The Legacy of *Rodriguez*: Three Decades of School Finance Reform in Texas

by

Jennifer Imazeki
Department of Economics
San Diego State University
5500 Campanile Drive
San Diego, CA 92182
(619) 594-5012
jimazeki@mail.sdsu.edu

and

Andrew Reschovsky
Robert M. La Follette School of Public Affairs
University of Wisconsin-Madison
1225 Observatory Drive
Madison, WI 53706
(608) 263-0447
reschovsky@lafollette.wisc.edu

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Introduction

Over three decades ago a federal district court in Texas ruled that the state's heavy reliance on the local property tax to fund public education violated the equal protection clause of the U.S. constitution because the wide disparities among school districts in per-pupil spending resulted primarily from differences in the assessed value of property among school districts. In a 5-4 decision, the U.S. Supreme Court in *San Antonio Independent School District v. Rodriguez* (1973) reversed the decision of the district court. The Supreme Court's decision held that education, although certainly important, is not a "fundamental right" guaranteed in the Constitution, and that property wealth should not be considered a "suspect classification." The Court also argued that the preservation of local school district control over education provided a compelling reason for the State of Texas to maintain its system for funding elementary and secondary education.

The significance of *Rodriguez* went well beyond Texas. In effect, the decision closed the door to future challenges of state school funding systems based on equal protection claims. Ever since that ruling, all school finance cases, in Texas and throughout the country, have been argued on the basis of violations to state constitutional provisions.

The Supreme Court in the *Rodriguez* decision emphasized that the state was the appropriate level of government to address the issue of public school funding, stating that:

> The consideration and initiation of fundamental reforms with respect to taxation and education are matters reserved for the legislative processes of the various States, and we do no violence to the values of federalism and separation of powers by staying our hand (Section IV).

While rejecting the plaintiff's core arguments, the Court appeared to suggest that it anticipated that the state of Texas would address the education equity issues through the normal political process. In its decision, the Court argued that:

> The need is apparent for reform in tax systems, which may well have relied too long and too heavily on the local property tax. And certainly innovative thinking as to public education, its methods, and its funding is necessary to assure both a higher level of quality and greater uniformity of opportunity…But the ultimate solutions must come from the lawmakers and from the democratic pressures of those who elect them (Section IV).

The purpose of this paper is to explore what happened in Texas in the aftermath of the *Rodriguez* decision. We will begin with a brief review of the judicial and legislative history related to school finance in Texas in the years since the decision. Our primary goal in this paper is to provide answers to two questions. First, we want to explore whether Texas has achieved or come close to achieving the school funding equity objective that was at the core of the *Rodriguez* plaintiffs' case. Drawing on the work of Coons, Clune, and Sugerman (1970), the argument at the center of the case was that although school districts should be free to decide how much they wanted to spend per student, these per-student amounts should not be determined by a school district's property wealth. This condition, which has come to be called *access equality*, is achieved when school districts that impose identical effective property tax rates on their residents are able to spend the same per-students amounts.

Although *Rodriguez* focused on access equality, more recent court cases, in Texas and other states, have shifted focus to equality of outcomes. Specifically, many cases have now argued that states should provide students with equal access to an *adequate* education. Thus, the second question we pose in this paper centers on the linkage between available resources and student academic achievement. As we describe in more detail below, Texas has been in the forefront of establishing student performance goals based on a set of standardized tests. Since the early 1990s, Texas has been systematically evaluating student achievement and using the results of these tests to assess the performance of schools and school districts. Given this history, we want to ask whether the current school funding system is providing school districts throughout

the state with sufficient revenues to educate students so that they can meet the performance and accountability standards imposed by the state. If the answer to this question is "no", we want to explore whether the observed "underfunding" of school districts is related to the socio-economic, racial or ethnic composition of their students, or to identifiable characteristics of school districts, such as their size and location.

Our analysis demonstrates that public school funding in Texas is considerably more equitable today than it was at the time of the *Rodriguez* case. Student performance on standardized tests has also improved dramatically. Despite these clear gains, the past few years have been characterized by growing inequalities in per pupil revenue among districts. At the same time, according to our estimates, the state's system of school finance fails to provide adequate revenues to a set of school districts with above-average concentrations of students from minority and low-income families. Whether the legislature will address these growing equity and adequacy issues is uncertain. In a recent ruling, the Texas Supreme Court appeared to indicate that it intends to play an ongoing role in ensuring that the legislature fulfills its constitutionally-mandated school funding obligations.

A Brief History of Post-*Rodriguez* School Finance Litigation in Texas

Although 11 years passed before another suit was filed in Texas challenging the equity of the state's school funding system, following the *Rodriguez* decision the legislature did take limited steps to increase state education funding and reduce fiscal inequalities among school districts. In 1984, the Mexican American Legal Defense and Education Fund (MALDEF) filed a suit (*Edgewood Independent School District et al. v. Kirby et al.)* in which they argued that Texas's heavy reliance on the property tax and the existence of a large variation in per-pupil property values led to a big disparity in spending per pupil across districts. The plaintiffs argued

that even if school districts with relatively little property wealth per pupil levied high property tax rates, they were unable to raise sufficient revenue to finance education programs that met the state's minimum education requirements. The plaintiffs argued that the existing funding system violated both the equal protection clause and education clause of the Texas Constitution.

In October 1989, the Texas Supreme Court ruled in favor of the plaintiffs and ordered the state legislature to develop an equitable system of school finance in time for the 1990-91 school year. What followed were a series of school finance plans enacted by the legislature, successful court challenges of these legislative funding plans, and finally, the enactment of a school finance plan (Senate Bill 7) that the Texas Supreme Court (in a case known as *Edgewood IV*) ruled was constitutional.[1]

Senate Bill 7 was designed to achieve fiscal neutrality. It established a system of state aid to education that consisted of three major elements: a foundation formula that provides school districts with a guaranteed amount of money per pupil if they agree to levy a minimum property tax rate; a guaranteed tax base formula that guarantees all districts a certain amount of money for each extra cent of property tax effort above the minimum (with a tax rate cap of $1.50 per $100 of assessed valuation); and a "recapture" provision, which initially capped the revenue-raising capacity of all school districts with property wealth above $280,000 per pupil by in effect requiring that the tax revenue from "excess" property wealth be used to fund the state's equalization system.[2] The legislation also established a statewide accountability system. The basis of the accountability system was student performance on a series of standardized reading, writing, and math tests.

