# Competitive Incentives: School Accountability and Student Outcomes in Texas

Donald Deere and Wayne Strayer

DRAFT - Preliminary and Incomplete

Contact author:

Donald Deere
Department of Economics
Texas A&M University
College Station, TX 77843-4228

**"All Campuses Certified 'Exemplary' by the Texas Education Agency"**

Highway billboard on the outskirts of Itasca, Texas

## Introduction

In 1994 the state of Texas implemented a school accountability system that emphasizes student pass rates on standardized tests. The tests – math, reading, and writing – are based on the statewide curriculum, and are administered every spring to students in grades 3 through 8 and 10 (writing is only administered to students in grades 4, 8, and 10). Based on fraction of students that pass the tests, every school (and each district) in Texas is designated academically unacceptable, academically acceptable, recognized, or exemplary. Following the administration and grading of the tests each spring, the state releases to the public the test results (pass rates) and the accountability rating for each school.[1]

Dissemination of passing rates and accountability ratings includes publication in local newspapers and publication on the Texas Education Agency website. In addition, all schools are required by law to send a "school report card" home to parents that details the school's and district's performance on the TAAS tests and the resulting accountability ratings for the school and district. Successful districts often advertise their success – as noted in the header above.

Other than publicity and small, direct, monetary rewards, little else is explicitly tied to the test results. Mainly, the accountability system provides interested observers a low cost, easily interpreted measure of a school's performance on the TAAS tests. If parents value the information and make choices – choice of residence in particular – based on the ratings and pass rates, then the accountability system generates competition among schools and districts. It appears that the high visibility of the TAAS tests and the associated accountability ratings have placed increasing pressure on district and school administrators and teachers to achieve TAAS success. Though teachers' and principals' salaries have not yet been tied directly to TAAS passing rates, the jobs of administrators in some districts depend on results[2]. In March of 2000, the *Dallas Morning News* reported that the superintendent of Dallas schools might not renew the contracts of area superintendents, principals, and assistant principals if student progress on the

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[1] A student who achieves a standardized score of 70 or higher on a TAAS test passes. Section 2 provides an explanation of TAAS scores.

[2] For the 1998-99 school year, the state appropriated $2.5 million to be used to reward schools for high passing rates on the TAAS tests. The maximum reward a school can receive is $5,000.

TAAS tests was not achieved. Other districts have moved to shorten the length of principals' contracts, in case changes driven by TAAS results are necessary, and teachers mention increased stress associated with TAAS performance.

The results since 1994 suggest that schools and districts have made substantial adjustments in response to the increasing emphasis placed on the TAAS tests and, in particular, the passing rates. Between 1994 and 2000 average TAAS scores, the fraction of students passing each test, and the number of schools and districts receiving improved accountability ratings all increased. The fraction of all students who passed the math test increased from 58% in 1994 to 85% in 2000, and the fraction who passed the reading test increased from 74% to 86%.[3] Between 1994 and 2000 the fraction of schools that received the exemplary designation (the highest accountability rating) rose from 1.3% to 11.7% as passing rates increased. Likewise, the recognized rating (second highest rating) was given to 36.8% of schools in 1999, up from 13.1% in 1994.

How have schools generated the large gains in passing rates? Our analysis yields several interesting findings. First, improvements in resources can explain only a small fraction of the observed improvements in pass rates. Second, schools in Texas appear to have placed a greater emphasis on the tests that are used to calculate the accountability ratings relative to the tests that are not used in the ratings system. Between 1994 and 2000, the passing rates on accountability tests increased substantially relative to the passing rates on non-accountability tests. Schools are able to exempt certain students from taking the TAAS tests, and exempted students do not factor into a school's accountability rating. The data suggest that strategic exemption of lower ability students has occurred. Our findings, which indicate that public schools respond well to incentives, are also relevant to the issue of school choice and competition, where responses to (market) incentives are critical.[4]

## 1. Background and Data

Each spring, Texas public school students in grades 3 through 8 and 10 take standardized reading and mathematics tests. In addition, students in grades 4, 8, and 10 take a writing test,

[3] For comparison, national average scores on the National Assessment of Educational Progress (NAEP) exams in math and reading increased less than 1% during 1994-1999.

and eighth graders also take science and social studies tests. This battery of tests is known as the Texas Assessment of Academic Skills (TAAS) and has existed in its current form since 1994.[5] Each question on each TAAS test references a specific learning objective adopted by the Texas State Board of Education and included in the statewide curriculum (Texas Student Assessment Program Technical Digest, 1998-1999).[6] In the language of educational testing, TAAS test questions are criterion-referenced, which means that a student's score reflects performance relative to specific criteria (skills deemed important), as opposed to performance relative to other students (norm-referenced).

Table 1 reports passing rates in math and reading for grades 3-8 and 10 for the years 1994-2000. There have been substantial gains across the board. Math passing rates have increased by 20 to 30 percentage points and reading passing rates, which started from a higher base, have increased by 10 to 15 points. The larger gains in math have essentially eliminated the 15- to 20-point difference in passing rates between reading and math that existed in 1994. Gains for a cohort (across grades) can be traced along a diagonal, while gains for a grade (across cohorts) can be traced along a row. What can explain these gains?

*Changes in Resources*

The majority of economic research on the education process since the Coleman Report in 1966 has focused on the relationship between variation in outcomes, such as test scores, and variation in observable factors that serve as inputs in the "production" of the outcome (see Hanushek 1979 and 1986 for surveys of this literature). A natural starting place for explaining gains in TAAS passing rates is the traditional economic production function.

We use school level characteristics collected by the Texas Education Agency as inputs to try to explain gains in school level passing rates. These measures are expenditures on instruction per pupil, student-to-teacher ratio, average teacher experience, and average teacher salary level.

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[4] Hoxby (2000a) provides evidence of the importance of market forces (competition) on public education using student achievement data.

[5] As part of a transition from earlier standardized tests, the TAAS tests were administered to students in grades 3, 5, 7, 9 and 10 in 1990 and 1991, students in grades 3 and 7 in 1992, and students in grades 4, 8 and 10 in 1993. Prior to the TAAS, the Texas Assessment of Basic Skills (TABS) and the Texas Educational Assessment of Minimum Skills (TEAMS) were tests administered to Texas public school students. As the names indicate, these tests tested a limited range of academic skills, and no accountability system based on these tests was in place.

[6] The statewide curriculum was the Texas Essential Elements through the 1997 test administration, and the Texas Essential Knowledge and Skills (TEKS) after the 1997 test administration.

The summary statistics of these measured inputs are presented in Table 2. The reported means indicate that there have been increases in these measured inputs over time. From 1994 to 2000, real expenditures on instruction per pupil increased by 11%. At the same time, the student-to-teacher ratio fell modestly while teacher salaries rose. At least some of the increase in average teacher salaries can be attributed to teacher experience, which increased over the observed time period.

To estimate a simple education production process, we regress the change in the school-level passing rate from 1994-2000, on changes in the observed school inputs over the period.[7] This method ignores potential differences in the timing of changes in output and changes in inputs and therefore may overstate the relationship between inputs and outputs. By using total (1994-2000) changes in inputs and output, early gains in the passing rate could be correlated with subsequent increases in inputs. In order to assess the overall impact of all the input changes, we regress changes in the passing rate on three sets of explanatory variables.

First, changes in the math and reading passing rates are regressed on changes in school level input measure that include expenditures per pupil, average teacher salary, teacher experience, and student-to-teacher ratio. Second, changes in the passing rates are regressed on 1994 characteristics of the student population at each school. These characteristics are the fractions of the student population that are, respectively, Hispanic, African American, and economically disadvantaged. Finally, we regress changes in passing rates on changes in the input measures and the 1994 characteristics of the student population.

The results indicate that the variation in the measured input changes alone explains less than 1% of the variation in the math passing rate gains and less than 0.5% of the variation in the reading passing rate gains (column 1 of Table 3 for math and Table 4 for reading). The 1994 student characteristics alone explain approximately 20% of the variation in math passing rate changes and 15% of the variation in changes in the reading passing rate. When both sets of variables are used, the model explains 22% of the variation in math passing rate gains and nearly 17% of the variation in reading passing rate gains. Again, little of the remaining variation (after controlling for student characteristics) in passing rate gains can be explained by changes in measured inputs—only 3.1% of the variation in the math gains (2.5 of 80 percentage points) and 1.8% (1.5 of 85 percentage points) of the variation in reading gains.

