      | \$2.1          | 17.7 |
|   | 50                   | \$11.5         | 30.4                      | \$3.6          | 30.3 |
|   | 60                   | \$16.8         | 44.3                      | \$5.3          | 44.4 |
|   | 65                   | \$19.7         | 51.9                      | \$6.2          | 52.1 |
|   | 70                   | \$22.7         | 59.9                      | \$7.2          | 60.3 |
| Change to reach standard or a 3 percentage increase above present performance for districts above the standard <sup>1</sup> | 40                   | \$7.0          | 18.5                      | \$2.1          | 18.0 |
|   | 50                   | \$11.8         | 31.3                      | \$3.7          | 31.2 |
| Change to reach standard or a 5 percentage increase above present performance for districts above the standard <sup>2</sup> | 40                   | \$7.2          | 18.9                      | \$2.2          | 18.3 |
|   | 50                   | \$11.9         | 31.3                      | \$3.7          | 31.2 |
| <b>Student-Level Data</b>   |                      |                |                           |                |      |
| Change to reach standard  | 40                   | \$4.7          | 12.3                      | \$1.5          | 12.8 |
|   | 50                   | \$8.5          | 22.5                      | \$2.7          | 23.1 |
|   | 60                   | \$12.7         | 33.6                      | \$4.1          | 34.2 |
|   | 65                   | \$15.0         | 39.5                      | \$4.8          | 40.2 |
|   | 70                   | \$18.7         | 49.2                      | \$6.2          | 51.8 |
| Change to reach standard for districts below standard   | 40                   | \$5.0          | 13.1                      | \$1.7          | 13.9 |
|   | 50                   | \$8.1          | 21.3                      | \$2.6          | 22.3 |
|   | 60                   | \$11.5         | 30.2                      | \$3.7          | 31.3 |
|   | 65                   | \$13.3         | 35.0                      | \$4.3          | 36.2 |
|   | 70                   | \$14.5         | 38.3                      | \$5.4          | 45.7 |
| Change to reach standard or a 3 percentage increase above present performance for districts above the standard <sup>1</sup> | 40                   | \$5.5          | 14.4                      | \$1.7          | 14.3 |
|   | 50                   | \$8.8          | 23.3                      | \$2.8          | 23.5 |
| Change to reach standard or a 5 percentage increase above present performance for districts above the standard <sup>2</sup> | 40                   | \$5.6          | 14.7                      | \$1.7          | 14.5 |
|   | 50                   | \$8.8          | 23.3                      | \$2.8          | 23.5 |

Note: Spending estimates are inflation-adjusted to 2011 dollars using the GDP price index for SLG consumption and investments.

<sup>1</sup>Three percentage points are added to present performance for districts above the standard or within three percentage of the standard. The maximum of this estimate or present spending is used.

<sup>2</sup>Five percentage points are added to present performance for districts above the standard or within five percentage of the standard. The maximum of this estimate or present spending is used.

## 5. Conclusions

The primary objectives of the Second Supplemental Report are to discuss corrections that have been made to the data used in the first Supplemental Report and to report results of cost function analysis using the corrected data. It presents results for the original model with corrected data and for several alternative models, which have significantly better forecasting accuracy. The primary change in the model, which resulted in better forecasting accuracy was the replacement of the instrument, child poverty rate in peer districts with similar enrollment and property values, with the percent economically disadvantaged for the same peer group. Making this one change resulted in significantly better forecasting accuracy and projected spending increases similar to those presented in the first Supplemental Report. In addition, I presented another model with several additional changes, which had the best forecasting accuracy of the models I looked at. It also had projected spending increases similar to the first Supplemental Report.

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**Table SB2-1a. First-Stage Regression Results for Value-Added Performance Measure, Original Model With Corrected Data**

