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Three Essays on the Economics of Education in Texas

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Three Essays on the Economics of Education in Texas

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Dedication

To Allen, whose love and patience have made graduate school far less painful and life far more rewarding than I ever thought possible.

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Three Essays on the Economics of Education in Texas

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Chapter 2 examines the effect of school choice if the cost of educating students varies by ability. I construct a model where teachers allocate their time between lecturing and working with students individually. A selective magnet school is introduced and high-ability students exit the classroom, this makes educating students at non-magnets more costly. To test the effects of introducing a magnet school, I construct a six-year panel of students who during the last two years can attend a magnet program or their neighborhood school. I find that attending the magnet positively affects individual's test scores and that the share of future magnet students in ones class negatively affects individual test scores. This suggests that some students may be better off if magnet students are removed from their class.

Chapter 3 tests whether performance based incentives exist for employees of Texas schools. I construct a panel of approximately 1000 high schools in the state of Texas between 1998 and 2002 and examine the impact of performance on both salaries, and the probability of retention. The paper finds that while both coaches and principals

receive some monetary incentives to perform well, in actuality, coaches are held much more accountable for their performance than principals.

Chapter 4 examines how an incentive scheme for public employees based on performance measures can result in an inefficient allocation of a public good. I create a theoretical model with education being a function of verifiable and non-verifiable inputs, a fixed cost for the individual's effort and an incentive which rewards only the output derived from the "verifiable" input. This results in lowered production as individuals chose an economically inefficient, though personally rewarding, allocation of the inputs. I test this theory by examining the Houston School District, which adopted a similar policy, and comparing its education measures to all other schools in Texas. Houston schools showed a significant improvement in only one of the measures to which incentives were tied. Overall education performance did not significantly increase, however it also did not significantly decline as was predicted in the theoretical model.

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Chapter 1: Introduction

Let us reform our schools, and we shall find little need of reform in our prisons.

~ John Ruskin

So what is Texas? The simplest answer is that it is America on steroids.

~ The Economist

In 1983, the U.S. Department of Labor's National Commission on Excellence in Education declared that the nation was at risk. Citing declining student test scores, diluted curriculums and a deficient talent pool of teachers, the Commission called for massive reforms to improve educational content, expectations and teaching. These reforms, it was hoped, would stem the "rising tide of mediocrity" threatening the nation and restore the United States to its former preeminence.

In the intervening years, states have tried various approaches to redress public education's reported shortcomings, perhaps no more so than Texas. In 1984 it passed the "Education Reform Act," which instituted biennial testing for all students in mathematics and English, as well as requiring for graduation passage of an exit-exam. The state adopted competency tests for teachers and administrators, and a short-lived "career ladder" for teachers. Participation in extracurricular activities was prohibited for students who were not in good academic standing. The act required dropout reduction programs and revamped school finance so as to channel more funds into property-poor school districts. In 1990, the state instituted the Texas Assessment of Academic Skills (TAAS) and incorporated it into schools' annual performance reports. This test has since been included in accreditation determinations.

Beginning in 1995, newly elected Governor George W. Bush actively pursued education reform. During his tenure, Governor Bush pushed through legislation and policies that increased local controls over education, authorized charter schools and enabled students to transfer out of low-performing schools, increased salaries for new teachers, and upgraded the statewide curriculum and testing system. Emphasizing accountability and standards, his vision for reform culminated in the 1999 Student Success Initiative, which effectively ended social promotion in the state of Texas.

Bush was shortly thereafter elected President of the United States and appointed former Houston superintendent and school accountability advocate Rod Paige as the Secretary of Education. Together, the two marshaled the national education initiative known as "No Child Left Behind" into law, federalizing many of the reforms first tested in Texas.

Because Texas solutions are now being applied to national problems, the strategies that developed within the state merit closer attention. To this end, the following chapters examine various educational reforms implemented in Texas, the challenges they attempted to address, the theory behind their approach as well as possible unintended consequences of these approaches, and the impact of the programs.

Chapter Two deals with school choice in the form of magnet schools. Specifically, the chapter looks at how the departure of high-ability students from a classroom affects those students who are "left behind." It is assumed that teachers have a fixed amount of time and must allocate it between class lectures and working with individual students. Additionally assuming that students of varying abilities respond differently to these two methods of teaching, The chapter presents a theoretical model that considers the cost of educating differently abled students and how shifting the mix of students might impact overall educational outcomes. The chapter then goes on to examine a cohort of students in the Austin school system and estimate the effect its sole magnet junior high has on non-magnet students there.

Chapter Three visits the issue of merit pay by examining two very different types of employees of the Texas school system: high school football coaches and high school principals. The careers of both are followed during three consecutive school years in order to measure, by a variety of metrics, the impact of their performance on both salary and retention. The chapter pays particular attention to the Houston school district, which prior to the time period studied had enacted specific policies linking principals' pay and retention to performance.

Chapter Four extends the analysis of merit pay by looking at the policy implemented by the Houston school system, using a theoretical model that mirrors its incentive program to study how linking pay to quantifiable measures of education performance would impact overall education performance. The chapter then examines various measures at Houston schools in comparison to other Texas schools, prior to the district's policy and afterwards, in order to discern whether the policy had any significant effect on student performance in Houston.

These three chapters examine school choice as well as professional accountability – two of the major tactics proposed by school reform advocates and now being promulgated in the national arena. By examining these programs using an economic methodology, it is hoped that a better understanding of the underlying motivations and possible consequences will be gained, in order to identify both the benefits and the possible shortcomings of these approaches, and allow school reformers to improve programs, resulting in improved education outcomes for both Texas and the country at large.

Chapter 2: The Effects of Magnet Schools on Non-Magnet Students: The Kealing Magnet School

This is the right time for school choice . . . in the 60s we didn't want to go from segregation to integration because of fears that were never realized. It's the same today, going from no choice to school choice. The only fear we should really have is that we could deprive our children of a quality education because we failed to act.

~ Beryl Roberts

INTRODUCTION

Attempts to reform public education have centered upon increasing school choice by allowing parents to remove their children from foundering schools and place them in more successful programs. Means to this end have been somewhat contentious, as education vouchers have been subject to repeated court challenges, and charter schools have had uneven results. Largely absent from the debate has been a third alternative: magnet schools.

Magnets are public schools with special curriculum whose enrollment is open to students beyond the geographic attendance zone. The "special" quality may be an alternative teaching methodology – such as "open" and Montessori schools – or a unifying theme – such as Technology and Performing Arts. By appealing to particular interests, magnet schools have been used to combat segregation, attracting substantial numbers of students of different racial backgrounds.

This raises some concern for non-magnet schools. As many magnet schools use selective criteria for gaining admittance, non-magnet schools are left with a negatively skewed distribution of ability. Assuming that the presence of high-ability students has a positive effect on the educational performance of their peers, students at non-magnets will do worse after a magnet exodus. Moreover, if high-ability students require less teacher time than their peers, they in effect "subsidize" low-ability students in the classroom. Holding student-teacher ratios constant, then, non-magnet education becomes relatively more expensive as high-ability students depart.

The negative impact of a magnet exodus may be mitigated when neighborhood students attend classes with magnet students, as is the case with magnet schools that operate within an existing neighborhood school. Neighborhood students may experience a positive peer effect as high-ability students enter their school. If this is not the case, however, further questions arise regarding how to allocate resources between magnets and non-magnets at the same campus.

This chapter will examine these issues, first by creating a theoretical model which considers individual teachers' responses to the change in classroom makeup, followed by an empirical section that uses panel data for third through eighth grade students in Austin, Texas, between 1994 and 1999. Austin was chosen because during that period Austin had only one magnet junior high school, the district serves more than 76,000 students each year, and Texas allows matching of student level data. Finally, because the magnet school, Kealing Junior High, serves only seventh and eighth grade students, it is possible to infer the home schools of many of the students that elect to attend the magnet school.

The results of the theoretical and economic models are somewhat mixed. While the theoretical model offers no clear conclusion as to how teachers allocate their time to higher- and lower-ability students once the share of the latter increases, the empirical results suggest that the presence of "magnet" students negatively impacts test scores. As such, the results of this chapter could be interpreted as suggesting that high-performing students monopolize the teacher's time and that other students perform better if the share of these students in one class is minimized.