The production function regression results imply that changes in the observed inputs explain little of the variation in math and reading passing rate gains. However, certain coefficient estimates from the regressions show that changes in some inputs are statistically significantly correlated with changes in passing rates, and in an economically meaningful way. Most notably, decreases in the student-to-teacher ratio are associated with larger gains in math and reading passing rates. A 5% decrease in the student-to-teacher ratio at a school (the average decrease observed in the data) implies a 1.5% increase in the math passing rate and a 1.2% increase in the reading passing rate. Student-to-teacher ratios are interesting in the context of TAAS tests because smaller class sizes allow for more individualized student attention. If schools are targeting resources based on TAAS incentives, smaller class sizes will facilitate the process, and should lead to larger passing rate gains. The simple regression results presented here support this incentive-based hypothesis about the impact of class size.[8]

Using the estimated production function coefficients, we assess the impact of changes in all the measured inputs on the changes in the math and reading passing rates. To do this we "improve" all of the inputs at each school by one sample standard deviation and predict the effect that the improvements would have on the change in each passing rate. We find that a simultaneous one standard deviation improvement in all four measured inputs implies a 2.5 percentage point increase in the math passing rate and a 1 point increase in the reading passing rate between 1994 and 2000. While these results suggest that changes in the measured inputs have increased outputs, a comparison of these predicted passing rate gains with the gains reported in Table 1 demonstrates that input changes alone cannot explain the observed increases in passing rates. We must look elsewhere for an explanation of higher TAAS passing rates.

*Accountability and Incentives*

In 1994 the state implemented a school accountability system which rates, or grades, each school and district based on school and district level performance on the math, reading and

[7] Regressions using the change in the passing rate as a fraction of the potential change, $(Pass_{00}-Pass_{94})/(1-Pass_{94})$, as the dependent variable yield similar results to those using the simple change in the passing rate.

[8] A number of recent studies examine the relationship between test scores and class size, among other inputs. This work includes Card and Krueger (1996), Angrist and Lavy (1999), Krueger (1999), and Hoxby (2000b). Hanushek, Rivkin and Kain (1998 and 1999), using student level TAAS data and data on Texas teachers, find teacher effects on test scores that are substantially larger than class size effects. Betts and Shkolnik (1999) find that teaching methods change with class size. In particular, they find that teachers provide more individual instruction in smaller classes.

writing tests. The primary factor in the determination of a school's (or district's) accountability rating is the fraction of students at the school (or in the district) who *pass* the tests.[9] The accountability system is relatively simple. To receive a particular designation, ranging from "academically unacceptable" to "exemplary," a school must achieve a specified passing rate on each of the reading, mathematics, and writing tests, for each of five groups of students. The student groups are African American, Hispanic, white, economically disadvantaged, and all students. The specified passing rate for each designation is equal across tests and student groups.[10] In effect, a school's accountability rating is determined by its lowest student group passing rate. Higher accountability ratings require higher passing rates, so schools with any designation below "exemplary" can improve their rating by increasing the fraction of students passing the tests. The strongest incentive for improvement falls on the test and student group with the lowest passing rate.

Because the passing rate is the primary basis for the evaluation of schools and therefore a critical factor in the incentives facing schools, it is important to understand how passing is determined. Along with changes in the TAAS testing framework and the implementation of the school accountability rating system, benchmark standards for each subject and each grade were established in 1994. These standards represent the level of mastery of material necessary to pass a test in a given subject for a given grade. In subsequent years scores on tests are compared to the grade-level benchmark to determine whether a student passes. The scores are standardized in such a way that a score of 70 in any year on any test implies that the student has met the absolute standard for that student's grade level, and passes. Because the passing standard is absolute, gains in passing rates over time—both across grades for a given cohort and across cohorts for a given grade—are possible, and observed.

We use campus and student level data in our analysis of pass rates. The campus level data, provided by the Texas Education Association, include pass rates by student group (race groups and the economically disadvantaged group), student body demographic characteristics (e.g., racial decomposition), variables that indicate whether each student group counts towards a school's rating, and student exemption rates. Also available are campus level operation attributes, such as expenditures on instruction, number of teachers, and average teacher

[9] The accountability rating also depends on the school's attendance/dropout rate.

experience (used above). There are approximately 3,000 schools (observations) per year (1994-2000) in our campus level data.

## 2. A Model of School Behavior

The results in the previous section suggest that the substantial increase in TAAS passing rates observed since 1994 in Texas cannot be explained by changes in the inputs available to schools. Alternatively, the TAAS accountability rating system may provide an explanation. In this section we present a simple model of school behavior that incorporates essential aspects of the incentives created by the accountability system.

Texas public schools use their inputs to produce a vector of outputs that includes, but is not limited to, the TAAS tests. A school's objective is to maximize a weighted average of these outputs, where the weights are shadow prices reflecting the relative importance of the school's outputs to its various constituencies. Different schools may have different relative shadow prices for the same outputs due to differences in constituencies. The vector of outputs produced by a school can be partitioned into the following elements: (1) the passing rate on TAAS tests included in the accountability ratings (denoted $T_A$), (2) the passing rate on TAAS tests not included in the accountability ratings (denoted $T_N$), and (3) a non-TAAS composite output (denoted by X). A school seeks to maximize the value function:

$$V = P_A T_A + P_N T_N + P_X X,$$

where $P_A$, $P_N$, and $P_X$ are the respective shadow prices of these outputs, subject to a resource constraint given by $C(T_A, T_N, X) \leq B$. The implementation of the accountability rating system in 1994 and the increased emphasis on the TAAS tests since then have increased the relative shadow prices of both types of TAAS output ($P_A$ and $P_N$), hence $P_A/P_X$ and $P_N/P_X$ have increased. In addition, the focus on the accountability rating system increased the shadow price of the TAAS tests included in the ratings (i.e., the math, reading, and writing tests) relative to the

[10] In 1999, a school needed a passing rate of 90% in math, reading, and writing to receive a rating of Exemplary, a passing rate of 80% on each test to be rated Recognized, and a passing rate of 45% on each test to be rated Acceptable. In 2000, the passing rate necessary for a rating of Acceptable increased to 50%.

shadow price of the excluded tests (i.e., the social studies and science tests). Thus $P_A/P_N$ also increased.

Starting from a point where the passing rates $T_A$ and $T_N$ are similar and have similar shadow prices, an increase in $P_A/P_N$ will increase $T_A/T_N$, provided that the marginal cost of $T_A$ does not rise too rapidly relative to the marginal cost of $T_N$. As a result, we expect to see a school's passing rates in math, reading, and writing—the tests included in the accountability ratings—rise relative to the social studies and science tests, which are not included in the ratings.

The accountability system requires that schools achieve a specified pass rate for each student group (Hispanic, African American, white, economically disadvantaged, or all students) on each accountability test in order to receive a particular rating, and higher ratings require higher pass rates. This system implicitly encourages schools to maximize the minimum of all the group/test pass rates included in the accountability rating, or

$$\max(\min(PR_j^k)) \quad \text{for } j = 1, \ldots, 5 \text{ and } k = 1, 2, 3,$$

where $j$ is a student group and $k$ is a test. With three accountability tests and five student accountability groups, each school can have up to fifteen group-test pass rates.[11]

Given the "maximize the minimum pass rate" structure of the accountability system, what can we expect from a comparison of the passing rates of the math, reading, and writing tests? The system suggests that, when comparing two tests included in the accountability ratings, a school is more likely to benefit from an increase in the passing rate of the test with the lower initial passing rate. Therefore, we expect that among two tests included in the accountability rating, the passing rate of the test with the lower initial passing rate will rise relative to the test with the higher initial passing rate. In addition, when comparing the pass rates of one student group to another for any accountability test, the lower group pass rate should rise relative to the higher group pass rate.

We consider two important complications to the "max(min)" model implied by the accountability system. First, to a large extent, schools are constrained to offer the same instruction to all students in the same classroom. This precludes the school from allocating resources in a totally independent manner to each student group. Suppose that the school is constrained to offer exactly the same instruction to all of its students in a given grade in a given year.  In order to maximize its accountability rating, the school will focus on the test with the lowest performing group.  By focusing on this test, the pass rates of the other student groups on this test will rise along with the low group's pass rate as the other groups benefit from the increased attention paid to the subject.  Thus, the public good nature of the education process should result in a somewhat dampened version of the  predicted "maximize the minimum pass rate" outcome.

Second, some student groups may not count towards a school's rating if the group is small.  In order for a group's pass rate on an exam to count towards a school's rating, the student group must include at least 30 students or represent at least 10% of the students taking an exam. This determination is made for each group on each exam, so that, for example, a group's math and reading pass rates can count in the school rating while its writing pass rate does not.  The incentives suggest that larger gains should be achieved by a group on a test if the group counts in their school's rating.  Of course, a school has some control over whether a group counts, particularly if the group is relatively small (close to the 30 student, or 10% cutoff).

The final aspect of the TAAS system we consider is the ability of schools to determine which students take the TAAS tests.  Students in grades subject to the TAAS tests may be exempted from some or all of the tests for special education reasons or due to limited English proficiency.  As a result, a school can, to some degree, determine the number and the composition of students taking each test, which can affect the school's accountability rating. An exempted student, while still receiving educational inputs, would not be counted in the school's TAAS passing rate.  From a strategic perspective, schools would prefer to exempt students who are expected to score poorly, or, specifically, those with low ability.  Exemptions are constrained by two considerations: the extra cost of mandated services provided to exempted students (especially for special education reasons), and the likelihood that widespread exemptions would attract the attention of the Texas Education Agency.