| Variables   | Model 2 (District-level Value-added) |         | Model 2 (Student-level Value-added) |         |
|---|--------------------------------------|---------|-------------------------------------|---------|
|   | Coefficient                          | p-value | Coefficient                         | p-value |
| Intercept   | 185.371                              | 0.000   | 193.310                             | 0.000   |
| <b>Cost variables</b>   |                                      |         |                                     |         |
| Student poverty (percent economically disadvantaged students)   | -0.001                               | 0.807   | -0.004                              | 0.261   |
| Urban student poverty (Percent economically disadvantaged multiplied by percent of the population in urban areas) | 0.001                                | 0.851   | 0.001                               | 0.678   |
| Percent special education students with speech and learning disabilities  | 0.076                                | 0.000   | 0.101                               | 0.000   |
| Percent special education students with other disabilities  | -0.009                               | 0.799   | 0.029                               | 0.374   |
| Percent of students in high school  | -0.023                               | 0.135   | -0.016                              | 0.309   |
| Square miles <sup>a</sup>   | -0.248                               | 0.000   | -0.317                              | 0.000   |
| <b>Enrollment categories</b>  |                                      |         |                                     |         |
| 251 to 500 students   | -1.613                               | 0.000   | -1.770                              | 0.000   |
| 501 to 750 students   | -2.034                               | 0.000   | -2.452                              | 0.000   |
| 751 to 1,000 students   | -1.715                               | 0.000   | -2.206                              | 0.000   |
| 1,001 to 1,500 students   | -1.573                               | 0.000   | -2.224                              | 0.000   |
| 1,501 to 2,000 students   | -1.192                               | 0.002   | -1.686                              | 0.000   |
| 2,001 to 3,000 students   | -1.656                               | 0.000   | -2.344                              | 0.000   |
| 3,001 to 5,000 students   | -1.451                               | 0.001   | -2.090                              | 0.000   |
| 5,001 to 10,000 students  | -2.257                               | 0.000   | -3.326                              | 0.000   |
| 10,001 to 25,000 students   | -2.292                               | 0.000   | -3.237                              | 0.000   |
| 25,0001 to 50,000 students  | -2.128                               | 0.003   | -3.115                              | 0.000   |
| Over 50,000 students  | -1.740                               | 0.018   | -2.967                              | 0.000   |
| <b>Efficiency-related variables</b>   |                                      |         |                                     |         |
| Per pupil state aid <sup>a</sup>  | -2.371                               | 0.363   | -2.528                              | 0.275   |
| Per pupil state aid squared <sup>a</sup>  | 0.158                                | 0.323   | 0.193                               | 0.174   |
| Percent commercial/industrial property  | -0.003                               | 0.534   | -0.002                              | 0.679   |
| Herfindahl enrollment index (labor market)  | 0.030                                | 0.932   | 0.290                               | 0.401   |
| Percent of population 65 years or older (2000)  | -0.081                               | 0.032   | -0.100                              | 0.010   |
| Percent of population 65 years or older (2000) squared  | 0.001                                | 0.260   | 0.001                               | 0.216   |
| Percent of adults who are college graduates (2000)  | 0.008                                | 0.285   | 0.015                               | 0.033   |
| <b>Instruments</b>  |                                      |         |                                     |         |
| Predicted salary <sup>a</sup>   | -16.497                              | 0.000   | -17.410                             | 0.000   |
| Average for other districts in enrollment/property value category:  |                                      |         |                                     |         |
| Child poverty rate (Census)   | -0.338                               | 0.000   | -0.433                              | 0.000   |
| Percent of students in high school  | 0.160                                | 0.000   | 0.217                               | 0.000   |
| Percent Black students  | 0.127                                | 0.000   | 0.186                               | 0.000   |
| Percent Hispanic students   | 0.116                                | 0.000   | 0.149                               | 0.000   |
| Average for other districts in labor market area:   |                                      |         |                                     |         |
| Percent Black students  | 0.036                                | 0.000   | 0.025                               | 0.002   |
| Percent Hispanic students   | 0.011                                | 0.000   | 0.010                               | 0.000   |
| Sample Size   |                                      |         | 4632                                |         |
| Adjusted R-square   | 0.08                                 |         | 0.14                                |         |

Note: Estimated with linear CLS regression with the value-added for percent of students reaching commended level for math and reading TAKS as the dependent variables. Variables expressed in dollar values are adjusted to be 2011 dollars using the CPI-U. Robust standard errors are used for hypothesis testing (controlling for clustering at the district level).

<sup>a</sup> Expressed as a natural logarithm

**Table SB2-1b. First-Stage Regression Results for Value-Added Performance Measure, Model With Best Forecasting Accuracy and Corrected Data**