PREVIOUS LITERATURE

The majority of research on school choice has focused on the issue of educational vouchers and has primarily taken one of two approaches: using existing data to determine how programs affect participating students; or using a computational model to determine how a voucher program would affect all students, and how it would affect the financing of a public school system. Alternative research on the subject examines open enrollment districts – where students may attend any school within their district – as well as the effects of moving in and out of closed enrollment districts.

An overview of randomized voucher experiments which took place in New York City, Dayton, Ohio, and the District of Columbia between 1998 and 2001 can be found in Peterson *et al.* (2003). Partial vouchers, the amounts of which varied by program, were offered to low-income families. Applying students took the Iowa Test of Basic Skills (ITBS) in order to gauge baseline performance, while parents were interviewed about the education experiences of all their children. A lottery then determined which students would receive the vouchers. In each successive spring, students took the ITBS again to measure academic gains.

In general, all three programs found significant gains in math scores for only African American students utilizing the vouchers: after two years they scored on average 6.3 percentage points higher on the ITBS than comparable African American students who remained in public schools. Krueger and Zhu (2004) question the results of the New York experiment, however. They found that if students with missing baseline information were included, the results were much less significant. In addition, a convention used by the authors of the New York study – using mother's race to proxy for student's race – further overstates the effects of vouchers on minority students. Kruger and Zhu were left to conclude only that the availability of vouchers had a small positive effect on math and reading exams after three years.

Rouse (1998) examines the Milwaukee voucher program, first instituted in 1990, which provided low-income families with vouchers (worth approximately $3200 for the 1994-1995 school year) for students to attend the secular private school of their choice. Early studies of the program found no achievement gains among choice students. However, these studies were criticized for using a comparison group from more advantaged families than those which participated in the choice program. Alternatively, using unsuccessful applicants to the choice program as a comparison group, Rouse found significant gains in both reading and math for choice students. This analysis was thought to overstate the effects, as it excluded students admitted into the choice program who did not attend a private school for any substantial period of time, and counted unsuccessful applicants as a nonrandom comparison group. Rouse (1998) uses both unsuccessful applicants and a random sample of students from Milwaukee public schools as a comparison group. Choice students, according to this hybrid approach, had faster gains in math scores than the comparison groups but reported similar gains for reading.

Instead of looking at voucher experiments, Epple and Romano (1998) create a theoretical and computational model with vouchers, differentiated private schools, a homogenous public school, and students varying by ability and income. In addition, the model assumes that school costs vary only by size and that the marginal cost of educating each student is constant. Vouchers in this model produce an enlarged private sector, increase student sorting, and primarily benefit low-income, high-ability students.

Cullen *et al.* (2000) study the impact of the open enrollment policy of the Chicago School District (CSD) by examining the probability that students graduate while controlling for family characteristics, eighth grade test scores, average eighth grade test scores for the school they attend, and whether they attended their base school or opted to attend another school in the district. Most relevant to this chapter, this study finds no negative spillover effects for students that remain at their base school. This result is somewhat contrary to the theoretical prediction of the model presented below.

I would argue that Cullen's choice of data set and institutions led to her conflicting outcome. Cullen's data consists of high school students for whom she has eighth grade math and reading achievement scores. Students exempted from taking the tests, such as special education students, are not included in the study. The dependent variable is whether a student graduates or not. Roughly half of students in the CSD opt out of neighborhood schools, which makes it difficult *ex anti* to predict what the peer quality of a given school will be. Any of these factors would make the effect of sorting on low-ability students difficult to isolate.

Rather than considering open enrollment, Hanushek, Kain, and Rivkin (2001a) examine the impact of students in the state of Texas switching schools between fourth and seventh grade. They find a small increase in school quality for students who changed districts in all demographic groups except African American, but no evidence that switching schools within districts results in higher school quality. Additionally, the results show that students attending schools with high turnover rates suffer significant achievement losses.

With regard to the actual learning process within a classroom, Lazear (1999) addresses the equivocal effects of class size on student learning by constructing a theoretical model that accounts for classroom disruptions, which lower productivity. His results suggest that the effect of class size is more pronounced in smaller classes with more disruptive students, as is often the case in elementary education. He argues that private schools are able to have larger classrooms while out-performing their public counterparts because charging a positive price attracts better, less disruptive students. However, Lazear assumes that there are only two types of students – more and less disruptive – and that student type is the only factor in probability of disruption.

My model assumes that teachers divide their time between lecturing and working with individual students whose abilities vary. While all students benefit from individual time with a teacher, low-ability students' marginal benefits are greater than those of high-ability students. Teachers maximize the score of each student on a set criterion, such as the TAAS test, conditional on their time endowment. Because of their higher marginal benefits, teachers devote more individual time to low-ability students. If, however, a magnet school attracts students from the upper tail of the ability distribution, then holding student-teacher ratios constant, educating students at non-magnets becomes relatively more expensive. Since the total time endowment for teachers has not increased and this time must now be divided between students with a lower mean ability level, the average scores of students on the criterion is expected to fall.

THEORETICAL MODEL

Assume that the education output of the class on a standardized test is of the form:

2.1 $$EducationalOutput = \Phi_N(\vec{\Theta}_s, \overline{\Theta}, t_p, \vec{t}_s)$$

$\vec{\Theta}_s$ = A vector of individual student abilities

$\overline{\Theta}$ = Average ability of all students in the classroom

$\vec{t}_s$ = A vector of the share of a teacher's time spent with each individual student

t_p = Share of teacher's time spent lecturing

Assume that teachers are aware of this relationship between their time, student and class ability, and student outcomes. Teachers must allocate their total time between lecturing and spending time with each student in order to maximize the overall educational outcome of the classroom (i.e., the number of students passing some objective test). The teacher's maximization problem then takes the general form of

$$2.2 \qquad \underset{\vec{t}_s, t_p}{Max}: \Phi_N(\vec{\Theta}_s, \overline{\Theta}, t_p, \vec{t}_s) \qquad \text{subject to:} \; t_p + \sum_{s=1}^{N} t_s \leq 1$$

where N is the total number of students in the class.

In order to simplify the derivation, assume that there are only two types of students, high ability (Θ_h) and low ability (Θ_l), where $\Theta_h > \Theta_l$. Moreover, assume that the total share of students is equal to $n_h + n_l = 1$ with the class size equaling the constant N. Assuming that the educational output function is separable, the output function can be written as

$$2.3 \qquad \Phi_N(\Theta_l, \Theta_h, \overline{\Theta}, t_l, t_h, t_p) = n_l N \phi_l(\Theta_l, \overline{\Theta}, t_l, t_p) + (1 - n_l) N \phi_h(\Theta_h, \overline{\Theta}, t_{h,} t_p)$$

The teacher's time constraint can now be written as

$$2.4 \qquad t_p + n_l N t_l + n_h N t_h = 1$$

From this we can derive the share of lecture time as

$$2.5 \qquad t_p = 1 - n_l N t_l + n_h N t_h$$

This can be substituted into the teacher's maximization problem to produce the following unconstrained problem:

2.6 $$\underset{t_l,t_h}{Max}:\Phi_N(\Theta_l,\Theta_h,\overline{\Theta},t_l,t_h,t_p)= \\ n_l N\phi_l(\Theta_l,\overline{\Theta},t_l,1-n_l Nt_l-(1-n_l)Nt_h) \\ +(1-n_l)N\phi_h(\Theta_h,\overline{\Theta},t_{h,}1-n_l Nt_l-(1-n_l)Nt_h)$$

Assume that all of these inputs have non-negative first derivatives and negative second derivatives. That is to say, increasing ability, the ability of one's peers, time spent in individual instruction with a teacher and time spent listening to a teacher lecture - while not necessarily increasing the probability that an individual will pass a test - will certainly not lessen it. The effects diminish, however, as each input increases.