To summarize, the model presented in this section has three key implications for public school behavior.  First, relative outputs will change in response to changes in (1) the relative shadow prices of TAAS output relative to non-TAAS outputs and (2) the relative shadow prices of TAAS outputs included in the accountability ratings relative to TAAS outputs that do not

[11] If a school does not administer the writing test (does not have grades 4, 8, or 10), or does not have enough students of a particular group among its student body, it will have fewer group pass rates.

affect these ratings. TAAS test passing rate should rise, and in particular, the passing rates on the math, reading, and writing tests should rise relative to the passing rates on the science and social studies tests. Second, the structure of the accountability system encourages schools to focus on lower group/test pass rates, or to maximize the minimum of (up to) fifteen group/test pass rates. This implication of the structure is confounded by two factors. First, there is a public good aspect to classroom instruction, so all students benefit from focusing on the low group/test. Second, the pass rates of some groups at a school may not count in the school's rating, meaning that the group will not receive the attention they might if they did count. Finally, schools have an incentive to exempt from taking the TAAS tests those students expected to perform poorly, as accountability ratings depend on the fraction of students taking each test who pass the test. Students who do not take a test do not count against a school.

## 3. Results

*Accountability Tests vs. Non-Accountability Tests*

Table 5 reports 1995-2000 eighth grade passing rates on the math, reading, and writing tests, which are used in the calculation of a school's accountability rating, and the social studies and science tests, which are not. There were markedly greater state-wide gains in passing rates on the three tests included in the accountability ratings than on the two excluded tests. We begin by examining the changes in relative passing rates at the school level in order to shed light on the relationship between output substitution choices and the incentives created by the TAAS accountability rating system.

Table 6 reports the fraction of schools that experienced an increase in the ratio of the passing rate on an accountability test to the passing rate on a non-accountability test (i.e., the fraction of all schools where $PR_A/PR_{NA}$ increased) for each accountability/non-accountability test pair. The test pairs are math, reading, and writing (the accountability tests) relative to social studies and science, respectively. In five of six test-pair comparisons, a majority of schools experienced an increase in the relative passing rate on the test included in the accountability rating. Four of these six fractions are significantly different from 0.5, the value that represents the hypothesis of random, as opposed to systematic, changes in the relative passing rate. The results for the math test are particularly strong—in excess of 96% of the approximately 1,380 schools increased their math passing rates relative to their social studies and science passing rates. These findings imply that, among TAAS outputs, there was a significant shift in relative output toward the tests that determine the accountability rating.

*Maximize the Minimum Pass Rate*

In addition to placing emphasis on TAAS accountability outputs relative to other, non-accountability outputs, the incentives inherent in the accountability system should lead schools to focus on certain accountability outputs relative to other accountability outputs. Specifically, schools should focus on low performance tests and student groups as moving lower scores up will have a greater (potential) impact on accountability ratings. If schools are maximizing the minimum score, the larger improvements should be observed for lower initial scores.

The pass rates on the math, reading and writing tests by group reveal a general convergence in scores that supports the theory that schools target low passing rates (see Table 7). For example, in 1994 the highest student group passing rate for the math test was 71.0 (white) and the lowest group passing rate for math was 40.9 (black). In 2000, the average black passing rate on math had risen to 79.0 and the white math passing rate was 91.9. The next year (not reported in the table) the black math passing rate increased to 83.5, so that in 2001 all the math passing rates were above 80 percent and within 10 percentage points of one another. The convergence was similar on reading and writing; all reading and writing passing rates were above 80 by 2000 and within 10 percentage points of each other.

Table 8 contains 1994 and 2000 group/test passing rates ranked by 1994 passing rate. The numbers reveal that, generally, lower initial pass rates rise more than higher initial pass rates between 1994 and 2000. Black math is the lowest pass rate in 1994 (40.9% passing) and exhibits the greatest gain (38.0 percentage points), while white writing, the highest 1994 passing rate, increases by only 5.5 percentage points.

There is, however, an exception to the expected gains by initial rank. The white math passing rate gain is larger than one would predict based on the (relatively high) initial white math passing rate. The gain in the white student math passing rate is similar in magnitude to the math passing rate gains of the other student groups, despite the fact that it is substantially higher than the other math passing rates initially. While the general trend in gains by initial rank point to maximization of the minimum pass rate, the white math pass rate points to structural aspects of teaching that constrain the relative gains in passing rates. It is not possible to place a heavy emphasis on math in order to raise the scores of black and Hispanic students without also raising the math scores of white students.

In order to isolate the response of schools to the max(min) incentives, we turn to the lowest two tests at each school. We follow the lowest 1994 test-group and the second lowest 1994 test-group over time to see whether the low 1994 test improves relative to the second lowest 1994 test. Table 9 shows the fraction of schools where the lowest 1994 test-group is higher than the second lowest 1994 test-group by year. Obviously, in 1994 the low test-group, by definition, must be lower or equal to the second lowest test-group. In 1995, the 1994 low test was higher than the test that was second lowest in 1994 at 30% of the schools in our sample. Over time this percentage gradually rises until, in 2000, the 1994 low test is higher than the 1994 second lowest at nearly 40 percent of the schools.

When we examine all test-groups by initial (1994) passing rate order, the result is similar to that found for the lowest two test-groups; lower initial pass rates rise relative to higher initial pass rates. Table 10 shows average pass rate gains by initial pass rate order separately for schools responsible (explicitly accountable) for nine group-tests, twelve group-tests, and fifteen group-tests. The gains are smallest for the high initial test group, and increase monotonically as initial passing rate rank declines. Table 11 shows the average rank of each test in the next period by order in the initial period. Again, the numbers reveal the same type of convergence as the previous table. The ranking of lower test-groups rise from one period to the next as the gains on the lower ranked tests are larger than on higher ranked tests.

Finally, table 12 shows the decomposition of within campus variation in passing rates into a within test (across student groups) component and a between test component. The hypothesized objective of a school to increase the lowest passing rates, but focusing on a particular test to raise the scores of one group should spill over to other, higher scoring student groups. In fact, the numbers in table 12 reveal that within campus variance in passing rates has fallen as schools raise lower passing rates, while the between test component of that variance has fallen as a fraction of total variance. Differences in student group passing rates within tests have increased relative to differences in passing rates across tests.

There are two important conclusions that can be gleaned from the numbers presented so far. First, it appears that schools target tests and groups with low pass rates as one would expect given the accountability incentives. Second, there is some evidence that certain groups' pass rates rise because schools are targeting the test, not the group. As we showed above, the pass rate of white students on math rose along with black and Hispanic rates despite the fact that it was substantially higher initially. The structural, or public good, nature of teaching makes it difficult to target specific groups on a specific test without affecting other groups' scores on the test.

Overall, Tables 7 – 12 suggest that schools systematically increase certain TAAS outputs relative to other outputs. Passing rates on TAAS tests included in the accountability ratings increased relative to passing rates on TAAS tests not used in the ratings. Among the TAAS accountability tests, performance on tests with lower initial passing rates improved relative to tests with higher initial passing rates. On average, schools appear to have focused their effort on producing those outputs with the greatest impact on their accountability ratings.

*Student Group Indicator Regressions*

As discussed above, the TAAS accountability system bases school ratings on the overall pass rate *and* the pass rate of each student group. Any particular student group with a low initial pass rate will benefit from both the emphasis on the group pass rate and the emphasis on the overall pass rate. Thus, multiple incentives make it difficult to isolate the effect of the group pass rate requirements on the achievement gains of minority groups. The results we have presented are consistent with a response by schools to group pass rate incentives, but do the group pass rate requirements really play a separate role in the relative improvement of minority students?

To isolate the effect of group incentives, we use the fact that, at some schools, groups of students do not count separately in the accountability rating because the group size does not meet the minimum requirements. At these schools the group either has fewer than 30 students, or the group represents less than 10% of the school's test taking population. If group incentives are affecting school behavior, we expect to observe larger improvement by a particular group at schools where the group "counts" in the accountability rating.

When we compare the simple average pass rate gains of minorities at the two types of schools –those where minorities count separately in the rating and those where they do not– we find larger improvement at schools where the minority group counts. The average pass rate gains for Hispanics and African Americans are presented in Tables 13 and 14, respectively. Only schools where the white student group counts in the rating are used to calculate the pass rate gains and pass rate gaps below. Hispanic students at schools where Hispanics count in the rating show gains on the math, reading, and writing tests that are 17%, 30% and 62% larger, respectively, than the corresponding gains by Hispanic students at schools where the Hispanic group does not count. The results for African American students are similar but smaller. The improvements on the math, reading, and writing tests by African American students at schools where they count are 6%, 7% and 32% larger, respectively, than the corresponding improvements by African American students at schools where they do not count.

Table 15 contains average changes in the campus-level pass rate gap between Hispanic students and white students, $(P_{00}^{H} - P_{94}^{H}) - (P_{00}^{W} - P_{94}^{W})$, on the math, reading and writing tests. Between 1994 and 2000, the math pass rate gap between Hispanic and white students closed by 14.55 percentage points at schools where Hispanics count, as opposed to 11.46 at schools where Hispanics do not count. For reading the gap closed by 7.35 points where Hispanics count compared to 4.90 where they do not. The writing test results are similar, with the gap closing by 5.85 percentage points at schools where Hispanics count and by 3.05 percentage points at schools where the Hispanic students do not count. All of these differences are statistically significant at the 5% level.