| Variables   | Model 2 (District-level Value-added) |         | Model 2 (Student-level Value-added) |         |
|---|--------------------------------------|---------|-------------------------------------|---------|
|   | Coefficient                          | p-value | Coefficient                         | p-value |
| Intercept   | 189.896                              | 0.000   | 215.967                             | 0.000   |
| <b>Cost variables</b>   |                                      |         |                                     |         |
| Student poverty (percent economically disadvantaged students)   | -0.003                               | 0.369   | -0.007                              | 0.053   |
| Urban student poverty (Percent economically disadvantaged multiplied by percent of the population in urban areas) | 0.002                                | 0.434   | 0.003                               | 0.256   |
| Percent special education students with non-speech and learning disabilities                                      | 0.002                                | 0.953   | 0.045                               | 0.176   |
| Percent of students in high school  | -0.010                               | 0.516   | 0.001                               | 0.953   |
| Square miles <sup>a</sup>   | -0.240                               | 0.000   | -0.328                              | 0.000   |
| <b>Enrollment categories</b>  |                                      |         |                                     |         |
| 251 to 500 students   | -2.582                               | 0.000   | -2.977                              | 0.000   |
| 501 to 750 students   | -2.879                               | 0.000   | -3.521                              | 0.000   |
| 751 to 1,000 students   | -2.582                               | 0.000   | -3.293                              | 0.000   |
| 1,001 to 1,500 students   | -2.182                               | 0.000   | -2.959                              | 0.000   |
| 1,501 to 2,000 students   | -1.794                               | 0.000   | -2.406                              | 0.000   |
| 2,001 to 3,000 students   | -1.910                               | 0.000   | -2.628                              | 0.000   |
| 3,001 to 5,000 students   | -1.710                               | 0.000   | -2.372                              | 0.000   |
| 5,001 to 10,000 students  | -2.040                               | 0.001   | -3.060                              | 0.000   |
| 10,001 to 25,000 students   | -2.073                               | 0.001   | -2.958                              | 0.000   |
| 25,001 to 50,000 students   | -1.851                               | 0.009   | -2.758                              | 0.000   |
| Over 50,000 students  | -1.391                               | 0.053   | -2.532                              | 0.000   |
| <b>Efficiency-related variables</b>   |                                      |         |                                     |         |
| Per pupil state aid <sup>f</sup>  | -0.266                               | 0.936   | -0.778                              | 0.802   |
| Per pupil state aid squared <sup>f</sup>  | 0.036                                | 0.858   | 0.094                               | 0.616   |
| Percent commercial/industrial property  | -0.003                               | 0.549   | -0.003                              | 0.485   |
| Herfindahl enrollment index (labor market)  | -0.302                               | 0.380   | -0.144                              | 0.669   |
| Percent of population 65 years or older (2000)  | -0.033                               | 0.007   | -0.047                              | 0.000   |
| Percent of population 5 to 17 years old   | 0.044                                | 0.029   | 0.054                               | 0.006   |
| Percent of adults who are college graduates (2000)  | 0.001                                | 0.831   | 0.005                               | 0.438   |
| <b>Instruments</b>  |                                      |         |                                     |         |
| Predicted salary <sup>a</sup>   | -17.761                              | 0.000   | -20.149                             | 0.000   |
| Average for other districts in enrollment/property value category:  |                                      |         |                                     |         |
| Percent economic disadvantage   | -0.150                               | 0.000   | -0.207                              | 0.000   |
| Percent of students in high school  | 0.215                                | 0.000   | 0.276                               | 0.000   |
| Percent Black students  | 0.101                                | 0.001   | 0.159                               | 0.000   |
| Percent Hispanic students   | 0.103                                | 0.000   | 0.142                               | 0.000   |
| Average for other districts in labor market area:   |                                      |         |                                     |         |
| Percent Black students  | 0.033                                | 0.000   | 0.021                               | 0.009   |
| Percent Hispanic students   | 0.007                                | 0.015   | 0.005                               | 0.051   |
| Sample Size   | 4631                                 |         |                                     |         |
| Adjusted R-square   | 0.68                                 |         | 0.68                                |         |

Note: Estimated with linear OLS regression with the value-added for percent of students reaching commended level for math and reading TAKS as the dependent variables. Variables expressed in dollar values are adjusted to be 2011 dollars using the CPI-U. Robust standard errors are used for hypothesis testing (controlling for clustering at the district level).

<sup>a</sup> Expressed as a natural logarithm.