More interestingly, assume the following cross-partial relationships (where *s* can either equal low-ability *(l)* or high-ability *(h)* students):

2.7 $$\partial^2\phi_s/\partial t_p\,\partial\Theta_s>0$$

2.8 $$\partial^2\phi_s/\partial t_s\,\partial\Theta_s<0$$

2.9 $$\partial^2\phi_s/\partial t_p\,\partial\overline{\Theta}>0$$

2.10 $$\partial^2\phi_s/\partial t_s\,\partial\overline{\Theta}=0$$

2.11 $$\partial^2\phi_s/\partial t_s\,\partial t_p\geq 0$$

These relationships indicate that high-ability students respond more than their low-ability counterparts to lectures, while low-ability students benefit more from individual time spent with teachers. In addition, as the average ability of the class falls, the effectiveness of lectures also falls, since presumably the lecture must be slower paced. However, average ability of the classroom has no effect on the efficacy of individual instruction, since the other students are not participating in the interaction between the students and the teacher. Finally, individual instruction and lectures are mutually beneficial, or at least do not diminish the benefits of the other.

The teacher maximizes with respect to t_l and t_h. Assuming interior solutions, we have first order conditions of

2.12 $$\frac{\partial \Phi_N}{\partial t_l} = Nn_l \left(\frac{\partial \phi_l}{\partial t_l} - n_l N \frac{\partial \phi_l}{t_p} - (1-n_l) N \frac{\partial \phi_h}{\partial t_p} \right) = 0$$

2.13 $$\frac{\partial \Phi_N}{\partial t_h} = N(1-n_l) \left(\frac{\partial \phi_h}{\partial t_h} - Nn_l \frac{\partial \phi_l}{\partial t_p} - (1-n_l) N \frac{\partial \phi_h}{\partial t_p} \right) = 0$$

From equations 2.12 and 2.13, we can find the second order conditions:

2.14 $$\Phi_{ll} = Nn_l \left(\frac{\partial^2 \phi_l}{\partial t_l^2} + n_l^2 N^2 \frac{\partial^2 \phi_l}{\partial t_p^2} + (1-n_l) n_l N^2 \frac{\partial^2 \phi_h}{\partial t_p^2} \right)$$

2.15 $$\Phi_{hh} = N(1-n_l) \left(\frac{\partial^2 \phi_h}{\partial t_h^2} + (1-n_l) n_l N^2 \frac{\partial^2 \phi_l}{\partial t_p^2} + (1-n_l)^2 N^2 \frac{\partial^2 \phi_h}{\partial t_p^2} \right)$$

$$2.16 \quad \Phi_{lh} = N^3(1-n_l)n_l\left(n_l\frac{\partial^2\phi_l}{\partial t_p^2}+(1-n_l)\frac{\partial\phi_h}{\partial t_p^2}\right)$$

$$2.17 \quad \Phi_{hl} = N^3(1-n_l)n_l\left(n_l\frac{\partial^2\phi_l}{\partial t_p^2}+(1-n_l)\frac{\partial\phi_h}{\partial t_p^2}\right)$$

All of the second order conditions are less than zero. These second order conditions form the Hessian, written in shorthand here as

$$2.18 \quad \begin{bmatrix} \Phi_{ll} & \Phi_{lh} \\ \Phi_{hl} & \Phi_{hh} \end{bmatrix}$$

and proven in the appendix to be negative semi-definite.

Because low-ability students get more out of individual teacher instruction than their high-ability counterparts, and because the marginal products of both types of students must be equal at the optimum, we can assume that t_l is greater than t_h. As such, we can then sign the following relationship.

$$2.19) \quad \frac{\partial t_p}{\partial n_l} = N(t_h - t_l) < 0$$

That is, as additional low-ability students join the classroom, teachers respond by decreasing the amount of time devoted to lectures.

Finding the effect that changing the share of low-ability students in the classroom has on individual time with each type of student is more difficult. Using the Hessian in conjunction with Cramer's rule, we can define the following relationships[1]:

$$2.20 \qquad \frac{\partial t_l}{\partial n_l} = \frac{\begin{vmatrix} \left[-\Phi^*_{lp}\dfrac{\partial t_p}{\partial n_l} - \Phi^*_{l\overline{\Theta}}\dfrac{\partial t_{\overline{\Theta}}}{\partial n_l} - N\left(\dfrac{\partial \phi_h}{\partial t_p} - \dfrac{\partial \phi_l}{\partial t_p}\right)\right] & \left[\Phi^*_{lh}\right] \\ \left[-\Phi^*_{hp}\dfrac{\partial t_p}{\partial n_l} - \Phi^*_{h\overline{\Theta}}\dfrac{\partial t_{\overline{\Theta}}}{\partial n_l} - N\left(\dfrac{\partial \phi_h}{\partial t_p} - \dfrac{\partial \phi_l}{\partial t_p}\right)\right] & \left[\Phi^*_{hh}\right] \end{vmatrix}}{\begin{vmatrix} \Phi^*_{ll} & \Phi^*_{lh} \\ \Phi^*_{hl} & \Phi^*_{hh} \end{vmatrix}}$$

$$2.21 \qquad \frac{\partial t_h}{\partial n_l} = \frac{\begin{vmatrix} \left[\Phi^*_{ll}\right] & \left[-\Phi^*_{lp}\dfrac{\partial t_p}{\partial n_l} - \Phi^*_{l\overline{\Theta}}\dfrac{\partial t_{\overline{\Theta}}}{\partial n_l} - N\left(\dfrac{\partial \phi_h}{\partial t_p} - \dfrac{\partial \phi_l}{\partial t_p}\right)\right] \\ \left[\Phi^*_{hl}\right] & \left[-\Phi^*_{hp}\dfrac{\partial t_p}{\partial n_l} - \Phi^*_{h\overline{\Theta}}\dfrac{\partial t_{\overline{\Theta}}}{\partial n_l} - N\left(\dfrac{\partial \phi_h}{\partial t_p} - \dfrac{\partial \phi_l}{\partial t_p}\right)\right] \end{vmatrix}}{\begin{vmatrix} \Phi^*_{ll} & \Phi^*_{lh} \\ \Phi^*_{hl} & \Phi^*_{hh} \end{vmatrix}}$$

Both of these relationships are shown in the appendix to be indeterminate.

That the share of time spent lecturing decreases as overall ability in the class diminishes is not surprising. Given the assumptions that low-ability students benefit more from individual time with teachers whereas high-ability students are the main beneficiaries of lectures, these results should naturally follow. What is curious is that the effect of an increase in the share of low-ability students on individual time is ambiguous for both types of students.

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[1] The * notation on the second derivatives indicates that these second derivatives are evaluated at the optimum. See the Appendix A for further details.

The explanation for this curiosity hinges on the impact of peer effects. If the increase in n_l makes lecture time so unproductive that it is radically curtailed, teachers may increase individual time slightly for all types of students. In some special cases this might actually cause low-ability students, who don't benefit as much from the lectures in general, to see a gain in test scores as the average ability level in their classroom decreases. How high-ability students fare would depend on whether the marginal returns of lecture time were more or less than that of individual time.

Alternatively, because by increasing n_l you are in effect replacing a student requiring less time with one requiring a good deal more, teachers may have to skim time from all students in order to spend an efficient amount with the new additions, resulting in students losing the benefits of both lecture and individual time. This case is more likely as it doesn't require such a large fall in average ability or that lectures are largely unproductive for remaining students. Educational outcome should fall for both types of students in this scenario, though it's unclear which will fall by more.

This second contention lends support to the argument that neighborhood students whose schools include a magnet school are worse off than students left in non-magnet schools. At schools outside the magnet neighborhood, a smaller percentage of the student population will attend the magnet school, as their expected benefit must exceed the implicit cost of attending a school outside their immediate locality. For those students living within the neighboring area, the costs are significantly lower and so a higher fraction of high-ability students will choose the magnet classroom over the non-magnet one. If class sizes remain the same, then teachers may have to decrease the amount of time spent with the original low-ability students in favor of newly added students whose abilities are lower than their predecessors' and therefore require relatively more individual time. This in turn would result in a decrease of those students' outcomes, all other things being equal.

THE KEALING MAGNET SCHOOL

The Kealing Magnet School was formed in 1986 as a science, math, and technology magnet within the existing Kealing Junior High. In 1992, a liberal arts magnet was added. This school within a school selects approximately 300 students each year for the magnet program from a pool of around 500 applicants. The application process consists of ITBS scores, teacher recommendations, past homework assignments, a parent questionnaire, and a letter written by the student explaining their interest and desire to attend Kealing. Students may apply to the Science, Math and Technology (SMT) Strand, the Liberal Arts Strand, or the Combined Strand.