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[1] For a more detailed history of school finance reform in Texas since *Rodriguez*, see Imazeki and Reschovsky (2004b) and Legislative Budget Board (2001).

[2] For the 2004-05 school year, the foundation amount was equal to $2,537 per student, the required tax rate equal to $0.86 per $100 of assessed value, the guaranteed tax base was set at $271,400, and tax base per pupil above which revenue was "recaptured" was equal to $305,000.

In 2004, more than 300 school districts joined together as plaintiffs and intervenors to once again challenge the constitutionality of the Texas school finance system. The plaintiff districts in *West Orange-Cove et al. v. Neeley et al.* (2004) argued that the existing $1.50 statutory property tax rate cap has become both a floor and a ceiling for most school districts, and that under the current funding system school districts do not have access to sufficient resources to provide a constitutionally-mandated "general diffusion of knowledge." The plaintiffs argued that because of the falling share of state aid and the rising costs of meeting state accountability standards, school districts have lost all "meaningful discretion" over their property tax rates. Furthermore, because so many school districts have reached the $1.50 rate cap, the school property tax has become a *de facto* state ad valorem property tax, something that is constitutionally prohibited in Texas. The plaintiffs also presented evidence, based on an econometric study that we conducted (Imazeki and Reschovsky, 2004a), that most school districts must increase spending in order to be able to meet the state's accountability standards. The plaintiffs argued that the school finance system is unconstitutional because it fails to provide the majority of school districts with access to sufficient resources to enable them to provide an *adequate* education for their students.

In November 2004, Travis County District Court presiding judge, John Dietz, issued a ruling in which he accepted the plaintiffs' basic arguments and declared the Texas school funding system to be unconstitutional. The ruling was appealed directly to the Texas Supreme Court, which in a November 2005 7-1 opinion (*Neeley et al. v. West Orange-Cove et al.*, 2005) struck down the state's school funding system. The Court gave the Legislature until June 1, 2006 to come up with an acceptable funding system. In its ruling, the Court concluded that the funding system had evolved into an unconstitutional state property tax because most school districts no

longer have any meaningful discretion to set their local property tax rates. While the Court accepted the trial court's definition of educational adequacy, it reversed the ruling by Judge Dietz that the school funding system is inadequate. However, the Court included language in its opinion that characterizes the current school funding situation as an "impending constitutional violation" (Opinion at 92). In reaching this conclusion, the Court cited a number of characteristics of the current system, such as wide gaps in the academic performance of students characterized by race, economic status, and proficiency in English, which, in the view of the Court, cannot be addressed without significant changes being made in the existing school funding system.[3]

Has the Texas School Finance System Become More Equitable?

Both the *Rodriguez* and the *Edgewood* litigation were motivated in large part by the disparity in available revenues per pupil that resulted from large variations in per-pupil property wealth across school districts. Heavy reliance on the local property tax meant that low-wealth districts could not raise sufficient revenue to finance the quality of education mandated by the state, even when levying high tax rates. In this section we want to investigate the ways in which school finance reform in Texas over the past three decades has impacted equity in school financing. We will focus on three distinct, yet different, measures of school funding equity. All three focus on the distribution of dollars available for the funding of public education. In the next section, we will return to the question of the relationship between fiscal resources and student academic performance.

The first equity measure we consider is *equality* in revenue per pupil. Perhaps because the concept is very easy to understand, state legislators and the public often focus on the differences in the amount of money per pupil that school districts across the state have available to

[3] For a detailed analysis of the Supreme Court's decision, see Bramblett, Thompson, et al. (2005).

spend. Under this equity standard, large differences in revenue per pupil are considered inequitable. No distinction is made concerning the reasons for any observed differences across school districts in revenues per pupil. The intellectual foundation of the *Rodriguez* and the *Edgewood* cases drew on two alternative measures of school funding equity—*wealth neutrality* and *access equity*. In a school funding system that could be characterized by wealth neutrality, there would be no observed correlation between property wealth per pupil and per-pupil revenues (or spending). Revenue per pupil may vary among school districts, but the observed variation would be unrelated to the per-pupil property wealth of school districts. School finance experts originally believed that access equality would result in wealth neutrality. This means that a school funding system that guaranteed that districts with equal tax rates have available equal amounts of revenue per pupil would automatically achieve wealth neutrality. In other words, any differences in revenues per pupil would be attributable to differences in locally-determined property tax rates, and the choice of tax rates would be unrelated to differences across districts in property wealth. In response in large part to the court rulings in the *Edgewood* cases, the funding system enacted by the legislature was explicitly designed to provide school districts with equal revenues for equal tax effort.

In a well-known article, Martin Feldstein (1975) demonstrates that it is in fact highly unlikely that the choice of both tax rates and desired spending on education would be uncorrelated with school district wealth. The result is that while achievement of the equity goal of access equality may be an entirely appropriate judicial and legislative goal, achieving it will almost certainly not result in wealth neutrality.[4]

[4] For a more detailed discussion of this issue, see Reschovsky (1994).

The data in Table 1 provides an initial picture of the overall impact the state school funding system has on the distribution of resources available to fund education. As expected, the first

Table 1

Equalized Property Value and Revenue per Pupil
Texas K-12 School Districts, 2004-05

	Equalized Property Value per pupil	Revenue Per Pupil
Number of districts	965	965
Mean	$289,687	$9,203
Standard Deviation	322,760	2,218
Range	3,413,498	23,390
Minimum	21,533	4,723
Maximum	3,435,031	28,113
Restricted Range	423,661	3,942
10th percentile	98,502	7,471
90th percentile	522,163	11,413
Coefficient of variation	1.114	0.241
Gini coefficient	0.423	0.109
Wealth elasticity		0.091

Source: Author's calculations based on data from the Texas Education Agency, *Academic Excellence Indicator System* .

column shows that large disparities across districts exist in equalized property values per district. The extent of the variation in property wealth per student can be measured by the coefficient of variation, which indicates that the standard deviation of the distribution of property wealth is actually 11 percent greater than the average value of property wealth per student. Although the per-pupil property value in the richest district is 160 times the property value in the poorest district, the spatial inequality in per-pupil property wealth in Texas has actually diminished since the time of the first *Edgewood* case, when the ratio was 700-to-1. We can ignore the most wealthy and most property-poor districts by ranking districts by property wealth per pupil and comparing the district at the 10^{th} percentile with the district at the 90^{th} percentile. The data indicate that per-pupil property wealth is 5.3 times higher in the 90^{th} as compared to the 10^{th} percentile district. This implies that if the state played no role in the financing of public education, at any given rate of property taxation, property wealthy districts could spend vastly more money per pupil than poorer districts.