The African American pass rate gaps, $(P_{00}^{B} - P_{94}^{B}) - (P_{00}^{W} - P_{94}^{W})$, also differ by group accountability status, as shown in Table 16. At schools where African Americans count in the school rating the pass rate gap on math, reading and writing fell by 19.48, 11.48, and 9.89 percentage points, respectively. The corresponding math, reading, and writing numbers for schools where African American students do not count are 17.83, 9.96, and 7.44. Again, these differences in pass rate gaps are all statistically significant at the 5% level. Evidently, the emphasis on specific groups of students leads to greater improvements in the performance of those student groups.

Next, we examine the relationship between group accountability status and the minority pass rate gap controlling for other school characteristics. The general regression function we use is

$$(P_{00}^{H} - P_{94}^{H}) - (P_{00}^{W} - P_{94}^{W}) = \beta_0 + \beta_1 F_{97}^{H} + \beta_2 X + \varepsilon$$

for Hispanics, and

$$(P_{00}^{B} - P_{94}^{B}) - (P_{00}^{W} - P_{94}^{W}) = \beta_0 + \beta_1 F_{97}^{B} + \beta_2 X + \varepsilon$$

for African Americans. These pass rate gap regressions are estimated separately for the math, reading and writing tests (six total group/test regressions for each specification). The variable $F$ is a flag which indicates that the minority group counts in the school's accountability rating. The vector $X$ contains several measures intended to capture school characteristics that might also reduce the pass rate gap between minority and white students.

Table 17 contains pass rate gap regression results for Hispanics on the math, reading and writing exams, and Table 18 contains results for African Americans. The regressions include a flag that indicates whether the group counts in the school's rating, and the average group pass rate in 1997 as regressors. The 1997 group pass rate is included in the regressions because the accountability ratings are based on the overall fraction of students who pass the TAAS tests, so schools have an incentive to raise the score of any low-performing student, regardless of race. In addition, it may be easier to improve the score of a low scoring student, so that decreasing returns can explain a portion the larger gains for lower scoring students.

In each regression, the fraction of the minority group that is also designated economically disadvantaged (interacted with a flag that indicates whether economically disadvantaged students count as a group in the school rating) is included in the second regression. Students who are economically disadvantaged at schools where the economically disadvantaged group counts in the rating may receive more attention than non-disadvantaged students or disadvantaged students at schools where disadvantaged students do not count separately.

We also include the other minority group flag in the regressions (African American flag in the Hispanic group regressions and the Hispanic flag in the African American group regressions). This is intended to capture the effect of a competing group in the school. If another minority group counts, the school has a greater incentive to divide resources. Alternatively, more groups that count may alter the focus (or curriculum) of the school toward

TAAS, which could benefit all groups. Either way, we hope to isolate the effect of the other minority group status on the pass rate gap.

Finally, we include student-to-teacher ratio and group size (as a percent of all test takers) in the regressions. Differences in per-student school resources may explain why students at some schools show greater improvement over time, and our measures are intended to capture across-school variation in resources. Student-to-teacher ratio, or class size, could be particularly important, as smaller class sizes may allow schools to provide greater individualized attention to low performing students.

As the results in Table 17 show, the group flag is consistently positive for Hispanics across exams, indicating that, even after controlling for other school characteristics, the gap closes more where Hispanic students count in the rating. The coefficient on the accountability flag in the Hispanic math regression is 3.11 which represents a 10% decrease in the Hispanic math gap going from a school where Hispanics do not count to a school where they do. The reading math pass rate gap closes by 1.43 percentage points (12%) more at schools where Hispanics count and the drop in the writing gap is 2.95 percentage points (37%) larger if Hispanic students count.

For African Americans, the difference between school types is positive, though not as large as the Hispanic results (Table 18). The accountability flag coefficient in the math regression implies that the math gap closes by 1.98 percentage points (11%) more at schools where African American students count in the rating. For reading we find that the gap closes by 0.64 percentage points (6%) more at schools where African American counts, and the accountability flag coefficient is not statistically significant. Based on the results in Table 18, the African American writing pass rate gap falls by 1.90 percentage points (26%) more at schools where African American students count in the rating.

*Exemption of Students from the TAAS Tests*

We saw above that when a student group "counts" toward determining a school's accountability rating the group's passing rate gains are larger. Whether a student group is included or not in the calculation of a school's accountability rating is, however, not exogenous. By strategic exemption of students from the TAAS, a school can potentially affect which student groups determine its rating. For a student group to be included it must exceed the size requirement: the group must have at least 30 students taking the TAAS and the group must comprise at least 10% of all test-takers at the school.[12] In addition to the effect of exemptions on the inclusion of particular student groups, a school can also directly affect its passing rate by disproportionately exempting students expected to do poorly on the TAAS. Texas schools have an incentive to exempt students from the TAAS with an eye towards the implications for the school's accountability rating. Such strategic exemption has two parts: the relationship between exemptions and TAAS scores, and the relationship between exemptions and the inclusion of particular student groups. We examine each of these in turn.

Students can be exempted from a TAAS test due to limited English proficiency or due to special education status, and the exemption decision can be different for the same student on different tests. There is a formal process including teacher, parent, and administrator input that determines exemption status. Although the school cannot unilaterally exempt a student, it can exercise substantial influence on this decision.

The first indication that schools' exemption decisions respond to incentives comes from a comparison of exemption rates in one year to TAAS scores from the previous year. Matched data on individuals for 1997 and 1998 show a strong negative relationship between test score in 1997 and exemption rate in 1998. Though most students who are exempt from a TAAS exam in one year also were exempt in the previous year, about 15% - 20% are newly exempt. This allows a comparison of exemption rates across students grouped by their TAAS score in the previous year.

Table 19 presents the comparison of exemption rates on the reading and math tests for 1998 by TAAS score group in 1997. The first column shows that the exemption rate in 1998 for those who passed the TAAS in 1997 was 0.24% in math and 0.22% in reading. In contrast, the 1998 exemption rates in column two for those who took, but did not pass the TAAS in 1997, were 5.34% in math and 5.85% in reading—over twenty times as high as for those who passed. The third and fourth columns distinguish the 1998 exemption rates for those who were relatively close to passing (within 10 points) in 1997, from those who were more than 10 points below the

[12] This requirement for inclusion of a student group in the determination of a school's accountability rating is applied separately to each exam (reading, mathematics, and writing). Recall that the student groups are African American, Hispanic, White, and Economically Disadvantaged in addition to all students.

passing standard in 1997. The exemption rates among the lowest-scoring non-passers, 8.63% and 8.95% in math and reading respectively, are over four times as high as among students close to passing.

There is little doubt that poor performance on the TAAS tests may be an indicator of a language or learning deficiency that merits an exemption. However, the negative relationship between exemption rates and lagged scores exists in other year pairs (not shown). This is inconsistent with a one-time exemption decision based on the first TAAS administration to a student. The strong and persistent negative relationship between the exemption rate in one year and the TAAS score in the previous year suggests that strategic behavior on the part of schools also plays some role in determining exemptions.

The strategic use of exemptions implies that, other things equal, schools' with higher exemption rates should have higher passing rates. The first column of Table 20 presents results from a simple regression of a school's passing rate on its exemption rate. There is a separate regression for each TAAS test: reading, math, and writing. These simple regressions show a negative relationship between passing rates and exemption rates. But, schools differ in more than their exemption rates, and an important difference related to both passing rates and exemptions is the presence of the two minority student groups in the school's enrollment. More minority students implies that, on average, the school has a larger fraction of low-scoring students and that the school might have a higher exemption rate for strategic reasons. The second column of Table 20 controls for the percentages of students at the school who are African American or Hispanic, respectively. With this one change, the partial relationship between exemption rates and passing rates across schools is positive and statistically significant for all three tests.

Students who take the TAAS in a given year and score poorly are substantially more likely to be exempted from the TAAS in the next year. In addition, controlling for differences in student demographics, schools with higher exemption rates have higher TAAS passing rates. Exempting a student who would otherwise score poorly increases a school's measured TAAS performance and may improve its accountability rating. A school also can affect its accountability rating by exempting enough students in a particular group to get below the minimum size requirement described above and thereby remove that group from inclusion in the school's rating. We now examine the relationship between exemption rates and whether a particular minority student group is included in a school's accountability rating.

A simple comparison is instructive. The average exemption rate for students in the two minority student groups is just under 13%. Consider a school that has a student group excluded from its accountability rating that would otherwise be included if all students in the group at the school actually took the TAAS. The average exemption rate for the minority student groups at these schools switching exclusion status (which comprise about 4% of all schools) is over 27%, or more than twice as high as the overall average exemption rate. The higher exemption rates at schools where a student group is actually excluded because not all of the students take the TAAS proves nothing, but does suggest that schools with a "better chance" of excluding a student group via exemptions, may have a higher exemption rate.