While Kealing Junior High offers honor classes (which magnet students can take in lieu of magnet courses, provided they attend magnet courses in their "Strand"), magnet courses are taught at an advanced level with an enriched curriculum designed for Gifted and Talented students. Kealing magnet students have been honored for their performance in math and science with a number of awards and grants, both regionally and nationally, over the years.

Non-magnet or neighborhood students attending Kealing come primarily from one of five feeder schools: Lee, Blackshear, Maplewood, Campbell and Oak Springs Elementary. Of these schools, Campbell and Oak Springs tend to be under-represented in the Magnet program, while Lee is thought to be over-represented. Neighborhood students are placed in either the "Pre-AP" program or the "Excel Program"; the former is geared toward honors-level work and the latter curriculum is designed for students functioning below grade level. Both Pre-AP and Excel classes have student-teacher ratios significantly lower than that of magnet classes. Magnet electives are open to non-magnet students, though availability is limited and magnet students are given first priority. Honors classes are open to all students who are academically eligible for them. All students are required to take one semester of physical education each year.

The magnet program at Kealing was originally created to help integrate the school, and in fact the mission statement of the program reads, "to provide a rigorous and accelerated core curriculum, innovative instruction, and a supportive environment to a diverse community of motivated students" (Handout, 2003). While it has been unequivocally successful at its first two charges, the realization of its last is less clear. Whites account for 43 percent of the magnet's population, compared to 31 percent of the entire Austin Independent School District (AISD), yet they comprise only 29 percent of Kealing's non-magnet students (Handout, 2003).

Many neighborhood parents charge that there is little interaction between magnet and non-magnet students, and there is a significant disparity between the student groups' outcomes. Though Texas Assessment of Academic Skills (TAAS) scores as reported by the Texas Education Agency (TEA) combine the magnet and non-magnet scores for a single school performance measurement, the AISD web page reported an average gap of more than 34 points in the percentage of magnet versus neighborhood students passing the TAAS math, reading and writing tests during the 1998-1999, 1999-2000, and 2000-2001 school years.[2] It also appears that neighborhood students at Kealing are doing worse than their peers at other AISD junior high and middle schools, with only 66

[2] The gap between eighth grade magnet and non-magnets was only 25 points for share passing the reading test in 1998-1999, and 28 points for the math test in 2000-2001. The gap between seventh grade magnet and non-magnet was only 28 points for the math test in 1999-2000. For all other years, the gap was 30 points or more for both seventh and eighth graders.

percent of non-magnet eighth graders passing the state achievement test in math in 1999-2000, compared with 79 percent of other district eighth graders (Reston, 2001).

Magnet parents, upset with district curriculum changes, attempted to make the magnet program a charter school, completely independent of Kealing, as recently as 2001. The attempt failed after community leaders argued Kealing would be severely hurt by the flight of teachers, students and funding. Meanwhile, a contentious firing of Kealing's principal in 2001 led many parents of neighborhood students to suggest that the dismissal was racially motivated and that her termination was the result of disgruntled teachers who resented the principal's attempts to make magnet resources available to neighborhood students.

It should be noted that these controversies occurred shortly after the time period this paper examines. During the 2000-2001 school year, 23 of the 79 teachers at Kealing requested transfers to other schools (Reston, 2001), though few teachers accepted transfers once the principal was fired (Spencer, 2001). It would certainly be reasonable to suppose perceptible conflict existed at Kealing before this, and that this might affect the performance of all types of Kealing students. This may understate any positive effects of magnet students on neighborhood student's performance, though it would have no effect on students not attending Kealing. More problematic is that if the friction between parents of magnets and non-magnets were well publicized (and it appears that they were well chronicled by the Austin American-Statesman), then potential magnet students may have opted to attend their own neighborhood school instead of Kealing, which would lessen the effect this paper is examining.

However, as the next section will explain in detail, this paper looks only at seventh and eighth graders in the spring of 1998 and 1999 respectively. This precedes the firing of the Kealing principal, though it does cover the period when magnet parents were petitioning for a science, math and technology charter school. Since the current students would not have been eligible (being well into high school by the time their parent's efforts could have reached fruition), I will assume that the political climate did not significantly alter the applicant pool.

THE DATA

Data for this paper were provided by the University of Texas at Dallas's Texas Schools Project (TSP). The dataset consists of detailed information on individual students, teachers and schools from 1992 to the present. The period of 1994 to 2000 was chosen because TAAS was well established by 1994, and a minimum of changes to the collection process occurred during this time period.

Students were selected who were in the corresponding grade for each year (that is, they were in third grade during the 1993-1994 school year, fourth grade in the 1994-1995 school year, etc) and took the TAAS within the Austin school district. Only students' scores that were considered "valid" were used in this analysis, though entries with invalid scores were used to determine the number of peers and the tenure of a student in the district. Requiring that students follow a traditional progression rather than either accelerated or decelerated promotion entailed excluding a small fraction of students, 0.74 percent between 1993-1994 and 1994-1995, though the number of students held back in sixth grade was somewhat larger (2 percent). Requiring valid scores had a much more limiting effect: 15 percent of the observations had to be dropped, the majority of which were labeled either limited English proficiency (LEP) or special education (SPECED).[3]

[3] These were restricted because the majority of the tests recorded a raw score of zero, which can be due to test administrators filling in both the "Score Test" and an alternative designation (such as LEP or special education) rather than one or the other. Approximately 3.8 percent of the observations were dropped because of LEP status in the case of both math and reading tests; 6.9 and 7.4 percent of the observations were dropped due to SPECED status for math and reading respectively.

Students were matched, using identification numbers provided by the TEA, between their attendance, demographic, and TAAS files. School information (such as average test scores and racial composition) came from the TEA demographics file. Students were allowed to leave the school district and then return, though information on them during their time outside AISD was not included.

Tables 2.1.a through 2.1.c give the general demographic information about the panel. Note that there are 3,344 students for which I have information on for all six years of the sample, which was roughly 59 percent of all eighth graders in the Austin School District in 1998-1999. Also of interest is that blacks, whites, and females are over-represented in the full panel, whereas Asians, Hispanics, and males are under-represented.

Tables 2.2.a through 2.2.d list attendance rates, number of districts, number of schools, and average scores as well other demographic information by type of school and year. Worthy of note is that the average scores and school demographic information came from the TEA school files, and therefore does not distinguish between the magnet and non-magnet programs at Kealing. Most of the statistics remain fairly stable over time; however, the share of students labeled "Gifted" jumps from 8.76 percent for fifth graders, which is consistent with the district average, to an excess of 40 percent for seventh graders. This suggests that the district broadens the definition once children enter middle-school age. Additionally, junior high[4] students appear to do better than their middle school counterparts on both the math and reading TAAS exams, though Kealing non-magnet students fare worse.

Whether a Kealing student is a neighborhood student or part of the magnet is not reported in the data. In addition, the specification of "Gifted and Talented" (G/T) is

[4] Junior highs are defined as schools which serve only the seventh and eighth grades, while middle schools serve the sixth, seventh and eighth grades.

neither necessary nor sufficient to determine if a Kealing student is a magnet or not. To identify students in the magnet program, students who did not attend a Kealing feeder school prior to attending Kealing are treated as magnet students, while those who did are assumed to be non-magnet students. This is admittedly not a clean proxy, as school officials have stated that some feeder schools are actually "over-represented" in the magnet program, and those students who move to the neighborhood in seventh or eighth grade are automatically assumed to be magnet students regardless of prior performance. However, as this assumption understates magnet performance (since some non-magnet students will be identified as magnet students) and overstates non-magnet performance (since some magnet students will be identified as non-magnet) the effect will be to understate the effect of a magnet exodus and thus is the more conservative research option. Students who eventually attend the magnet program are assigned a value of "1" for the variable entitled "magnet" for all years in the sample. The share of students at each school who eventually attend the magnet is reported for every student in the sample.

Attendance information comes from the TSP's attendance file, which marks which school a student is enrolled in every six weeks, how many days they attended, and how many days they could have attended. Because attendance rolls were not always current, it was possible for a student to be listed at more than one school. The convention used here was to attribute their performance to whatever school administered the TAAS; their attendance rate, the total number of districts and the total number of schools attended during the school year were included as separate variables.