The data in the second column include the sum of property tax revenue and revenue from state and federal sources, and thereby provide a picture of the equity-enhancing impact of the state equalization system. The data show that the state funding system has had a big impact on the distribution of revenue available to fund public education. Relative to the distribution of the property tax base, revenue per pupil is fairly evenly distributed across school districts, with per-pupil revenue available to the 90^{th} percentile district only about 50 percent higher than the revenue available to the 10^{th} percentile district. As indicated by the 0.241 coefficient of variation, the standard deviation of the distribution of revenue per pupil is less than a quarter of the average value. Also, at 0.109, the Gini coefficient, a commonly used distributional statistic, indicates that revenues per pupil are relatively evenly distributed across the state.

The use of a foundation formula supplemented by a guaranteed tax base formula combined with a property tax cap suggests that the variation in revenues per pupil should be quite modest for all school districts with per-pupil property wealth below the guaranteed tax base of $271,400. One indication that these expectations are being at least partially met is that the coefficient of variation of revenue per pupil for the 757 school districts with per-pupil property values below the guaranteed level is 0.188, about 25 percent smaller than the coefficient of variation across all school districts. An alternative way to assess the effectiveness of the school funding system that has been adopted in response to the *Edgewood* rulings is to ask whether revenues per pupil have become more equally distributed over time. In previous work (Imazeki and Reschovsky, 2004b), we noted that it has. Using the coefficient of variation and the Gini coefficient, the data indicate that inequality as measured by these two indices was greatest in 1991-92, the year prior to the implementation of the Foundation School Plan, the school funding system implemented in response to the *Edgewood* ruling. Over the past dozen years, there has been a modest, and somewhat uneven, movement towards more equality in per-pupil school revenue.

One criticism of judging school funding equality by looking at the distribution of school district revenue per capita is that because of factors outside their control some school districts will need to spend more money per pupil in order to provide any given quality of education. In other words, the *costs* of education vary across school districts. If districts with relatively low per pupil revenues face above average costs, and/or districts with relatively high per pupil revenues face below average costs, then the data presented in Table 1 would understate the funding inequalities that exist among school districts. To account for the potential impact of cost differences on fiscal resource equity, we divide each school district's per pupil revenues by the value of an index of costs that is described in the next section of the paper. The results of this calculation in-

dicate that after adjusting for cost differences across districts, the school finance system is somewhat less equalizing. The coefficient of variation and the Gini coefficient increase by about 10 percent and the 90th percentile per capita revenue doubles. This latter result reflects the fact that school districts that enjoy the highest revenues per pupil tend to also benefit from lower than average costs.

As emphasized above, the focus of the Court in both the *Rodriguez* and the *Edgewood* cases was not equal per-pupil revenue, but rather the achievement of access equality. One way to ascertain the extent to which this goal has been achieved is to calculate what economists refer to as an average *tax-price*. Using data for 2004-05, we calculate a tax-price for each district by dividing its maintenance and operations tax rate by its revenue per pupil measured in thousands of dollars. For all K-12 school districts, the tax-price equals $0.164, which means that on average, taxpayers must pay 16.4 cents per $100 of assessed value for each thousand dollars of total revenue per student. As a measure of access equality, we look at the variation across districts in tax-prices. If tax-prices are approximately the same across all districts, this implies that all districts with the same tax rates will have the same amount of revenue per pupil to spend, and that a district that has a tax rate of, say, 10 percent higher than another district would be able to spend 10 percent more per pupil. The 2004-05 data indicate that the coefficient of variation of tax-prices is equal to 0.18. Given that the distribution of school revenues is based on a number of factors that are not directly related to property wealth, we interpret this result as indicating that Texas has been reasonably successful in achieving access equality. This conclusion is strengthened by noting that among school districts with per-pupil wealth below the guaranteed tax base level, the coefficient of variation of tax-prices equals 0.15. In fact, the data indicate that the largest deviation in tax-prices from the average value occurs among school districts with the highest property

values. Thus, the average tax-price in the wealthiest decile (defined in terms of equal number of students per decile) is $0.137, while the average tax-prices in the other nine deciles are within a few tenths of a cent of the overall average tax-price.

The final equity concept we consider is wealth neutrality. To determine the relationship between property tax wealth per pupil and total revenue per pupil, we calculate a wealth elasticity of per-pupil revenue for K-12 school districts. As indicated in Table 1, in 2004-05 there was a positive and statistically significant relationship between property wealth and school district revenue. An elasticity of 0.091, however, is quite small. The number implies that a one percent increase in property values per pupil (an increase of roughly $2,896 at the mean property value) is associated with a 0.091 percent increase in revenue per pupil, or an increase of $8.37 at the mean revenue per pupil. It is interesting to note, however, that for the 757 K-12 districts with per-pupil property wealth less than the $271,400 guaranteed tax base, the elasticity is -0.04. This number indicates that at least for the 61 percent all K-12 public school pupils who live in these 757 districts, the school funding system is approximately wealth neutral. It is also the case that the wealth neutrality of the Texas school funding system has increased over time, with a quite sharp reduction in the wealth elasticity since the late 1980s.