To examine this question, we first calculate the impact of one additional exemption on the probability that a student group is excluded from the accountability rating for a school. The marginal impact of an exemption is defined as the difference between two binomial probabilities:

$$\binom{N_g - 1}{k-1} p^{k-1} (1-p)^{N_g - k} \; - \; \binom{N_g - 1}{k} p^{k} (1-p)^{N_g - 1 - k},$$

where $N_g$ is the number of students in group g at the school who would take the test absent any exemptions, $k$ is the number of students necessary to exempt in order to fall below the minimum size requirement, and p is the probability that a student in group g is exempted (taken as equal to the average exemption rate across all schools). The first probability assumes that one student in the group is exempted with probability one and that the remaining students are exempted with probability equal to the population average rate. The second probability assumes that one student in the group is not exempted and that the remaining students are exempted with probability equal to the population average rate. The difference in these probabilities, which we define as the marginal impact of an exemption, gives the increase in the probability of having the student group excluded by definitely exempting one more student compared to definitely not exempting this student.

Table 21 provides summary evidence on the relationship between the marginal impact of an exemption and the exemption rate. The five rows of the table divide the schools into groups based on the value of *k* (i.e., the number of students who must be exempted in order to fall below the minimum size requirement for inclusion in the accountability rating). The first column gives the average marginal impact of an exemption for that row. If *k* is negative, then the student group will be excluded no matter what happens to exemptions, so the marginal impact of an exemption is zero. If *k* is zero or slightly positive then the marginal impact is positive but small, because the population average exemption rate will very likely lead to exclusion. Further increases in *k*, first increase the marginal impact of an exemption and then decrease it.[13] If *k* is large enough, the probability of inclusion is essentially one, given the population average exemption rate, whether one more student is exempted or not. The third column reports the average of the actual exemption rates for the school groups in that row. The observed exemption rates track the marginal probabilities, with the lowest exemption rates at the extreme values of *k*, where exemptions have little to no impact, and higher rates at intermediate values, where exemptions have a greater impact.

To make the comparison of exemption rates and marginal impacts more formal, Table 22 presents results from a regression of a school's exemption rate for a given student group in a given year on the calculated marginal impact of an exemption for that school, group, and year. The regressions are estimated separately for each TAAS test, math, reading, and writing, and include a complete set of student group by year dummy variables. The reported standard errors allow for clustering of the residuals for a school. The coefficients on the marginal impact variables are positive and statistically significant. The magnitudes of the coefficients for each TAAS test are about equal to the mean exemption rates for reading and math and larger for writing. The coefficient gives the estimated effect on the exemption rate of moving from a case where the impact of one more exemption on the probability of exclusion is zero to where the impact of one more exemption is to make exclusion certain. This is a large change that is well outside the range of the data. A more reasonable change would be to compare the difference between the categories in Table 21, going, say, from a marginal impact of .07 to one of .17. This change in the impact of an exemption on the probability of exclusion would increase the exemption rate by about 1.3 to 1.4 points for reading and math, respectively, and by about 1.9

[13] The quadratic shape of the marginal impact of an exemption is due to the shape of the binomial distribution. A rough check on the averages reported can be done by evaluating the formula above for $k$ = 2, 5, and 9 with $N_g$ = 31, 34, and 38 and with p = .13. This gives marginal impacts of .062, .203, and .061, respectively.

points for writing.  These changes in exemption rates represent about 10% of the average exemption rate for reading and math and about 16% for writing.  While (from Table 21) a relatively small fraction of schools are in the sensitive range for the impact of an exemption, these schools appear to make strategic exemption decisions.

Perhaps the best evidence that schools are strategic in their use of TAAS exemptions comes from the response to a change in the treatment of special education students.  The designation of students to receive special education services and the exemption of students from the TAAS for special education reasons are not the same.  Students who are designated special education may or may not take the TAAS exam, while students exempt from the TAAS for special education reasons also are designated to receive special education services.  Thus the students exempt from TAAS for special education reasons are a proper subset of all special education students.  Through 1998, the test scores for special education students who were not exempt were not included in the accountability ratings for a school (those who were exempt had no score because they did not take the test).  Beginning in 1999, however, the TAAS scores for special education students who were not exempt were included in campus accountability ratings. There was a sudden shift, starting in 1999, in the incentive to exempt special education students from the TAAS tests.

Table 23 reports for each year from 1994-2000 the fraction of special education students who were exempt for special education reasons from each of the TAAS tests, reading, math, and writing.  For each test there is a slight rise in the special education exemption rate from 1994 to 1995 followed by a monotonic, and sizeable, decline to 1998.  In 1999 there is sharp increase in the special education exemption rate for each test amounting to about 15 percentage points or a one-third increase.  This is followed by another increase in 2000 of more than 2 percentage points.  The special education exemption rates in 1999 and 2000, when the new inclusion rule for special education students applies, are higher than in any previous year under the old inclusion rule.  There can be no explanation for the sharp increase in special education exemptions in 1999 other than the strategic response of schools to the change in how the accountability rating is calculated.

*Are the Results Real?*

One concern with the response to incentives in Texas voiced by some observers is that students are being taught a very narrow set of skills that relate only to the TAAS tests and the taking of the TAAS tests. If the gains in Texas are "real," we should observe improvement in other education (non-TAAS) outcomes. To address this issue we compare the NAEP test scores of Texas students to the national NAEP scores over time.

The NAEP results, presented in table 24, suggest that the gains in TAAS tests are carrying over to other standardized tests. The average NAEP scores in math of Texas 4th and 8th graders improved relative to the nation; Texas 4th graders went from 1 point below the national average in 1992 to 7 points above the national average in 2000, while 8th graders went from 4 points below the national average in 1990 to 1 point above the national average in 2000. Comparing gains at various percentiles is even more illustrative. The gains by Texas students at the lower percentiles of the score distribution are much greater than the gains at higher percentiles. Evidently, lower scoring Texas students have benefited the most – measured using TAAS scores or NAEP scores – from the TAAS accountability system.

Compare this with the relative performance of Texas 8th graders in science on the NAEP. Not only have Texas students failed to gained ground in science, this failure has been across the board. There has been no compression of the science scores in Texas. In fact, the 90 – 10 differential has widened by 5 points. This contrasts rather sharply with the performance of Texas on the math NAEP, perhaps because the Texas accountability system includes math performance, but not science performance.

In addition, the performance of Texas 4th graders on the reading NAEP is intermediate to the math and science performances—there have been gains, and relatively larger gains at the lower percentiles. The NAEP reading gains are not as large as the math gains, just as the TAAS gains are larger in math. Note also that, though a trend comparison is not possible, the NAEP reading scores of Texas 8th graders in 1998 relative to the national average are more compressed—higher than the national average at the 10th percentile and lower than the national average at the 90th percentile.

The comparison of NAEP scores for Texas and the nation suggest several patterns that are consistent with an interpretation of the TAAS gains as signifying real learning. 1) The accountability subjects have shown greater improvement than the non-accountability subjects; 2) Math gains have been greater than reading gains; 3) The gains have been disproportionately concentrated at the lower percentiles. Texas' accountability system emphasizes math and reading relative to science and provides incentives for a focus on lower achieving students. Finally, if the TAAS improvements were exclusively or even largely due to improvements in test-taking skills, one would not expect the relative differences in improvements for math relative to science and for the $10^{th}$ percentile relative to the $90^{th}$ percentile.

*Is Enrollment Affected?*

In addition to the apparent impact on NAEP scores, does Texas' accountability system provide the mechanism for school competition? One method for approaching this is to examine whether schools facing more competitive pressure, say from charter schools, have greater, or greater-than-expected gains on TAAS exams (e.g., see Gilpatric, 2001). An alternative approach is to assess whether "better" (as measured by the accountability system) districts experience higher enrollment growth. Tables 25 and 26 provide some preliminary evidence on this issue.

Table 25 documents that enrollment growth between 1995 and 2000 was monotonically related to the districts initial accountability rating. Table 26 examines this relationship controlling for some demographic features of the students in the district. The growth differences are smaller, but remain. Interestingly, there also is some evidence that the accountability rating(s) of other (competing) districts in the county has an effect on enrollment growth.

## 4. Concluding Remarks

There have been substantial increases in the passing rates on the TAAS tests across all grades since the state of Texas implemented its accountability system in 1994. Increases in the typical school input measures, such as student-to-teacher ratio and teacher salaries, can explain only a small fraction of the variation in the passing rate increases across schools over time. This suggests that we must look elsewhere to explain the passing rate gains.

It seems likely that schools are doing something different with the inputs they have. Examination of the increases in passing rates for math, reading, and writing—the subjects used to determine accountability ratings—relative to the increases in science and social studies demonstrates that schools can, and do, change relative outputs in response to the incentives they face. In addition, an analysis of the relationship between changes in TAAS scores and initial scores suggests that schools have targeted relatively more of their inputs to students with lower expected subject mastery in order to maximize passing rates, the feature of TAAS scores that affects the accountability rating. Moreover, the exemption of students from the TAAS exams also appears to be affected by concerns about passing rates.