A series of metrics are used to measure student performance, all of which are a variation of the TAAS score. A Texas Learning Index (TLI) score is a TAAS score reported by the state that has been adjusted for the difficulty of the exam. These are recorded for both math and reading tests. Z-scores are created for both math and reading

TAAS scores by normalizing a student's raw score to the average valid score for all students in that grade level in the state of Texas. Both math and reading scores were used as dependent variables (separately), though some research has suggested math scores are a better measure of student performance. However, there were strong, positive correlations, on the order of .77 to .84, between the math and reading scores for all metrics used.

Charts 2.1.a through 2.1.d and 2.2.a through 2.2.d show the breakdown of TLI math and reading scores respectively, by type of school attended. Kealing magnet students performed more than 50 percent better than their non-Kealing, middle school counterparts on both the math and reading exams. The scores for non-magnet Kealing students were similar to those in the non-Kealing middle school distribution for math and slightly above them for reading.

RESULTS

Both least-squares and fixed effects models were run for all metrics with an assortment of independent variables to ascertain how student performance on both math and reading tests was affected by individual and school qualities, as well as the presence of and interaction with magnet students. Tables 2.3.a and 2.3.b show math and reading scores for elementary and non-elementary schools, respectively. Year and school dummies are included in the regressions but not detailed in the tables. School effects, such as the share of students in gifted and talented programs, were not included in all equations in order to see how their absence impacted other variables. The non-elementary regressions appear to be more robust, having adjusted R^2 measures of .08 to .12 higher and significantly larger F statistics. Interestingly, while males perform significantly better in math during elementary school, they do not in junior high or middle school, whereas females perform significantly better in reading in both settings.

Most of the other variables had similar effects across school types. The controls for school effects, however, were much more significant at non-elementary schools, where the share of gifted students generally had a significant positive effect, while the share of disadvantaged and the share of white had negative effects. At elementary schools, only the share labeled "disadvantaged" had a significant effect on math scores and it is in the opposite direction. It is unclear why this would be the case.

Tables 2.4.a and 2.4.b present OLS regressions with robust standard errors at all schools, for either all students or those in the dataset every year, respectively. The signs of the majority of coefficients follow conventional wisdom: being male has a positive effect on math performance and a negative effect on reading; being labeled "gifted" factors in positively, as does a school's average TAAS scores, while being labeled "special education" or "LEP" or receiving free lunches all have a negative effect. Attendance rate appears to have a positive relationship with test scores, indicating that attending school is, reassuringly, beneficial.

Age is consistently negative and significant, which would be expected as older students might have been held back prior to the third grade and would therefore be expected to perform worse. The number of districts attended in the year is insignificant in the OLS analysis, which isn't surprising given that the dataset is restricted to students who took the TAAS test in ASID, limiting its variability. More interesting is that the number of schools attended is negative and significant, but only for the reading scores of students who remained in the dataset all six years. Presumably, these students are moving throughout the district for financial reasons, and so while it's not surprising that this would negatively impact their scores, it is interesting that this only affects reading scores. A possible explanation would be if these movers predominantly had limited English proficiency; any difficulty with the language could be exacerbated by their transitory lifestyle.

While eventually attending the magnet program has a positive and significant effect, the share of magnet students at a student's school is consistently and significantly negative. Attending Kealing without being part of the magnet program appears to have no effect, which is surprising given the claims of non-magnet parents. It should be noted, however, that non-magnet students were identified by having attended a Kealing feeder school; prior to their attending Kealing, the share of their classmates that would eventually attend the magnet was zero, while that share at other elementary schools was around 5 percent. Once these non-magnet students enter Kealing, this share becomes over 65 percent, and so it is true that non-magnet students fare worse from the presence of magnet students, but it does not appear to be solely because they are part of the non-magnet program.

This result causes an interesting interpretation of the theoretical model. While the effect on individual time of both low- and high-ability students once the share of low-ability students increased was indeterminate, the empirical results suggest that low-ability students would do better with fewer high-ability students at their school. Following the logic of the theoretical model, this implies that as the share of low-ability students rises, teachers curtail lectures in favor of more individual time from which low-ability students benefit more. The strength of this argument, however, is mitigated by the fact that some of the students identified as non-magnets are in fact magnet students and vice versa. As such, both the negative presence of magnet students and the indifference of attending the non-magnet program are probably overstated.

Additionally, it should be noted that while eventually attending the Kealing magnet program has a positive effect on all scores, the presence of other magnet students offsets this effect somewhat. While the net effect is positive during elementary school years, once magnet students attend Kealing the net effect becomes negative. It would seem that they too pay a price and that being identified as a magnet student is far more beneficial than attending a magnet school.

The school effects variables were largely insignificant. Only the share of the school that was labeled "disadvantaged" had any effect on any of the regressions, and its effect was positive and only for math scores for all students. However, this is probably due to school dummies being included in the regressions.

Fixed effects regressions were run in order to ascertain if controlling for individual variation would alter the impact of magnet schools. Interestingly, in the fixed effects model using all students in the sample (the results of which are shown in Table 5.a), the number of districts becomes positive and significant for math scores. This suggests that once individual characteristics are controlled for, switching districts does improve one's math skills. That the variable is insignificant when the fixed effects model is restricted to include only students in the dataset for all six years (Table 5b) is not surprising, as one would expect the number of students having switched districts in this restricted dataset to be small.

The coefficient on receiving free lunch becomes positive for the normalized math score in both tables. This might indicate that once individual effects are taken into account, the fact that one receives additional aid helps performance. While LEP is no longer significant, being labeled "special education" retains its same effect, as do the attendance rate and the average math or reading score.

Oddly, once individual effects are taken into account, the overall impact of attending Kealing's non-magnet program becomes positive for the TLI math scores, and the share of magnet students at a student's school becomes positive for all of the reading scores. Non-magnet students still suffer a negative net effect for math, but the presence of magnet students does no harm to their reading scores, in the fixed effects model. Once the dataset is restricted to those in the sample all six years, the Kealing non-magnet variable ceases to have any effect on regressors, while the share of magnet students continues to be negative for math scores and positive for reading.

Why the magnet students would have a different effect on scores for different disciplines deserves some discussion. It could be that math better lends itself to a lecture format than reading, and so the presence of magnet students would encourage teachers to devote more time to lectures when focusing on math lessons, sacrificing individual time and impeding the progress of low-ability students. This effect may have been confounded in the OLS regressions due to individual effects not being taken into account.

Additionally, while Kealing is a math, science and humanities magnet school, its history has been more deeply rooted in mathematics and the hard sciences. As such, it may attract more math-oriented students. As a result, non-magnet students may perform relatively better on reading tests and so the presence of magnet students does not have such a negative effect once individual effects are taken into account.

However, this conclusion complicates any policy proposals that the above theoretical model might put forth. Once individual effects are controlled for, the presence of magnet students has contrary effects depending on the discipline, which would suggest that segregating these students will have a beneficial effect on non-magnet math scores but a negative effect on their reading scores. As such, school administrators would have to decide which scores they're willing to sacrifice when contemplating the creation of magnet schools.

CONCLUDING REMARKS

There appears to be some empirical support for the notion that students are better off once magnet students are isolated, as the presence of magnet students consistently hurts math scores of non-magnet students attending other schools and reading scores if individual effects are not controlled. However, it is unclear whether being a non-magnet student at a magnet school negatively impacts one's academic progress. The non-magnet students attending Kealing suffer from a large presence of magnet students at their school, yet attending the non-magnet school itself has little or no effect. One might be tempted to explain the insignificance of the "Kealing non-magnet" variable by assuming that it is correlated with the "percent magnet," however, this ignores the fact that when looking exclusively at elementary schools, the "percent magnet" variable was still negative and significant.

Because the behavior of these variables is such a departure from either the predictions of the model - that high-ability students subsidize low-ability students, and their exodus lowers remaining students' performance - or the assessment of participants themselves (attending the non-magnet program in Kealing hurts students) suggests that these issues be explored further. Better information regarding the identity of magnet versus non-magnet students might clarify the effect of the program on each. This may be accomplished by examining magnet programs in other states and schools that are devoted exclusively to magnet programs.