An analysis of equity in the Texas school funding system would not be complete without a discussion of the role played by the “Robin Hood” or, more formally, the *recapture* provisions of the system. In 2005-06, 152 K-12 school districts are subject to “recapture.” The combination of the recapture requirements and the $1.50 property tax rate cap, limits the revenue that these school districts can raise in support of their public schools. In addition, a substantial portion of the funding of the entire state aid program comes from the revenues that are “recaptured” from the wealthy districts. Thus, the very structure of the “Robin Hood” scheme both reduces the total

revenue per pupil of wealthy districts, while contributing to the revenue available to districts with less property wealth. The net result is to increase equity by each of the three measures discussed above.

This increased equity, however, comes at a substantial cost. School districts subject to recapture have strong incentives to keep as much revenue as possible out of the equalization system by finding ways to legally shelter local tax revenue. A strategy that appears to be growing in popularity involves granting new business development long-term property tax abatements in return for the business making voluntary "contributions" to the school district (Moak, 2002). Alternatively, in return for a property tax abatement, a company can promise to construct a new school building and donate it to the school district. In both these cases, the school district secures cash or in-kind funding that is not subject to recapture.

Not only are school districts subject to recapture unable to increase their spending on education to reflect the preferences of their residents, but the residents themselves face tax-prices for education that are greater than one. This implies that a dollar increase in per-pupil spending will cost residents more than a dollar per pupil. As convincingly demonstrated by Hoxby and Kuziemko (2004), the effects of recapture are capitalized into substantial reductions in property values. This not only reduces the economic welfare of the residents of recapture districts, but it reduces the level of overall tax revenue available in Texas for the funding of public education. Because residents of recapture districts receive very little direct benefit from the state aid system, they have a strong incentive to try to influence the political process in a way that minimizes the level of state support for education. As the recapture provisions limit the amount of financial support that school districts subject to recapture can spend on the public education of their chil-

dren, residents in those districts may choose to send their children to private school and to oppose proposed increases in state education aid.

We end our discussion of school funding equity by noting that the Supreme Court in its *Edgewood IV* decision created three measures to assess the equity of the funding system. First, at least 98 percent of school revenues should be within the equalization system; second, at least 85 percent of students should be in districts within the equalized funding system, and third, revenue per weighted student in "recapture" districts should be no more than $600 higher than average revenue in districts with property wealth below the guaranteed tax base. Data compiled by the Legislative Budget Board (various years) indicate that while these standards were met in the first years following the decision, in recent years, the system has failed to meet any of the standards in recent years. Primarily because the legislature has not increased the foundation level, the guaranteed tax base, or the recapture wealth level in the past few years, the Legislative Budget Board is predicting that in fiscal year 2006 less than 95 percent of the revenue will be in the equalization and fewer than 75 percent of students will be educated in districts within the equalized funding system.

Has the Texas School Finance System Achieved *Adequacy*?

Although the school finance system in Texas appears to have addressed the equity issues that were the basis for the earlier court cases, more recent litigation has moved away from a focus on the distribution of dollars to a broader concern with what those dollars can buy. In the years prior to the passage of the *No Child Left Behind Act of 2001* (NCLB), courts in a number of states ruled that their systems of public education must be structured so that all children are provided with an *adequate* education. In these states, the courts, with varying degrees of specificity, have defined the characteristics of an adequate education. It is then left to state legislatures to

devise systems of school finance that assure that local school districts have sufficient resources to meet their states' adequacy standards. With the passage of the *No Child Left Behind Act of 2001* (NCLB), all states are now required to test students on an annual basis and to ensure that all students make *adequate yearly progress* towards meeting state standards of academic proficiency.

In Texas, one of the arguments put forward by the plaintiffs in *Orange Cove v. Neeley et al* was that the school funding system is unconstitutional because it fails to provide school districts with sufficient resources to provide an *adequate* education. Embedded in this argument is the understanding that equal dollars do not guarantee equal outcomes. Thus, states that have managed to equalize revenues or attain fiscal neutrality may still exhibit large disparities in student outcomes. There may still be students who are not receiving an adequate education because the amount of money necessary to achieve a particular performance standard may be different across districts as a result of variations in costs, for reasons that are outside the control of the districts. For example, some districts, because of their geographic location or the composition of their student bodies, may need to pay higher salaries than other districts to attract teachers of the same quality. Or a district with a high concentration of students from poor families or from families where English is not spoken in the home may need additional resources (in the form of smaller classes or specialized instructors) to reach a given achievement goal.

In this section we explore this claim by first establishing the cost of adequacy; that is, by determining how much each district must spend in order for its students to achieve adequate performance levels. Although there is much debate about how exactly to define an adequate education, in this paper we assume that the standards established as part of the Texas Accountability System provide a reasonable indicator of the education Texans believe to be adequate.

Once the cost of adequacy has been determined, we will take a closer look at those districts that are 'underfunded,' relative to the adequate amounts. We will provide quantitative estimates of the amount of additional resources needed to assure that all students have the opportunity to receive an adequate education, and then will ask whether this underfunding is related to the observable characteristics of these districts and their students.

Estimating a Cost Function for K-12 Education in Texas

Several alternative methodologies have been used for measuring the cost of an adequate education.[5] In this paper, we use an econometric approach and estimate a cost function for K-12 education in Texas. Cost functions characterize the relationship between spending per pupil by school districts and various measures of student performance, while also taking account of the characteristics of each school district's student body, other characteristics of the school district, such as size, and prices the school district must pay for inputs into the education process.[6] For a much more detailed discussion of the assumptions required to estimate a cost function for education and the consequences of alternative assumptions, see Imazeki and Reschovsky (2005).[7]

We follow the approach found frequently in the literature of estimating a log-linear cost function using 2004-05 data for 828 K-12 districts in Texas.[8] Our dependent variable is per-pupil

[5] A review of this literature suggests that most studies involve one of four methodological approaches: the professional judgment approach, the related, evidence-based approach, the successful schools approach, and the cost function (or econometric) approach. For assessments of the advantages and disadvantages of each approach, see Duncombe, Lukemeyer, and Yinger (2004) and Baker, Taylor, and Vedlitz (2004). A highly critical review of the various methodological approaches to measuring the costs of adequacy is provided by Hanushek (2005) and a response to Hanushek by Duncombe (2006).