There are two caveats to our results that deserve mention. First, the most convincing evidence of a large impact of the accountability rating system on school behavior would be to observe some school output(s) that decline. What are schools substituting away from in order to raise passing rates on TAAS exams? We have no evidence of a school output that has decreased in order to provide more inputs for TAAS preparation. It is possible, if not likely, that any output that could be measured systematically across schools would also be visible enough that it would not be sacrificed for TAAS gains. If schools previously focused on student self esteem, this focus may have decreased, but we cannot tell. To the extent that increased TAAS performance has required greater effort by teachers, one would expect that, other things equal (e.g., salaries), teacher turnover would increase. There is anecdotal evidence that teachers in Texas are feeling increased stress under the TAAS system and deriving less job satisfaction. As Hoxby (2000c) points out, changes in what is expected/valued from teachers will make at least some teachers (relatively) better off. Thus, a systematic analysis of teacher turnover could prove instructive.

Second, how much of the negative relationship between initial scores and subsequent score gains can be attributed to diminishing returns in the education process? It is certainly plausible that there are decreasing returns *within a student* to TAAS preparation. But, explaining our results with decreasing returns requires decreasing returns *across students* as we move through the score distribution. This seems less plausible. While it may be increasingly difficult to continue to raise a given student's TAAS score, it is not obvious that it is easier to raise the score of a low-scoring student compared to a high-scoring student.

We do not mean to imply that the outputs from which schools have diverted inputs in favor of TAAS objectives are of one particular type or another—only that such substitution appears to have occurred. While "teaching to the test" skeptics are concerned about what is not on the TAAS test, school accountability advocates are grateful that there are now agreed upon goals and a test in place to assess goal attainment.[14] Along this line, it is interesting to examine the performance of Texas' high school students on college admissions tests, given that these tests concentrate on quantitative and verbal skills that are presumably related to the math and reading TAAS test skills. Between 1994 and 2000, the percentage of students taking a college admission test fell slightly (from 65% to 62%), while the percentage who scored above the "criterion score" remained virtually constant at 27%.[15] Whether this suggests that concerns about what is not on the TAAS have merit, or whether this merely reflects the relative targeting of TAAS preparation efforts toward lower-scoring students (who are less likely to take college admission tests) is unclear.

What is clear is that schools in Texas have responded, and dramatically, to the incentives of the state accountability rating system. The state of Texas has responded to the observed improvement on the TAAS tests by expanding the scope of the accountability system. In particular, the science and social studies tests will join reading, math, and writing as accountability tests during 2002-2004. Evidently, administrators have learned from the incentive response of schools and intend to expand the existing incentives. The results should be interesting.

[14] Grissmer *et. al.* (2000), Klein *et. al.* (2000), and Koretz (1996) are concerned with the issue of teaching to the test, but whether teaching to the test is "bad" depends on the alternative.

[15] The criterion score is 24 for the ACT and 1000 for the original SAT, administered prior to April 1995, or 1110 on the "re-centered" SAT.

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**Table 1**
**Gains in TAAS Math and Reading Passing Rates for Grades 3 – 8 and 10**
**1994–2000**

**Math Passing Rates**

| | Year | | | | |
|---|---|---|---|---|---|
| **Grade** | **1994** | **1996** | **1998** | **2000** | **94-00 Gain** |
| **3** | 61 | 73 | 78 | 80 | 19 |
| **4** | 57 | 74 | 82 | 87 | 30 |
| **5** | 60 | 75 | 86 | 87 | 27 |
| **6** | 58 | 73 | 82 | 88 | 30 |
| **7** | 56 | 67 | 79 | 87 | 31 |
| **8** | 55 | 64 | 79 | 90 | 35 |
| **10** | 55 | 63 | 75 | 86 | 31 |

**Reading Passing Rates**

| | Year | | | | |
|---|---|---|---|---|---|
| **Grade** | **1994** | **1996** | **1998** | **2000** | **94-00 Gain** |
| **3** | 76 | 78 | 83 | 87 | 11 |
| **4** | 73 | 75 | 86 | 89 | 16 |
| **5** | 75 | 79 | 85 | 92 | 17 |
| **6** | 71 | 74 | 82 | 86 | 15 |
| **7** | 73 | 79 | 82 | 83 | 10 |
| **8** | 74 | 74 | 81 | 89 | 15 |
| **10** | 75 | 79 | 86 | 90 | 15 |

**Table 2**
**Changes in Campus Level Inputs, 1994-2000[1]**

| Variable | 1994 Level | 2000 Level | % Change (94 – 00) |
|---|---|---|---|
| **Instruction Expenditures Per Pupil** | 2,661.27<br>(496.40) | 3,131.54<br>(518.92) | 17.67 |
| **Average Teacher Salary** | 32,050.76<br>(2,507.17) | 37,479.36<br>(2,756.32) | 16.94 |
| **Average Teacher Experience** | 10.97<br>(2.37) | 11.72<br>(2.60) | 6.84 |
| **Student to Teacher Ratio** | 16.57<br>(2.09) | 15.46<br>(2.17) | −6.70 |

[1]Real 2000 dollars reported. Standard deviations in parentheses.

**Table 3**
**Campus Level Education Production Function Regressions (WLS)**
**Dependent Variable is the Campus Level Change in Math Passing Rate (1994-2000)[1]**

| | | | |
|---|---|---|---|
| Change in Per Pupil Teaching Expend./100 | – 0.040 | | 0.188 |
| | (.042) | | (.039) |
| Change in Avg. Teacher Salary/1000 | – 1.154 | | -0.534 |
| | (.141) | | (.129) |
| Change in Teacher Experience | 0.828 | | 0.395 |
| | (.124) | | (.113) |
| Change in Student to Teacher Ratio | – 0.096 | | – 0.370 |
| | (.116) | | (.104) |
| Percent Hispanic | | 0.086 | 0.081 |
| | | (.011) | (.011) |
| Percent African American | | 0.087 | 0.087 |
| | | (.013) | (.013) |
| Percent Economically Disadvantaged | | 0.115 | 0.130 |
| | | (.013) | (.013) |
| Constant | 31.776 | 15.962 | 16.578 |
| | (.734) | (.370) | (.804) |
| $R^2$ | 0.017 | 0.199 | 0.216 |
| Number of Campuses | 4,220 | 4,220 | 4,220 |

[1] Observations are weighted by number of students at each campus who take the test. Standard errors in parentheses.

**Table 4**
**Campus Level Education Production Function Regressions (WLS)**
**Dependent Variable is the Campus Level Change in Reading Passing Rate (1994-2000)[1]**

| | | | |
|---|---|---|---|
| Change in Per Pupil Teaching Expend./100 | – 0.137 | | 0.037 |
| | (.031) | | (.029) |
| Change in Avg. Teacher Salary/1000 | – 0.457 | | – 0.079 |
| | (.104) | | (.095) |
| Change in Teacher Experience | 0.551 | | 0.321 |
| | (.092) | | (.084) |
| Change in Student to Teacher Ratio | – 0.053 | | – 0.226 |
| | (.085) | | (.077) |
| Percent Hispanic | | 0.026 | 0.026 |
| | | (.008) | (.008) |
| Percent African American | | 0.061 | 0.066 |
| | | (.009) | (.009) |
| Percent Economically Disadvantaged | | 0.116 | 0.120 |
| | | (.009) | (.009) |
| Constant | 13.607 | 3.309 | 2.766 |
| | (.541) | (.273) | (.597) |
| $R^2$ | 0.014 | 0.197 | 0.204 |
| Number of Campuses | 4,220 | 4,220 | 4,220 |

[1] Observations are weighted by number of students at each campus who take the test. Standard errors in parentheses.

**Table 5**
**Changes in 8th Grade Passing Rates on Accountability Tests (Math, Reading, Writing) and Non-Accountability Tests (Social Studies, Science), 1995-2000**

| | Year | | | |
|---|---|---|---|---|
| **Accountability Test** | **1995** | **2000** | **Gain 95-00** | **Percent of Potential Gain** |
| **Math** | 54 | 90 | 36 | 78 |
| **Reading** | 72 | 89 | 17 | 61 |
| **Writing** | 72 | 84 | 12 | 43 |
| **Average** | 66 | 87.7 | 21.7 | 60.7 |
| **Non-Accountability Test** | | | | |
| **Social Studies** | 63 | 71 | 8 | 22 |
| **Science** | 75 | 88 | 13 | 52 |
| **Average** | 69 | 79.5 | 10.5 | 37 |

**Table 6**
**Changes in Relative Passing Rates (1995-2000)**
**Accountability vs. Non-Accountability Tests**

| Exam Pairs | Fraction of Schools with increase in Ratio | Std. Error | Number of Schools |
|---|---|---|---|
| **Math/Soc. Stud.** | 0.955 | 0.006 | 1,364 |
| **Math/Science** | 0.977 | 0.004 | 1,366 |
| **Reading/Soc. Stud.** | 0.693 | 0.012 | 1,365 |
| **Reading/Science** | 0.660 | 0.013 | 1,366 |
| **Writing/Soc. Stud.** | 0.526 | 0.014 | 1,362 |
| **Writing/Science** | 0.442 | 0.013 | 1,364 |
| **Min. Account/ Soc. Stud.** | 0.908 | 0.008 | 1,367 |
| **Min. Account/ Science** | 0.933 | 0.007 | 1,368 |