**Table SB2-2a. First-Stage Regression Results for Teacher Salaries,  
Original Model With Corrected Data**

| Variables   | Model 2 (District-level<br>Value-added) |         | Model 2 (Student-level<br>Value-added) |         |
|---|---|---------|--|---------|
|   | Coefficient                             | p-value | Coefficient                            | p-value |
| Intercept   | 2.780                                   | 0.001   | 2.780                                  | 0.001   |
| <b>Cost variables</b>   |   |         |  |         |
| Student poverty (percent economically disadvantaged stud  | 0.000                                   | 0.079   | 0.000                                  | 0.079   |
| Urban student poverty (Percent economically<br>disadvantaged multiplied by percent of the population in<br>urban areas) | 0.000                                   | 0.837   | 0.000                                  | 0.837   |
| Percent special education students with speech and<br>learning disabilities   | -0.002                                  | 0.004   | -0.002                                 | 0.004   |
| Percent special education students with other disabilities  | 0.000                                   | 0.919   | 0.000                                  | 0.919   |
| Percent of students in high school  | 0.000                                   | 0.832   | 0.000                                  | 0.832   |
| Square miles <sup>a</sup>   | -0.001                                  | 0.784   | -0.001                                 | 0.784   |
| <b>Enrollment categories</b>  |   |         |  |         |
| 251 to 500 students   | -0.022                                  | 0.031   | -0.022                                 | 0.031   |
| 501 to 750 students   | -0.031                                  | 0.005   | -0.031                                 | 0.005   |
| 751 to 1,000 students   | -0.016                                  | 0.144   | -0.016                                 | 0.144   |
| 1,001 to 1,500 students   | -0.036                                  | 0.003   | -0.036                                 | 0.003   |
| 1,501 to 2,000 students   | -0.027                                  | 0.025   | -0.027                                 | 0.025   |
| 2,001 to 3,000 students   | -0.043                                  | 0.004   | -0.043                                 | 0.004   |
| 3,001 to 5,000 students   | -0.020                                  | 0.166   | -0.020                                 | 0.166   |
| 5,001 to 10,000 students  | -0.027                                  | 0.175   | -0.027                                 | 0.175   |
| 10,001 to 25,000 students   | 0.004                                   | 0.853   | 0.004                                  | 0.853   |
| 25,001 to 50,000 students   | -0.013                                  | 0.578   | -0.013                                 | 0.578   |
| Over 50,000 students  | -0.002                                  | 0.944   | -0.002                                 | 0.944   |
| <b>Efficiency-related variables</b>   |   |         |  |         |
| Per pupil state aid <sup>a</sup>  | -0.115                                  | 0.128   | -0.115                                 | 0.128   |
| Per pupil state aid squared <sup>a</sup>  | 0.006                                   | 0.181   | 0.006                                  | 0.181   |
| Percent commercial/industrial property  | 0.000                                   | 0.090   | 0.000                                  | 0.090   |
| Herfindahl enrollment index (labor market)  | 0.104                                   | 0.000   | 0.104                                  | 0.000   |
| Percent of population 65 years or older (2000)  | -0.008                                  | 0.000   | -0.008                                 | 0.000   |
| Percent of population 65 years or older (2000) squared  | 0.000                                   | 0.000   | 0.000                                  | 0.000   |
| Percent of adults who are college graduates (2000)  | -0.001                                  | 0.009   | -0.001                                 | 0.009   |
| <b>Instruments</b>  |   |         |  |         |
| Predicted salary <sup>a</sup>   | 0.777                                   | 0.000   | 0.777                                  | 0.000   |
| Average for other districts in enrollment/property value category:  |   |         |  |         |
| Child poverty rate (Census)   | 0.000                                   | 0.415   | 0.000                                  | 0.415   |
| Percent of students in high school  | 0.005                                   | 0.000   | 0.005                                  | 0.000   |
| Percent Black students  | 0.002                                   | 0.007   | 0.002                                  | 0.007   |
| Percent Hispanic students   | 0.000                                   | 0.599   | 0.000                                  | 0.599   |
| Average for other districts in labor market area:   |   |         |  |         |
| Percent Black students  | -0.001                                  | 0.075   | -0.001                                 | 0.075   |
| Percent Hispanic students   | 0.001                                   | 0.000   | 0.001                                  | 0.000   |
| Sample Size   | 4632                                    |         |  |         |
| Adjusted R-square   | 0.05                                    |         | 0.09                                   |         |

Note: Estimated with linear OLS regression with the natural logarithm for adjusted teacher salaries as the dependent variables. Variables expressed in dollar values are adjusted to be 2011 dollars using the GDP price index for state and local government consumption and investments. Robust standard errors are used for hypothesis testing (controlling for clustering at the district level).