[6] In algebraic terms, a cost function can be represented by the following equation: $E_{it} = h(S_{it}, P_{it}, Z_{it}, F_{it}, \varepsilon_{it}, u_{it})$, where per-pupil expenditures, E_{it}, are specified as a function of public school outputs, S_{it}, a vector of input prices, P_{it}, the characteristics of the student body, Z_{it}, other characteristics of the school district such as its size, F_{it}, a vector of unobserved characteristics of the school district, ε_{it}, and a random error term u_{it}

[7] In that article, we estimate a cost function very similar to the one presented here, and discuss the methodological similarities and differences between our cost function and one estimated by Gronberg, et al. (2004).

[8] Due to missing data we were forced to drop a number of school district from our cost function analysis. Nearly all the excluded school districts are very small. The 828 school districts included in our analysis educate about 97 percent of all K-12 public school students in Texas.

expenditures in 2004-05; however, because spending on transportation and food services are not directly related to student academic performance, these two categories of spending are excluded. Although student performance can, in principle, be measured in various ways, most states measure how effective school districts are in improving the academic performance of their students by relying on standardized exams. Texas is no exception, with an accountability program built around a well-developed testing system for the majority of students. Thus, one of our measures of student achievement is average passing rates on the math and reading portions of the Texas Assessment of Knowledge and Skills (TAKS).[9] As an additional school output variable we use the percentage of graduating seniors who achieve a score of 1100 or above on the SAT or a score of 24 or above on the ACT.[10]

It is important to note that the theory underlying cost functions assumes that districts act efficiently; that is, we assume that districts spend the minimum amount necessary to achieve a given performance goal (or conversely, that they maximize performance for a given budget). If districts do not act efficiently, the cost function coefficients may be biased in indeterminate ways. Other researchers have used complex statistical techniques to attempt to identify inefficient districts directly (e.g., Duncombe, Ruggiero and Yinger, 1996; McCarty and Yaisawarng, 1993; Deller and Rudnicki, 1993). These methods are, however, highly sensitive to model definition and estimation decisions, making it difficult to have confidence in the accuracy of the efficiency estimates that are generated. Here, we take a more indirect approach and assume that

[9] In estimating our cost function, we focus on annual changes in passing rates; that is, we utilize a *value-added* approach. We believe that it is appropriate to use a value-added measure of student academic performance in estimating a cost function because a primary objective of schools is to improve, on an annual basis, the knowledge and skills of students. The cost function we estimate thus includes for each school district the average of the passing rates on the TAKS reading and mathematics exams administered to students in grades 4 through 11 in 2004-05. To create a value-added measure, these results are compared to the average of the TAKS math and reading passing rates administered to the same cohort of students in grades 3 through 10 in 2003-04.

[10] The 1100 criterion for the SAT and the 24 for the ACT were established by the Texas Education Agency. This variable is calculated as the number of students who achieve the criterion score, divided by the total number of graduating students.

school districts will operate more efficiently if they face a competitive local educational market.[11] To measure public school competition, we use a Herfindahl index. This index, which has also been used by Hoxby (2000), is constructed on the assumption that metropolitan statistical areas can be used to define local "markets" for education.[12] The index increases with the amount of competition so if district efficiency is correlated with the amount of competition that the district faces, then we would expect spending to be lower in districts with higher values of the Herfindahl index.

Table 2 shows the coefficient estimates resulting from our cost function regression.[13] In general, all coefficients have the expected signs. The TAKS and College Board test measures have positive signs, indicating that it costs more to achieve higher levels of performance. Since lagged scores are a proxy for past levels of student achievement, higher scores mean that districts can spend less to achieve any given level of educational progress. The cost variables generally

[11] Lori Taylor (2000), after reviewing the literature on government competition, concludes that, "Almost across the board, researchers have found that school spending is lower, academic outcomes are better, and school-district efficiency is higher where parents have more choice in their children's education provider." (p. 7)

[12] A Herfindahl index for school districts in market k can be calculated using the following formula:

$$\text{Herfindahl Index} = 1 - \sum_i \left(\frac{enrollment_i}{enrollment_k} \right)^2$$

For a market with just one district and no competition, the index will equal zero. For a market with *n* equally-sized districts, the index will equal 1 – 1/n. Thus, the index approaches 1 as the number of districts, and presumably competition, increases. For districts that are located outside of metropolitan statistical areas, the market is defined by the county.

[13] The statistical estimation of a cost function should take special account of the fact that while decisions by local school boards to raise the level of student performance presumably will require additional spending, decisions concerning per student spending are likely to directly influence student performance; that is, per-pupil expenditures and student performance are simultaneously determined. To deal with this simultaneity, we estimate our cost function using a standard two-stage least squares. Instruments include median household income, percent residential property, percent of households with children, percent of households with college-educated head of household, and percent of households that own their homes. Estimation is also weighted by district enrollment.

Table 2

Education Cost Function, 2004-05
828 K-12 School Districts

Variable	Coefficient	t-statistic
Intercept	7.33*	15.97
Average TAKS math/reading passing rate, 2004-05	0.014*	2.1
Average TAKS math/reading passing rate, 2003-04	-0.015*	-2.57
Percent passing College Board exams	0.57*	6.81
Log of beginning teacher salaries	0.30*	6.9
Percent of students eligible for free and reduced price lunch	0.30*	5.72
Percent of students with limited English proficiency	-0.10*	-2.38
Percent of students with disabilities	0.79*	5.47
Percent African-American students	0.08*	1.96
Percent Hispanic students	0.10*	3.13
Percent of students enrolled in high school	-0.47*	-2.78
Log of student enrollment	-0.37*	-11.09
Square of log of student enrollment	0.02*	9.35
Herfindahl index	0.003	0.62
SSE	8.735	

* indicates statistically significant at the 5% level
** indicates statistically significant at the 10% level

have the expected signs and most of them are statistically significant. In particular, beginning teacher salaries,[14] the percentages of minority students, of students eligible for free and reduced-price lunch, and of students with disabilities all have coefficients that are positive and statistically significant. Consistent with previous studies, we find a U-shaped relationship between per-

[14] Data on beginning teacher salaries come from the Texas Education Agency's AEIS reports which often mischaracterizes who is a 'new' teacher. Where possible, these data were updated with clean data obtained from Lori Taylor.

pupil spending and school district size; with our estimates, average costs are lowest in a district with 39,385 students. At that point, costs begin to rise again. We find a negative relationship between per-pupil spending and the percentage of limited English proficiency (LEP) students; however, these results may reflect economies of scale in the specialized programs provided for these students. In Texas, any district with even one LEP student is required to provide extra services for that student, thus, when there are few such students, the per-pupil costs could be quite high. For LEP students, these services can range from tutoring to a full bilingual curriculum. If there are more than 20 LEP students in an elementary grade, the district must offer a bilingual program. Given these requirements, it is perhaps not surprising to find economies of scale for at least lower levels of LEP students.