**Table 7**
**Average Passing Rates by Student Group and Test for 1994 and 2000**

**Math**

| Student Group | Mean 1994 Passing Rate | Mean 2000 Passing Rate |
|---|---|---|
| All Students | 60.4 | 87.0 |
| African American | 40.9 | 79.0 |
| Economically Disadvantaged | 49.9 | 82.9 |
| Hispanic | 51.5 | 84.4 |
| White | 71.0 | 91.9 |

**Reading**

| Student Group | Mean 1994 Passing Rate | Mean 2000 Passing Rate |
|---|---|---|
| All Students | 76.6 | 88.0 |
| African American | 63.9 | 83.3 |
| Economically Disadvantaged | 68.1 | 83.5 |
| Hispanic | 69.8 | 84.0 |
| White | 85.5 | 93.3 |

**Writing**

| Student Group | Mean 1994 Passing Rate | Mean 2000 Passing Rate |
|---|---|---|
| All Students | 81.6 | 89.0 |
| African American | 70.2 | 83.9 |
| Economically Disadvantaged | 74.3 | 84.8 |
| Hispanic | 75.4 | 84.9 |
| White | 88.0 | 93.5 |

**Table 8**
**Average Passing Rates by Group and Test for 1994 and 2000**
**Ranked by 1994 Passing Rate (lowest to highest)**

| Student Group | Test | ’94 Pass rate | ’00 Pass rate | Gain ( ’94-’00) |
|---|---|---|---|---|
| Af. Amer. | Math | 40.9 | 79.0 | 38.1 |
| Econ. Disadv. | Math | 49.9 | 82.9 | 33.0 |
| Hispanic | Math | 51.5 | 84.4 | 32.9 |
| All Students | Math | 60.4 | 87.1 | 26.6 |
| Af. Amer. | Reading | 63.9 | 83.3 | 19.4 |
| Econ. Disadv. | Reading | 68.1 | 83.5 | 15.4 |
| Hispanic | Reading | 69.8 | 84.0 | 14.2 |
| Af. Amer. | Writing | 70.2 | 83.9 | 13.7 |
| White | Math | 71.0 | 91.9 | 20.9 |
| Econ. Disadv. | Writing | 74.3 | 84.8 | 10.5 |
| Hispanic | Writing | 75.4 | 84.9 | 9.4 |
| All Students | Reading | 76.6 | 88.0 | 11.4 |
| All Students | Writing | 81.6 | 89.0 | 7.4 |
| White | Reading | 85.5 | 93.3 | 7.8 |
| White | Writing | 88.0 | 93.5 | 5.5 |

**Table 9**
**Convergence of the Lowest Two Test Scores (by campus) Over Time**

| Year | Lowest score in 1994 is now: Less than 1994 second lowest score (percent) | Equal to 1994 second lowest score (percent) | Greater than 1994 second lowest score (percent) | Number of Schools |
|---|---|---|---|---|
| 1994 | 94.66 | 5.34 | 0.0 | 5,920 |
| 1995 | 66.44 | 3.47 | 30.08 | 5,561 |
| 1996 | 63.02 | 3.56 | 33.42 | 5,476 |
| 1997 | 60.24 | 4.35 | 35.41 | 5,450 |
| 1998 | 59.84 | 5.25 | 34.91 | 5,371 |
| 1999 | 56.83 | 5.41 | 37.77 | 5,383 |
| 2000 | 55.33 | 5.50 | 39.17 | 5,377 |

**Table 10**
**Average Group/Test Passing Rate Gain by Initial Passing Rate Order**
**Weighted by Enrollment**

| | Average Passing Rate Gain from Year One to Year Two | | |
|---|---|---|---|
| Passing Rate Order in Year One (highest to lowest) | Schools with 9 Test/Groups | Schools with 12 Test/Groups | Schools with 15 Test/Groups |
| 1 | -0.80 | -1.91 | -1.37 |
| 2 | -0.19 | -0.63 | -0.34 |
| 3 | 0.31 | 0.32 | 0.21 |
| 4 | 3.10 | 1.32 | 0.68 |
| 5 | 3.59 | 2.28 | 1.18 |
| 6 | 4.00 | 3.14 | 1.98 |
| 7 | 7.20 | 4.06 | 2.34 |
| 8 | 7.89 | 4.82 | 2.95 |
| 9 | 8.60 | 6.10 | 3.51 |
| 10 | | 7.99 | 4.42 |
| 11 | | 8.86 | 5.43 |
| 12 | | 10.62 | 6.51 |
| 13 | | | 6.98 |
| 14 | | | 8.40 |
| 15 | | | 10.65 |

**Table 11**
**Average Group/Test Passing Rate Order by Passing Rate Order in Previous Period Weighted by Enrollment**

| | Average Rank in Year Two | | |
|---|---|---|---|
| Pass Rate Order in Year One (highest to lowest) | Schools with 9 Test/Groups | Schools with 12 Test/Groups | Schools with 15 Test/Groups |
| 1 | 3.33 | 2.98 | 3.13 |
| 2 | 3.85 | 3.66 | 3.71 |
| 3 | 4.02 | 4.49 | 4.45 |
| 4 | 4.71 | 5.12 | 5.39 |
| 5 | 5.27 | 5.78 | 6.23 |
| 6 | 5.41 | 6.45 | 6.89 |
| 7 | 6.37 | 6.96 | 7.46 |
| 8 | 6.79 | 7.61 | 8.15 |
| 9 | 6.82 | 8.23 | 8.87 |
| 10 | | 8.79 | 9.61 |
| 11 | | 9.24 | 10.23 |
| 12 | | 9.81 | 10.88 |
| 13 | | | 11.71 |
| 14 | | | 12.54 |
| 15 | | | 13.24 |

**Table 12**
**Within Campus Variance in Passing Rates over Time:**
**Decomposition to Within-Test and Between-Test Components**

| | Average Within Campus Variance in Passing Rates | Within Test Component of Campus Variance (WT) | Between Test Component of Campus Variance (BT) | Within Test Share of Total Within Campus Variance WT/(WT + BT) |
|---|---|---|---|---|
| 1994 | 237.10 | 105.02 | 132.08 | 43.10 |
| 1995 | 193.67 | 95.86 | 97.81 | 49.88 |
| 1996 | 138.87 | 81.61 | 57.26 | 58.02 |
| 1997 | 104.02 | 65.02 | 39.00 | 62.58 |
| 1998 | 78.01 | 51.04 | 26.96 | 64.19 |
| 1999 | 64.94 | 43.80 | 21.14 | 66.76 |
| 2000 | 53.4 | 37.28 | 16.12 | 67.79 |

**Table 13**
**Average Hispanic TAAS Pass Rate Gains (1994-2000)**
**Campus Level**

| | Hispanic Group **Counts** in Campus Accountability Rating | Hispanic Group **Does Not Count** in Campus Accountability Rating |
|---|---|---|
| Math | 36.04 | 30.71 |
| | (0.29) | (0.50) |
| | 1,896 | 1,382 |
| Reading | 15.25 | 11.69 |
| | (0.24) | (0.40) |
| | 1,891 | 1,377 |
| Writing | 13.11 | 8.08 |
| | (0.42) | (0.45) |
| | 961 | 1,406 |

Note: Standard errors in parentheses.

**Table 14**
**Average African American TAAS Pass Rate Gains (1994-2000)**
**Campus Level**

| | African American Group **Counts** in Campus Accountability Rating | African American Group **Does Not Count** in Campus Accountability Rating |
|---|---|---|
| Math | 40.19 | 37.82 |
| | (0.42) | (0.47) |
| | 987 | 1,513 |
| Reading | 18.50 | 17.31 |
| | (0.34) | (0.42) |
| | 979 | 1,517 |
| Writing | 17.06 | 12.91 |
| | (0.64) | (0.54) |
| | 443 | 1,130 |

Note: Standard errors in parentheses.

**Table 15**
**Average Hispanic TAAS Pass Rate Gains (1994-2000) Relative to White Pass Rate Gains, Campus Level**

| | Hispanic Group **Counts** in Campus Accountability Rating | Hispanic Group **Does Not Count** in Campus Accountability Rating |
|---|---|---|
| Math | 14.55 | 11.46 |
| | (0.23) | (0.43) |
| | 1,896 | 1,382 |
| Reading | 7.35 | 4.90 |
| | (0.22) | (0.37) |
| | 1,891 | 1,377 |
| Writing | 5.85 | 3.05 |
| | (0.34) | (0.41) |
| | 961 | 1,406 |

Note: Standard errors in parentheses.

**Table 16**
**Average African American TAAS Pass Rate Gains (1994-2000) Relative to White Pass Rate Gains, Campus Level**

| | African American Group **Counts** in Campus Accountability Rating | African American Group **Does Not Count** in Campus Accountability Rating |
|---|---|---|
| Math | 19.48 | 17.83 |
| | (0.35) | (0.41) |
| | 987 | 1,513 |
| Reading | 11.48 | 9.96 |
| | (0.31) | (0.39) |
| | 979 | 1,517 |
| Writing | 9.89 | 7.44 |
| | (0.51) | (0.48) |
| | 443 | 1,130 |

Note: Standard errors in parentheses.