<sup>a</sup> Expressed as a natural logarithm

**Table SB2-2b. First-Stage Regression Results for Teacher Salaries,  
Model With Best Forecasting Accuracy and Corrected Data**

| Variables   | Model 2 (District-level Value-added) |         | Model 2 (Student-level Value-added) |         |
|---|--------------------------------------|---------|-------------------------------------|---------|
|   | Coefficient                          | p-value | Coefficient                         | p-value |
| Intercept   | 3.274                                | 0.000   | 3.274                               | 0.000   |
| <b>Cost variables</b>   |                                      |         |                                     |         |
| Student poverty (percent economically disadvantaged student)  | 0.000                                | 0.036   | 0.000                               | 0.036   |
| Urban student poverty (Percent economically disadvantaged multiplied by percent of the population in urban areas) | 0.000                                | 0.622   | 0.000                               | 0.622   |
| Percent special education students with non-speech and learning disabilities                                      | 0.000                                | 0.784   | 0.000                               | 0.784   |
| Percent of students in high school  | 0.000                                | 0.729   | 0.000                               | 0.729   |
| Square miles <sup>a</sup>   | -0.002                               | 0.253   | -0.002                              | 0.253   |
| <b>Enrollment categories</b>  |                                      |         |                                     |         |
| 251 to 500 students   | -0.037                               | 0.000   | -0.037                              | 0.000   |
| 501 to 750 students   | -0.053                               | 0.000   | -0.053                              | 0.000   |
| 751 to 1,000 students   | -0.038                               | 0.001   | -0.038                              | 0.001   |
| 1,001 to 1,500 students   | -0.060                               | 0.000   | -0.060                              | 0.000   |
| 1,501 to 2,000 students   | -0.050                               | 0.000   | -0.050                              | 0.000   |
| 2,001 to 3,000 students   | -0.074                               | 0.000   | -0.074                              | 0.000   |
| 3,001 to 5,000 students   | -0.048                               | 0.001   | -0.048                              | 0.001   |
| 5,001 to 10,000 students  | -0.070                               | 0.000   | -0.070                              | 0.000   |
| 10,001 to 25,000 students   | -0.039                               | 0.052   | -0.039                              | 0.052   |
| 25,0001 to 50,000 students  | -0.052                               | 0.027   | -0.052                              | 0.027   |
| Over 50,000 students  | -0.042                               | 0.096   | -0.042                              | 0.096   |
| <b>Efficiency-related variables</b>   |                                      |         |                                     |         |
| Per pupil state aid <sup>f</sup>  | -0.168                               | 0.035   | -0.168                              | 0.035   |
| Per pupil state aid squared <sup>f</sup>  | 0.010                                | 0.052   | 0.010                               | 0.052   |
| Percent commercial/industrial property  | 0.000                                | 0.338   | 0.000                               | 0.338   |
| Herfindahl enrollment index (labor market)  | 0.102                                | 0.000   | 0.102                               | 0.000   |
| Percent of population 65 years or older (2000)  | -0.002                               | 0.000   | -0.002                              | 0.000   |
| Percent of population 5 to 17 years old   | 0.002                                | 0.019   | 0.002                               | 0.019   |
| Percent of adults who are college graduates (2000)  | -0.001                               | 0.016   | -0.001                              | 0.016   |
| <b>Instruments</b>  |                                      |         |                                     |         |
| Predicted salary <sup>a</sup>   | 0.748                                | 0.000   | 0.748                               | 0.000   |
| Average for other districts in enrollment/property value category:  |                                      |         |                                     |         |
| Percent economic disadvantage   | -0.002                               | 0.000   | -0.002                              | 0.000   |
| Percent of students in high school  | 0.006                                | 0.000   | 0.006                               | 0.000   |
| Percent Black students  | 0.004                                | 0.000   | 0.004                               | 0.000   |
| Percent Hispanic students   | 0.001                                | 0.007   | 0.001                               | 0.007   |
| Average for other districts in labor market area:   |                                      |         |                                     |         |
| Percent Black students  | 0.000                                | 0.204   | 0.000                               | 0.204   |
| Percent Hispanic students   | 0.001                                | 0.000   | 0.001                               | 0.000   |
| Sample Size   | 4631                                 |         |                                     |         |
| Adjusted R-square   | 0.67                                 |         | 0.67                                |         |

Note: Estimated with linear CLS regression with the natural logarithm for adjusted teacher salaries as the dependent variables. Variables expressed in dollar values are adjusted to be 2011 dollars using the GDP price index for state and local government consumption and investments. Robust standard errors are used for hypothesis testing (controlling for clustering at the district level).

<sup>a</sup> Expressed as a natural logarithm.