Moreover, while panel data on the student was available for this analysis, information on the household was not. Changes in family structure, such as through divorce or death, will be picked up only if they result in the student's switching schools. Otherwise the economic model will not pick up domestic changes, making the individual effect noisier.

It would also be of interest for future researchers to frame the question in a teacher utility model, where teachers prefer working with certain types of students but may be evaluated based on their interaction with another type. This problem, however, would be far more complicated in that the choice of where to teach would also have to be considered, and would probably be better suited to a general equilibrium approach to the questions.

Table 2.1.a Number of Observations, by Ethinicty

	Ethinicity					
Years in Sample	N.A.	Asian	Black	Hispanic	White	Total
1	8	45	310	746	752	1861
2	*	48	173	524	464	1209
3	*	25	167	352	427	971
4	*	20	144	287	292	743
5	*	17	148	353	237	755
6	6	47	608	1271	1412	3344
Total observations	27	202	1550	3533	3584	8896
Race share of sample	0.3%	2.3%	17.4%	39.7%	40.3%	--
Race share 6 years	0.2%	1.4%	18.2%	38.0%	42.2%	--

*Note: Cells of less than five people are not allowed to be disclosed

Table 2.1.b Number of Observations, by Gender

	Gender		
Years in Sample	Male	Female	Total
1	994	871	1865
2	647	566	1213
3	525	448	973
4	389	358	747
5	398	360	758
6	1716	1628	3344
Total observations	4669	4231	8900
share of sample	52.5%	47.5%	--
share 6 years	51.3%	48.7%	--

Table 2.1.c Number of Observations, by Other Classifications

	Classification			
Years in Sample	LEP	SPECED	Econ. Dis.	GT
1	280	302	1001	207
2	235	169	718	176
3	139	140	535	96
4	91	125	422	19
5	144	121	488	12
6	343	369	1646	211
Total observations	1232	1226	4810	721

Table 2.2.a Summary Statistics for Elementary Schools

	1994	1995	1996	1997
N	4236	4547	4766	606
Percentage				
Male	49.83%	49.64%	50.02%	50.66%
Reduced Lunch	0.42%	0.57%	0.71%	1.98%
Free Lunch	45.37%	44.31%	44.15%	48.84%
Limited English Proficiency	3.94%	4.00%	6.63%	8.42%
Special Ed.	5.34%	6.62%	8.60%	11.06%
Gifted	6.61%	7.81%	8.88%	13.20%
Later Attend Magnet	4.96%	4.90%	5.27%	17.66%
Means				
TLI Math	69.220	72.779	73.752	76.432
	(15.856)	(15.209)	(15.500)	(14.307)
Z-Math	-0.032	-0.076	-0.174	-0.078
	(1.031)	(1.079)	(1.118)	(1.094)
Average Math	32.766	37.548	38.736	43.489
	(3.378)	(4.397)	(4.555)	(5.291)
TLI Reading	77.187	78.924	77.909	81.569
	(16.377)	(15.142)	(18.456)	(16.113)
Z-Reading	-0.027	-0.034	-0.151	-0.039
	(1.077)	(1.072)	(1.158)	(1.109)
Average Reading	29.390	30.192	30.989	30.860
	(2.746)	(3.517)	(3.533)	(4.016)
Number of Districts	1.023	1.023	1.022	1.013
	(0.158)	(0.162)	(0.159)	(0.114)
Number of Schools	1.076	1.079	1.073	1.066
	(0.311)	(0.316)	(0.297)	(0.297)
Attendance Rate	0.967	0.968	0.965	0.964
	(0.035)	(0.039)	(0.039)	(0.043)

Standard deviations appear in parenthesis

Table 2.2.b Summary Statistics for Middle Schools

	1997	1998	1999
N	3976	3814	3547
Percentage			
Male	50.48%	50.89%	51.20%
Reduced Lunch	0.96%	1.63%	2.14%
Free Lunch	43.69%	41.09%	35.33%
Limited English Proficiency	5.51%	5.66%	4.31%
Special Ed.	9.41%	9.44%	8.85%
Gifted	47.76%	55.17%	58.89%
Later Attend Magnet	3.95%	0.39%	0.54%
Means			
TLI Math	74.084	74.756	74.890
	(14.928)	(14.453)	(13.982)
Z-Math	-0.262	-0.262	-0.463
	(1.140)	(1.115)	(1.228)
Average Math	41.592	40.348	44.231
	(3.740)	(4.273)	(3.988)
TLI Reading	79.770	79.092	79.860
	(16.424)	(16.020)	(15.529)
Z-Reading	-0.145	-0.155	-0.305
	(1.118)	(1.112)	(1.187)
Average Reading	30.227	34.735	37.218
	(2.650)	(2.885)	(2.960)
Number of Districts	1.022	1.022	1.017
	(0.152)	(0.151)	(0.136)
Number of Schools	1.071	1.071	1.063
	(0.275)	(0.287)	(0.268)
Attendance Rate	0.958	0.957	0.940
	(0.050)	(0.051)	(0.078)

Standard deviations appear in parenthesis

Table 2.2.c Summary Statistics for Junior Highs

	1998	1999
N	663	585
Percentage		
Male	48.87%	48.21%
Reduced Lunch	1.21%	2.74%
Free Lunch	37.41%	32.31%
Limited English Proficiency	6.94%	4.10%
Special Ed.	8.75%	6.50%
Gifted	72.25%	76.07%
Later Attend Magnet	42.68%	44.96%
Means		
TLI Math	78.980	80.754
	(14.451)	(12.738)
Z-Math	0.101	0.084
	(1.135)	(1.143)
Average Math	44.223	49.510
	(2.141)	(0.510)
TLI Reading	83.131	85.094
	(15.913)	(14.387)
Z-Reading	0.115	0.086
	(1.098)	(1.091)
Average Reading	36.826	40.351
	(0.539)	(0.816)
Number of Districts	1.003	1.010
	(0.055)	(0.101)
Number of Schools	1.042	1.031
	(0.201)	(0.182)
Attendance Rate	0.971	0.977
	(0.041)	(0.042)

Standard deviations appear in parenthesis

Table 2.2.d: Summary Statistics for Fifth and Seventh Graders

	Fifth Graders	Seventh Graders, Non-Kealing	Seventh Graders, Kealing Magnet	Seventh Graders, Kealing Non-Magnet
N	4766	4046	282	149
Percentage				
Male	50.02%	50.59%	49.65%	52.35%
Reduced Lunch	0.71%	1.63%	1.06%	0.67%
Free Lunch	44.15%	41.40%	20.57%	55.03%
Limited English Proficiency	6.63%	5.93%	4.61%	6.04%
Special Ed.	8.60%	9.84%	2.13%	9.40%
Gifted	8.88%	55.14%	91.84%	62.42%
Later Attend Magnet	5.27%	0.40%	65.43%	65.43%
Means				
TLI Math	73.752	74.806	84.794	73.201
	(15.500)	(14.435)	(10.942)	(16.721)
Z-Math	-0.174	-0.259	0.588	-0.358
	(1.118)	(1.113)	(0.881)	(1.276)
Average Math	38.736	40.403	--	--
	(4.555)	(4.154)	--	--
TLI Reading	77.909	79.193	88.553	76.416
	(18.456)	(15.965)	(12.925)	(18.861)
Z-Reading	-0.151	-0.148	0.481	-0.348
	(1.158)	(1.108)	(0.883)	(1.312)
Average Reading	30.989	34.813	--	--
	(3.533)	(2.818)	--	--
Number of Districts	1.022	1.021	1.004	1.000
	(0.159)	(0.148)	(0.060)	(0.000)
Number of Schools	1.073	1.069	1.057	1.007
	(0.297)	(0.283)	(0.232)	(0.082)
Attendance Rate	0.965	0.958	0.981	0.965
	(0.039)	(0.051)	(0.027)	(0.048)

Standard deviations appear in parenthesis

Table 2.3.a Regressions of Elementary Math & Reading Test Scores with Year and School Dummies and Robust Standard Errors, 1994-97