Estimating the Costs of Meeting Accountability Standards

The cost function results can be used to predict how much a district must spend to meet a particular level of the outcome measures, given the actual values of its student and district characteristics. Specifically, we multiply each coefficient by the value of that variable and sum up, holding the outcome measures constant at the desired outcome level. This results in what might be called a *hypothetical* level of spending for each district. In our calculations, we also hold the Herfindahl index, our measure of efficiency, constant at the 90^{th} percentile value. This means that the predicted spending for each school district is calculated on the assumption that the school district operates with a high degree of efficiency.

In this paper, we want to ask whether school districts have sufficient revenues to meet the performance and accountability standards imposed by the state. The Texas Consolidated State Application Accountability Workbook (U.S. Department of Education, 2004) lists passing rate targets for each year that will satisfy the requirements of *No Child Left Behind*. For school year

2005-06, all students in all grades and in all sub-groups (economic disadvantaged, African-American, White, and Hispanic) need to achieve a TAKS passing rate of 53.5 percent on the reading/language arts examination and a 41.7 percent passing rate on the mathematics exam, or make "acceptable progress" towards those goals.[15] *No Child Left Behind* requires that all students achieve proficiency by 2014, meaning districts must achieve passing rates of 100 percent. The Texas accountability plans call for the Texas Education Agency to increase the required passing rates each year for the next several years.

We choose our definition of adequacy with these requirements in mind and begin by calculating the cost to achieve a TAKS passing rate of 55 percent. That is, we use the cost function estimates to predict spending when the TAKS passing rate is held constant at 55 percent. Since the Texas accountability system does not have an explicit target for the College Board exams, we simply hold this variable constant at the state average. In addition, although the target is 55 percent, the Texas accountability system also allows for the fact that some districts may be so far below the standard that expecting them to reach the standard in such a short time period is unrealistic. Districts that do not meet the absolute performance standard can still be characterized as *Academically Acceptable* if they demonstrate sufficient test score improvement (Texas Education Agency, 2005b). In Texas, this improvement is measured as the gain necessary to reach the accountability standard in two years. Therefore, rather than calculating the cost for all districts to reach the 55 percent standard, the 17 school districts in our sample that had a TAKS passing rate of less than 55 percent were instead assigned a required gain of half the difference between the 55 percent standard and their current passing rate.

[15] There are actually two elements involved in determining these standards. First, the state decides what grade on any examination will be considered passing, and second, decisions must be made about what passing rates, or increases in passing rates, will satisfy or define the standard. A 41.7 percent passing *rate* means that to meet the *acceptable* standard 42 percent of students must score high enough to pass the test according to the grading standard set by the state.

It is important to point out that the majority of districts in Texas are already achieving well above the *Acceptable* level. For these districts, a prediction of the costs of achieving a 55 percent passing rate can raise statistical difficulties; as we try to extrapolate farther away from sample values, the error associated with these predictions increases. Therefore, we also calculated the spending necessary for districts to reach a 70 percent passing rate, which approximates the standard for an accountability rating of *Recognized*.[16]

In order to see the distribution of costs most easily, we used these hypothetical spending predictions to generate a cost index. The calculation of a cost index allows for the summarization of all the information about costs into a single number for each district. For any given accountability standard, a cost index can be constructed that will indicate, for each school district, how much money that district must spend, relative to the district with average costs, for its students to meet the accountability standards. To determine the cost index value for any particular district, we divide the predicted spending number for that district by average spending in all districts. If we assume that the average per-pupil cost of education to meet some given accountability standard is $7,500, then a school district with a cost index value of 1.1 will need to spend $8,250 ($7,500 times 1.1) to reach the accountability standards. Another district with a cost index value of 0.9 will be able to meet the standards at a cost of $6,750 (0.9 times $7,500).

Table 3 demonstrates that there is a wide range of costs across school districts in Texas at both the 55 and 70 percent passing rate standards. The lowest-cost school district could meet the standard at a cost of roughly half of the district with average costs. On the other hand, the district with the highest costs would need to spend about twice as much as the district with average costs to meet the accountability standards. This wide range of costs, however, reflects the impact of a

[16] As with the *Acceptable* standard, districts that were below the 70 percent standard were assigned a required gain of half the difference between 70 percent and their current passing rate.

Table 3

Distribution of Education Cost Indicies

	Cost Index With 55 Percent Passing Rate	Cost Index With 70 Percent Passing Rate
Mean	1.00	1.00
Standard Deviation	0.23	0.21
Minimum	0.54	0.55
Maximum	1.99	1.95
At 10th Percentile	0.74	0.75
At 90th Percentile	1.31	1.29

few districts. If we rank school districts by their cost index values, the district at the 10th percentile level has costs about 25 percent below average, while the district at the 90th percentile, i.e. only 10 percent of districts have higher costs, has costs that are about 30 percent above average.

Which Texas Districts are Underfunded?