**Table 17**
**Campus Level Hispanic Pass Rate Gains (1994–2000) Relative to White Pass Rate Gains Conditional on TAAS Accountability Status**
**WLS Regressions**

| | Math | Reading | Writing |
|---|---|---|---|
| Intercept | 26.62 | 17.50 | 14.36 |
| | (12.80) | (7.73) | (6.92) |
| Hispanic Accountability Flag | 3.11 | 1.43 | 2.95 |
| | (4.22) | (2.19) | (3.97) |
| African American Flag | -0.38 | -1.22 | -0.32 |
| | (-0.82) | (-2.98) | (-0.49) |
| Fraction of Hispanics who are Econ. Disadvantaged[1] | -0.02 | -0.03 | -0.02 |
| | (-1.70) | (-3.31) | (-2.12) |
| Group Size (%) | -0.63 | 4.94 | 1.99 |
| | (-0.60) | (5.30) | (1.47) |
| Student to Teacher Ratio | -0.50 | -0.28 | -0.23 |
| | (-5.54) | (-3.48) | (-1.93) |
| 1997 Hispanic Pass Rate on Same Test | -0.11 | -0.09 | -0.09 |
| | (-4.94) | (-4.34) | (-4.06) |
| Number of Campuses | 3,275 | 3,265 | 2,365 |
| $R^2$ | 0.023 | 0.034 | 0.022 |

Note: t-statistics in parentheses.
[1]The fraction of the minority group that is economically disadvantaged is interacted with the Economically Disadvantaged flag.

**Table 18**
**Campus Level African American Pass Rate Gains (1994–2000) Relative to White Pass Rate Gains Conditional on TAAS Accountability Status**
**WLS Regressions**

| | Math | Reading | Writing |
|---|---|---|---|
| Intercept | 22.93 | 15.53 | 11.39 |
| | (9.10) | (5.61) | (2.96) |
| African American Accountability Flag | 1.98 | 0.64 | 1.90 |
| | (2.71) | (1.00) | (2.16) |
| Hispanic Flag | -0.23 | 0.23 | 2.23 |
| | (-0.43) | (0.48) | (2.97) |
| Fraction of African Americans who are Econ. Disadvantaged[1] | -0.01 | 0.03 | 0.02 |
| | (-0.91) | (2.94) | (1.43) |
| Group Size (%) | -0.24 | 1.37 | -2.87 |
| | (-0.13) | (0.83) | (-1.14) |
| Student to Teacher Ratio | -0.34 | -0.20 | 0.20 |
| | (-2.87) | (-1.94) | (1.18) |
| 1997 African American Pass Rate on Same Test | 0.01 | -0.05 | -0.10 |
| | (0.80) | (-2.22) | (-3.60) |
| Number of Campuses | 2,498 | 2,494 | 1,572 |
| $R^2$ | 0.007 | 0.020 | 0.035 |

Note: t-statistics in parentheses.
[1]The fraction of the minority group that is economically disadvantaged is interacted with the Economically Disadvantaged flag.

**Table 19**
**Percentage Exempt from TAAS Tests in 1998 by TAAS Score Group in 1997**

| | Passing in 1997 | Not Passing in 1997 | | |
|---|---|---|---|---|
| | | All | Within 10 points of passing | >10 points below passing |
| Math | 0.24% (933,218) | 5.34% (245,738) | 1.97% (121,538) | 8.63% (124,200) |
| Reading | 0.22% (944,727) | 5.85% (224,987) | 2.19% (103,275) | 8.95% (121,712) |

Number of students in parentheses.

**Table 20**
**The Cross-Section Relationship between School-Level Passing Rates and Exemption Rates**

| | | |
|---|---|---|
| Math | -.216<br>(.023) | .101<br>(.021) |
| Reading | -.268<br>(.020) | .044<br>(.019) |
| Writing | -.100<br>(.020) | .111<br>(.019) |
| Controls for Percentage African American and Percentage Hispanic | No | Yes |

Standard errors in parentheses. Each estimate represents the coefficient on the school's exemption rate in a separate regression of school passing rates.

**Table 21**
**Exemption Rates and the Marginal Impact of an Exemption**

| The Number Necessary to Exempt for Group Exclusion (*k*) | Number of Observations (School x Group x Test x Year) | Average Marginal Impact of an Exemption | Average Exemption Rate |
|---|---|---|---|
| < 0 | 75,508 | 0 | 13.2% |
| 0 – 2 | 2,990 | .07 | 14.3% |
| 3 – 5 | 2,611 | .17 | 15.0% |
| 6 – 11 | 4,703 | .06 | 14.4% |
| > 11 | 48,586 | .00 | 12.7% |

**Table 22**
**The Relationship between Exemption Rates and the Marginal Impact of an Exemption**

| | Reading | Math | Writing |
|---|---|---|---|
| Marginal Impact of an Exemption | 13.83<br>(2.40) | 13.07<br>(2.34) | 18,64<br>(2.24) |
| Number of Observations (School x Group x Year) | 46,458 | 46,504 | 41,436 |
| Mean Exemption Rate | 13.12 | 13.02 | 11.52 |

Standard errors are clustered on school and are in parentheses. Each regression also includes a full set of group x year dummy variables.

**Table 23**
**Special Education Exemption Rates from 1994 to 2000**

| Year | Math | Reading | Writing |
|---|---|---|---|
| 1994 | 51.57 | 53.84 | 55.46 |
| 1995 | 53.14 | 55.42 | 55.58 |
| 1996 | 42.90 | 45.63 | 47.89 |
| 1997 | 41.10 | 44.29 | 45.74 |
| 1998 | 39.23 | 43.07 | 43.81 |
| 1999 | 53.92 | 58.09 | 58.03 |
| 2000 | 56.09 | 60.42 | 60.96 |

Each figure is the percentage of special education students exempt from the relevant TAAS test in the given year.

**Table 24**
**Texas vs. U.S NAEP Scores, 1990 – 2000**

| Grade, Subject and Area | Year | Average | 10th Percentile | 90th Percentile |
|---|---|---|---|---|
| 4th Math | | | | |
| US | 2000 | 226 | 185 | 265 |
| Texas | 2000 | 233 | 199 | 266 |
| US | 1996 | 222 | 180 | 261 |
| Texas | 1996 | 229 | 190 | 266 |
| US | 1992 | 219 | 176 | 259 |
| Texas | 1992 | 218 | 179 | 256 |
| Gain TX vs. US | | +8 | +11 | +4 |
| 8th Math | | | | |
| US | 2000 | 274 | 225 | 321 |
| Texas | 2000 | 275 | 234 | 316 |
| US | 1996 | 271 | 222 | 316 |
| Texas | 1996 | 270 | 226 | 314 |
| US | 1992 | 267 | 219 | 314 |
| Texas | 1992 | 265 | 217 | 312 |
| US | 1990 | 262 | 214 | 307 |
| Texas | 1990 | 258 | 213 | 303 |
| Gain TX vs. US | | +5 | +10 | -1 |
| 8th Science | | | | |
| US | 2000 | 149 | 101 | 194 |
| Texas | 2000 | 144 | 99 | 187 |
| US | 1996 | 148 | 102 | 191 |
| Texas | 1996 | 145 | 102 | 185 |
| Gain TX vs. US | | -1 | -2 | -1 |
| 4th Reading | | | | |
| US | 1998 | 215 | 165 | 261 |
| Texas | 1998 | 217 | 172 | 259 |
| US | 1994 | 212 | 156 | 261 |
| Texas | 1994 | 212 | 161 | 259 |
| US | 1992 | 215 | 168 | 259 |
| Texas | 1992 | 213 | 168 | 255 |
| Gain TX vs. US | | +4 | +7 | +2 |
| 8th Reading | | | | |
| US | 1998 | 261 | 215 | 304 |
| Texas | 1998 | 262 | 222 | 299 |

**Table 25**
**Annual District Enrollment Growth (1995 – 2000)**
**by 1995 Accountability Rating**

| 1995 District Accountability Rating | Average Annual Percentage Growth in Enrollment From 1995 to 2000 | Standard Error |
|---|---|---|
| Academically Unacceptable | 0.53* | 0.35 |
| Academically Acceptable | 1.67* | 0.09 |
| Recognized | 2.89* | 0.35 |
| Exemplary | 5.70* | 1.44 |

*Significantly different (p < .05) from adjacent rating

**Table 26**
**Growth in District Enrollment (1995 – 2000) by Accountability Rating**
**and Student Demographic Characteristics,**
**Weighted Least Squares**

| Regressor | Coef. (SE) | Coef. (SE) |
|---|---|---|
| Intercept | 6.21<br>(1.30) | 6.60<br>(1.25) |
| Academically Unacceptable | -5.17<br>(1.24) | -3.17<br>(1.22) |
| Academically Acceptable | -3.97<br>(1.21) | -2.76<br>(1.17) |
| Recognized | -2.65<br>(1.31) | -2.14<br>(1.26) |
| Avg. Rating in County | -0.47<br>(0.44) | -0.74<br>(0.43) |
| %African American | -- | -0.032<br>(0.006) |
| %Hispanic | -- | -0.025<br>(0.003) |