N	14417	14417	14417	14417	14287	14287	14287	14287
F-Stat	157.87	281.39	145.86	148.93	119.84	114.47	120.2	114.77
R2	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	TLI Math	TLI Math	Z-Math	Z-Math	TLI Read	TLI Read	Z-Read	Z-Read
Male	**0.567**	**0.568**	**0.040**	**0.040**	**-2.213**	**-2.214**	**-0.147**	**-0.147**
	(0.209)	(0.209)	(0.014)	(0.014)	(0.228)	(0.228)	(0.015)	(0.015)
Age on September 1st	**-2.720**	**-2.743**	**-0.189**	**-0.190**	**-2.759**	**-2.767**	**-0.180**	**-0.180**
	(0.366)	(0.366)	(0.025)	(0.025)	(0.401)	(0.401)	(0.026)	(0.026)
Black	**-10.345**	**-10.339**	**-0.722**	**-0.722**	**-8.341**	**-8.337**	**-0.553**	**-0.553**
	(0.412)	(0.412)	(0.028)	(0.028)	(0.455)	(0.455)	(0.030)	(0.030)
Hispanic	**-4.763**	**-4.770**	**-0.333**	**-0.334**	**-4.948**	**-4.947**	**-0.325**	**-0.325**
	(0.303)	(0.303)	(0.021)	(0.021)	(0.322)	(0.322)	(0.021)	(0.021)
Number of Districts	0.253	0.252	0.011	0.011	0.836	0.836	0.059	0.059
	(0.869)	(0.869)	(0.060)	(0.060)	(1.009)	(1.008)	(0.067)	(0.067)
Number of Schools	-0.265	-0.257	-0.019	-0.018	**-1.295**	**-1.292**	**-0.089**	**-0.088**
	(0.486)	(0.486)	(0.033)	(0.033)	(0.562)	(0.562)	(0.037)	(0.037)
Receives Free Lunch	**-3.148**	**-3.158**	**-0.219**	**-0.219**	**-3.776**	**-3.778**	**-0.252**	**-0.252**
	(0.300)	(0.301)	(0.021)	(0.021)	(0.327)	(0.327)	(0.022)	(0.022)
Receives Reduced Lunch	-0.088	-0.238	0.005	-0.002	0.421	0.379	0.038	0.034
	(1.422)	(1.420)	(0.099)	(0.099)	(1.516)	(1.516)	(0.100)	(0.100)
Limited English Proficiency	**-2.786**	**-2.800**	**-0.204**	**-0.205**	**-5.338**	**-5.346**	**-0.348**	**-0.349**
	(0.560)	(0.560)	(0.039)	(0.039)	(0.603)	(0.604)	(0.040)	(0.040)
Special Education	**-14.276**	**-14.260**	**-0.994**	**-0.994**	**-15.874**	**-15.870**	**-1.047**	**-1.047**
	(0.491)	(0.491)	(0.034)	(0.034)	(0.565)	(0.565)	(0.037)	(0.037)
Gifted	**8.321**	**8.316**	**0.611**	**0.611**	**8.550**	**8.556**	**0.559**	**0.560**
	(0.253)	(0.253)	(0.018)	(0.018)	(0.265)	(0.265)	(0.017)	(0.017)
Attendance Rate	**37.596**	**37.512**	**2.622**	**2.618**	**31.462**	**31.475**	**2.079**	**2.077**
	(3.348)	(3.350)	(0.232)	(0.232)	(3.687)	(3.687)	(0.243)	(0.243)
Eventually Attends Magnet	**4.691**	**4.692**	**0.343**	**0.343**	**4.034**	**4.030**	**0.267**	**0.267**
	(0.362)	(0.361)	(0.025)	(0.025)	(0.403)	(0.403)	(0.027)	(0.027)
Magnet Percent	**-14.441**	**-13.344**	**-0.936**	**-0.877**	**-11.240**	**-10.556**	**-0.758**	**-0.702**
	(4.025)	(4.082)	(0.286)	(0.289)	(4.304)	(4.367)	(0.287)	(0.292)

Table 2.3.a continued

Average Math/Reading Score	**1.300**	**1.340**	**0.096**	**0.098**	**1.860**	**1.873**	**0.124**	**0.125**
	(0.077)	(0.079)	0.096	(0.005)	(0.132)	(0.137)	(0.009)	(0.009)
Share of School White	--	0.037	--	0.002	--	0.075	--	0.003
	--	(0.095)	--	(0.006)	--	(0.105)	--	(0.007)
Share of School Mobile	--	0.043	--	0.002	--	-0.013	--	0.001
	--	(0.053)	--	(0.004)	--	(0.059)	--	(0.004)
Share of School Econ. Disadv.	--	**0.247**	--	**0.013**	--	0.115	--	0.009
	--	(0.084)	--	(0.006)	--	(0.089)	--	(0.006)
Share of School Gifted	--	0.132	--	0.004	--	-0.018	--	-0.001
	--	(0.084)	--	(0.006)	--	(0.090)	--	(0.006)
Constant	**19.848**	-4.595	**-3.644**	**-4.902**	**24.133**	13.436	**-3.572**	**-4.405**
	(5.201)	(9.667)	(0.358)	(0.660)	(6.164)	(10.646)	(0.405)	(0.703)

Notes: Bold indicates significance at the 95 percent; Italicized indicates significance at 90 percent.

Table 2.3.b Regressions of Non-Elementary Math and Reading Test Scores with Year and School Dummies and Robust Standard Errors, 1997-99

N	12858	12858	12858	12858	12852	12852	12852	12852
F-Stat	381.70	339.76	425.03	378.30	337.65	300.92	327.51	291.92
R2	0.48	0.48	0.50	0.50	0.46	0.46	0.46	0.46
	TLI Math	TLI Math	Z-Math	Z-Math	TLI Read	TLI Read	Z-Read	Z-Read
Male	0.128	0.129	0.015	0.015	**-2.604**	**-2.605**	**-0.189**	**-0.189**
	(0.188)	(0.188)	(0.015)	(0.015)	(0.211)	(0.211)	(0.015)	(0.015)
Age on September 1st	**-2.173**	**-2.166**	**-0.174**	**-0.174**	**-2.224**	**-2.222**	**-0.159**	**-0.159**
	(0.311)	(0.311)	(0.024)	(0.024)	(0.343)	(0.343)	(0.025)	(0.025)
Black	**-8.392**	**-8.394**	**-0.677**	**-0.678**	**-7.582**	**-7.587**	**-0.533**	**-0.534**
	(0.350)	(0.350)	(0.027)	(0.027)	(0.390)	(0.390)	(0.028)	(0.028)
Hispanic	**-3.882**	**-3.879**	**-0.325**	**-0.325**	**-4.868**	**-4.868**	**-0.341**	**-0.341**
	(0.245)	(0.245)	(0.020)	(0.020)	(0.276)	(0.276)	(0.020)	(0.020)
Number of Districts	0.389	0.450	0.033	0.038	0.794	0.847	0.054	0.058
	(1.011)	(1.008)	(0.079)	(0.078)	(1.069)	(1.068)	(0.076)	(0.076)
Number of Schools	0.861	0.850	*0.071*	0.070	0.847	0.842	0.067	0.066
	(0.546)	(0.546)	(0.042)	(0.042)	(0.625)	(0.625)	(0.045)	(0.045)
Receives Free Lunch	**-2.213**	**-2.184**	**-0.176**	**-0.174**	**-3.458**	**-3.434**	**-0.240**	**-0.238**
	(0.267)	(0.267)	(0.021)	(0.021)	(0.300)	(0.300)	(0.022)	(0.022)
Receives Reduced Lunch	-0.531	-0.547	-0.059	-0.060	*-1.661*	*-1.672*	-0.113	-0.113
	(0.821)	(0.822)	(0.066)	(0.066)	(0.956)	(0.957)	(0.069)	(0.070)
Limited English Proficiency	**-5.739**	**-5.740**	**-0.448**	**-0.448**	**-7.999**	**-8.002**	**-0.569**	**-0.570**
	(0.552)	(0.551)	(0.042)	(0.042)	(0.617)	(0.617)	(0.044)	(0.044)
Special Education	**-11.431**	**-11.413**	**-0.870**	**-0.868**	**-11.089**	**-11.084**	**-0.788**	**-0.788**
	(0.410)	(0.410)	(0.031)	(0.031)	(0.478)	(0.478)	(0.034)	(0.034)
Gifted	**10.667**	**10.732**	**0.879**	**0.884**	**11.146**	**11.193**	**0.788**	**0.791**
	(0.242)	(0.242)	(0.019)	(0.019)	(0.273)	(0.273)	(0.020)	(0.020)
Attendance Rate	**26.699**	**26.616**	**2.198**	**2.187**	**23.360**	**23.377**	**1.745**	**1.744**
	(2.250)	(2.252)	(0.174)	(0.174)	(2.399)	(2.399)	(0.177)	(0.176)
Eventually Attends Magnet	**3.971**	**3.966**	**0.305**	**0.305**	**5.002**	**4.989**	**0.324**	**0.324**
	(0.540)	(0.540)	(0.044)	(0.044)	(0.688)	(0.688)	(0.048)	(0.048)
Magnet Percent	**-16.553**	**-29.482**	**-2.061**	**-3.268**	*-15.971*	**-27.669**	**-1.424**	**-2.483**
	(7.610)	(8.673)	(0.596)	(0.686)	(8.520)	(9.739)	(0.593)	(0.685)