From an equity standpoint, it is important to understand whether districts that fail to meet the accountability standards are demographically different from districts that do meet the standards. That is, when districts do not have sufficient resources to meet the standards, is this 'underfunding' related to the socio-economic, racial or ethnic composition of their students, or to identifiable characteristics of school district, such as their size and location? To answer this question, we calculate the additional funding necessary to bring each district up to the accountability standard, i.e, the amount of 'underfunding'. We use our cost function results to calculate, for each school district, the predicted cost of achieving the district's actual 2005 TAKS passing rate and then subtract that cost from the predicted cost of meeting the passing rate goal. For ex-

ample, a school district with a 45 percent passing rate would need to raise its passing rate to 50 percent, one half of the way to 55. We then would say that this district is 'underfunded' by the difference between the predicted cost of achieving a 50 percent passing rate and the predicted cost of achieving a 45 percent passing rate.[17]

Table 4 shows the characteristics of districts that are currently below either the *Acceptable* (55 percent passing rate) or *Recognized* (70 percent passing rate) accountability standards. In districts that fall below the 55 percent passing rate, the average district needs $231 more per pupil to reach the A*cceptable* standard. For districts that are *Acceptable* but not *Recognized*, it would, on average, take $342 to reach the *Recognized* standard. It is important to point out that the underfunded districts are already spending more per pupil than other districts. Even in the districts that are below the 55 percent passing rate, spending is over $1,000 more per pupil than in the districts that have average passing rates above 70 percent. It is simply not enough.

The data in Table 4 also shows that the underfunded districts are much more likely to contain higher percentages of poor, minority and Limited English Proficient students. The most poorly-performing districts are also more likely to be large urban districts. This suggests that although the Texas school finance system has achieved relative equality of dollars, it is still far from providing an adequate education for all its students.

It is also important to point out that whether we use 55 percent or 70 percent as the standard, our cost predictions almost certainly represent a systematic underestimate of *all* the costs necessary to meet the accountability standards. First, in estimating costs, data problems forced us to assume that a school district met any given passing rate standard if its overall passing rate

[17] We compare the predicted cost of reaching the standard to the predicted cost of achieving the actual passing rate, rather than to actual spending, because we implicitly assume that if school districts are currently spending more than what they need to spend in order to achieve their student performance goals, they are not able to reallocate current spending in order to meet the goal because this spending is needed to fulfill other goals of the school district, ones we are unable to measure. See Imazeki and Reschovsky (2005) for further discussion of this point.

Table 4

Characteristics of "Underfunded" Districts

	Underfunded Districts		All Other Districts
	Below Acceptable	Above Acceptable & Below Recognized	
Number of districts	17	189	622
Number of students	67,691	1,609,255	2,510,523
Spending per pupil 2004-05	$8,543	$7,811	$7,441
Predicted shortfall in spending per pupil	$231	$342	
Predicted shortfall as percentage of spending per pupil	3.0%	5.1%	
TAKS average math and reading pass rate, 2004-05	50.9%	64.1%	79.1%
Percent of students eligible for free and reduced price lunch	81.1%	69.3%	46.5%
Percent of students with limited English proficiency	22.2%	13.9%	5.6%
Percent of students with disabilities	12.2%	13.1%	14.3%
Percent of students who are non-white	86.7%	69.2%	34.3%
Percent African-American students	27.9%	12.6%	7.4%
Percent Hispanic students	58.5%	55.6%	25.5%
Student enrollment	3,982	8,515	4,036
Equalized property value per pupil	$169,029	$243,127	$284,757
Urban category:			
Urban-large and mid-size cities	17.6%	15.9%	6.1%
Suburban	17.6%	20.6%	20.9%
Non-metropolitan area towns	17.7%	19.1%	17.2%
Rural	47.1%	44.5%	55.8%

for all students exceeded the standard. In fact, a central tenet of the *No Child Left Behind* legislation is that for a school district to meet an accountability standard, every subgroup of students within a school district must meet the standard. For the purposes of NCLB, these subgroups include African-American, Hispanic, White, economically disadvantaged, special education, and LEP.

Although we are not able to provide a precise estimate of the cost of having all subgroups of students meet the Texas accountability standards, we are quite certain that using the overall passing rate provides an under-estimate of the cost of every sub-group meeting the pass-

ing rate standards.[18] We reached this opinion by examining the data from a number of individual school districts. Consider, for example, the Elgin Independent School District (ISD). This district with around 3,200 students just exceeded the 55 percent passing rate standard. However, when we examine the TAKS data for the sub-groups, we observe that the passing rate for African-Americans was 18 percent below the overall passing rate, the rate for Hispanics was 11 percent below the overall rate, and the rate for economically disadvantaged students was also 11 percent below the overall rate. The clear implication of these numbers is that Elgin ISD will have to spend additional money to bring the passing rates of these sub-groups of students up to the required passing rate standard. Although we are unable to assign a particular number for the required additional costs, our cost function results imply that everything else equal, it will cost more than average to improve the educational performance of African-American, Hispanic, and economically disadvantaged students.

A second reason why we underestimate the costs of meeting the accountability standards is that our cost estimates are based on a subset of the standards facing school districts. Recall that our measure of student performance is the average score on the reading/language arts and mathematics exams. The actual accountability standards require that students meet the passing rate standards on each exam. A close look at the test score data suggests that in a number of districts, an average passing rate above the standard reflects a relative high passing rate on the reading exam and a low (below standard) passing rate on the mathematics exam. This suggests that in these districts, additional resources will need to be devoted to improving performance on the mathematics exam.

[18] Statistically, the overall passing rate and the sub-group passing rates tend to be highly correlated. This correlation makes it difficult to include the passing rates for individual groups as separate outcome measures in the cost function.

Finally, the TAKS accountability standards for 2005-06 also include passing standards for social studies and science examinations. In addition, there are new examination-linked standards for promotion from grades 3, 5, and 8, and a new 11th grade examination that will be required for graduation. Although we can provide no empirical estimate of the additional costs associated with meeting these standards, it is difficult to believe that there will be no additional costs involved.

State versus National Standards

Our statistical analysis indicates that Texas is not spending enough money to ensure that students in all its school districts can meet its state-imposed student performance standards. Even these results, however, may be painting an overly rosy picture of the school funding environment in Texas. In a national study that compares passing rates on state reading tests administered to middle school students with the performance of a sample of students in each state on a nationally administered test, Texas had the largest gap between the percentage of students deemed "proficient" on the state test and on the national test. As reported by McCombs and Carroll (2006), although 88 percent of Texas eighth graders were deemed 'proficient' on the state reading test in 2003, only 26 percent scored at the proficient level on the National Assessment of Educational Progress (NAEP) reading exam. An analysis of the 2005 administration of both tests shows this gap closed a bit (84 and 30 percent on the TAKS and NAEP, respectively), but for both math and reading, and both fourth and eighth grades (the grades tested by NAEP), the gaps between the state rates and the NAEP rates remain huge.[19] These gaps are perhaps not surprising; NCLB requires sanctions for districts that consistently perform below proficiency and states thus have an

[19] In 2005, 80 percent of fourth graders were deemed proficient on the reading TAKS versus 29 percent on the NAEP; 82 percent versus 35 percent in math; 62 percent for 8th grade math versus 29 percent; and 84 percent versus 30 percent for 8th grade reading.

incentive to set standards at levels that can be easily met by most districts. Furthermore, administering more difficult tests and raising testing standards would certainly raise the political pressure on the state to do more to improve the quality of education. Improving education would require higher state spending and tax revenue, something that is politically difficult in a state where both the Governor and the Legislature are particularly eager to reduce taxes, rather than raise them.

The gap between the student performance on the state tests and the NAEP suggests that the costs for Texas to increase its standard of student performance to, for example, the average NAEP proficiency rate in the ten top-performing states, would be substantially higher than we have estimated here. The NAEP results also suggest that the degree of underfunding that we calculated for some districts may also substantially underestimate the total cost of underfunding.

Conclusions

In Texas, the legacy of *Rodriguez* has been more than three decades of judicial and legislative activity and change in the state's system of public school funding. As shown by the November 2005 ruling by the Texas Supreme Court in *Neeley et al. v. West Orange-Cove et al*. that declared the current funding system unconstitutional, school finance reform in Texas is an ongoing story.

There is little doubt that Texas has made great strides in addressing inequities in resources, the issue that prompted the original *Rodriguez* litigation. As we have attempted to demonstrate in this paper, the distribution of revenues per pupil across Texas school districts has become more equal over time. And pushed by the Courts in a number of rulings over the past three decades, the state has developed a funding system that relative to many states has made great progress in achieving both *access equality* and *wealth neutrality*.

Texas has been in the forefront of the national movement that has focused the attention of both educators and state policymakers on student performance and school district accountability. Starting in the early 1990s, Texas was one of the first states to require the annual testing of students and the assessment of the effectiveness of schools in improving student performance. By all reports Texas has made great strides in improving the quality of education. Nevertheless, the most recent data on student performance indicate that large achievement gaps remain, especially white and minority students and between students from economically advantaged and disadvantaged families. Furthermore, student performance on the NAEP, the only nationwide test of elementary and secondary student performance, suggests that student performance in Texas lags behind national averages. Our analysis, presented in this paper, suggests that a significant number of school districts still do not receive sufficient resources to provide students with an *adequate* education, where the standard of adequacy relies on the state's own accountability system. The evidence shows that those districts that are most underfunded are also those with the highest proportions of poor and minority students.

The Supreme Court's recent ruling requires the Legislature to enact changes to the funding system by June 1, 2006. Because the Court ruled that the state's property tax cap has evolved into an unconstitutional state property tax, most of the focus of the legislature will undoubtedly be on finding new sources of revenue in order to reduce reliance on the property tax. In its ruling, the Supreme Court majority opinion said that "There is substantial evidence…that the public education system has reached the point where continued improvement [in student performance] will not be possible absent significant change, whether that change take the form of increased funding, improved efficiencies, or better methods of education (Opinion at 69)."

Observing recent political events in Texas from a distance, we are skeptical whether the legislature will respond to the Supreme Court's plea to change the school funding system in a way that will result in improved student performance. One reason the funding problems in Texas seem so intractable and finding a long-run workable solution seems so elusive is the apparently strong aversion in Texas to taxes. By all measures, Texas, a state with considerable resources, is a low tax state. In fiscal year 2004, Texas collected less in state taxes per capita than all other states. In terms of state taxes relative to personal income, Texas ranked 47th.[20]

Yet it does not appear that the costs to achieve adequacy, at least as defined in Texas, are so far out of reach. We calculate the additional cost to bring all K-12 districts up to at least the *Acceptable* level as roughly $17.5 million (in 2005 dollars); this is less than one percent of spending for those districts in 2004-05. The additional cost to bring all K-12 districts up to at least the *Recognized* level is $612.2 million, which is still only a little over two percent of spending in those districts.[21] Obviously, raising student performance to, for example, 60 percent proficiency on the NAEP tests would require substantial additional resources.

Even though Texas should be able to provide an adequate education to most of its students without an investment of vast sums of new money, our most important conclusion is that to achieve the goal of educational adequacy, money must be distributed to those school districts within the state that are the most underfunded. Although the current finance formula includes adjustments for several cost factors (such as school district size, compensatory education and bi-

[20] The latest data on own-raised general revenue of state and local governments are from fiscal year 2002. These data includes taxes, user fees and charges, and miscellaneous revenues raised by all governments within each state. In 2002, Texas ranked 37th in per capita revenue and 42nd in general revenue relative to personal income.

[21] As we emphasized earlier in the paper, our cost estimates almost certainly provide an underestimate of costs. In addition, our cost estimates assume that the 75 percent of districts that are not classified as "underfunded" would receive no additional state aid. Politics 101 suggests that it will be impossible to target new funds solely to underfunded districts, thus the true costs will undoubtedly exceeds our estimate. Nevertheless, Texas should be able to meet its own adequacy standards without a massive increase in education spending.

lingual education), in previous work we found strong evidence that the existing adjustments and weights do a poor job in reflecting the true costs of reaching student performance goals (Reschovsky and Imazeki, 2003).

It is important to keep in mind that any changes to the finance system that improve the targeting of funds to high-need districts are also likely to result in reduced wealth neutrality and access equality. Because variations in costs across districts lead to differences in the level of resources necessary to achieve a given performance level, it is impossible to expect both equal outcomes *and* equal dollar allocations. In a policy environment that is increasingly focused on educational outcomes, we need to move beyond traditional notions of fiscal equity, the focus of *Rodriguez*, to ensure that all students receive an adequate education.

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