Table 2.3.b continued

Kealing Non-Magnet	0.232	0.233	-0.053	-0.052	1.236	1.224	0.050	0.050
	(0.935)	(0.935)	(0.077)	(0.077)	(1.089)	(1.088)	(0.078)	(0.078)
Average Math/Reading Score	**1.250**	**1.365**	**0.104**	**0.112**	**1.743**	**1.826**	**0.137**	**0.141**
	(0.104)	(0.128)	(0.008)	(0.010)	(0.180)	(0.201)	(0.013)	(0.015)
Share of School White	--	**-0.452**	--	**-0.031**	--	**-0.469**	--	**-0.034**
	--	(0.150)	--	(0.012)	--	(0.152)	--	(0.011)
Share of School Mobile	--	-0.084	--	-0.009	--	-0.102	--	-0.009
	--	(0.102)	--	(0.008)	--	(0.115)	--	(0.008)
Share of School Econ. Disadv.	--	**-0.384**	--	**-0.026**	--	**-0.401**	--	**-0.026**
	--	(0.114)	--	(0.009)	--	(0.126)	--	(0.009)
Share of School Gifted	--	**0.275**	--	**0.029**	--	0.171	--	**0.019**
	--	(0.114)	--	(0.009)	--	(0.130)	--	(0.010)
Constant	**21.292**	**52.977**	**-4.709**	**-2.521**	**31.863**	**68.312**	**-3.973**	-1.456
	(6.095)	(10.581)	(0.485)	(0.850)	(6.995)	(12.366)	(0.511)	(0.895)

Notes: Bold indicates significance at the 95 percent; Italicized indicates significance at 90 percent.

Table 2.4.a Regressions of All Math and Reading Test Scores, with Year and School Dummies and Robust Standard Errors, 1994-99

N	27275	27275	27275	27275	27139	27139	27139	27139
F-Stat	280.29	615.93	271.22	315.21	201.44	194.04	195.68	188.44
R2	0.43	0.43	0.44	0.44	0.41	0.41	0.42	0.42
	TLI Math	TLI Math	Z-Math	Z-Math	TLI Read	TLI Read	Z-Read	Z-Read
Male	**0.338**	**0.329**	**0.026**	**0.025**	**-2.423**	**-2.433**	**-0.169**	**-0.170**
	(0.142)	(0.142)	(0.010)	(0.010)	(0.156)	(0.156)	(0.011)	(0.011)
Age on September 1st	**-2.478**	**-2.476**	**-0.186**	**-0.186**	**-2.537**	**-2.530**	**-0.174**	**-0.174**
	(0.238)	(0.238)	(0.018)	(0.018)	(0.262)	(0.262)	(0.018)	(0.018)
Black	**-9.363**	**-9.363**	**-0.703**	**-0.703**	**-7.999**	**-8.001**	**-0.547**	**-0.547**
	(0.270)	(0.270)	(0.020)	(0.020)	(0.300)	(0.300)	(0.020)	(0.020)
Hispanic	**-4.347**	**-4.363**	**-0.334**	**-0.336**	**-5.006**	**-5.020**	**-0.341**	**-0.342**
	(0.194)	(0.194)	(0.014)	(0.014)	(0.211)	(0.211)	(0.014)	(0.014)
Number of Districts	0.324	0.339	0.020	0.021	0.806	0.840	0.055	0.057
	(0.662)	(0.661)	(0.048)	(0.048)	(0.740)	(0.739)	(0.050)	(0.050)
Number of Schools	0.035	0.036	0.013	0.013	-0.520	-0.522	-0.028	-0.028
	(0.362)	(0.362)	(0.026)	(0.026)	(0.418)	(0.417)	(0.029)	(0.029)
Receives Free Lunch	**-2.735**	**-2.746**	**-0.203**	**-0.203**	**-3.711**	**-3.716**	**-0.253**	**-0.253**
	(0.202)	(0.202)	(0.015)	(0.015)	(0.222)	(0.222)	(0.015)	(0.015)
Receives Reduced Lunch	-0.534	-0.569	-0.051	-0.053	-1.185	-1.207	-0.078	-0.080
	(0.722)	(0.721)	(0.055)	(0.055)	(0.814)	(0.813)	(0.057)	(0.057)
Limited English Proficiency	**-4.200**	**-4.197**	**-0.324**	**-0.323**	**-6.639**	**-6.627**	**-0.458**	**-0.457**
	(0.396)	(0.396)	(0.029)	(0.029)	(0.434)	(0.434)	(0.030)	(0.030)
Special Education	**-12.937**	**-12.917**	**-0.941**	**-0.939**	**-13.483**	**-13.464**	**-0.920**	**-0.919**
	(0.318)	(0.318)	(0.023)	(0.023)	(0.369)	(0.369)	(0.025)	(0.025)
Gifted	**9.647**	**9.671**	**0.790**	**0.792**	**10.049**	**10.085**	**0.706**	**0.709**
	(0.183)	(0.183)	(0.014)	(0.014)	(0.204)	(0.204)	(0.014)	(0.014)
Attendance Rate	**29.616**	**29.591**	**2.336**	**2.336**	**25.166**	**25.184**	**1.824**	**1.824**
	(1.900)	(1.898)	(0.141)	(0.141)	(2.040)	(2.039)	(0.145)	(0.145)
Eventually Attends Magnet	**4.490**	**4.485**	**0.310**	**0.310**	**4.155**	**4.144**	**0.262**	**0.261**
	(0.306)	(0.307)	(0.022)	(0.022)	(0.347)	(0.347)	(0.023)	(0.023)
Magnet Percent	**-12.762**	**-14.296**	**-1.024**	**-1.120**	**-9.430**	**-10.889**	**-0.734**	**-0.844**
	(3.465)	(3.596)	(0.253)	(0.262)	(3.774)	(3.909)	(0.255)	(0.264)

Table 2.4.a continued

Kealing Non-Magnet	1.092	1.097	-0.049	-0.049	0.474	0.468	-0.017	-0.017
	(0.827)	(0.828)	(0.067)	(0.067)	(0.918)	(0.917)	(0.066)	(0.066)
Average Math/Reading Score	**1.285**	**1.332**	**0.099**	**0.102**	**1.781**	**1.830**	**0.125**	**0.129**
	(0.062)	(0.063)	(0.004)	(0.004)	(0.107)	(0.110)	(0.007)	(0.007)
Share of School White	--	-0.056	--	-0.002	--	-0.064	--	-0.004
	--	(0.078)	--	(0.005)	--	(0.086)	--	(0.006)
Share of School Mobile	--	-0.010	--	-0.003	--	-0.062	--	-0.004
	--	(0.044)	--	(0.003)	--	(0.050)	--	(0.003)
Share of School Econ. Disadv.	--	**0.135**	--	**0.011**	--	0.066	--	0.007
	--	(0.062)	--	(0.004)	--	(0.067)	--	(0.004)
Share of School Gifted	--	0.082	--	0.001	--	-0.064	--	-0.002
	--	(0.063)	--	(0.005)	--	(0.067)	--	(0.005)
Constant	**22.256**	*10.922*	**-3.771**	**-4.606**	**26.594**	**22.930**	**-3.654**	**-4.126**
	(3.415)	(6.620)	(0.250)	(0.474)	(4.240)	(7.481)	(0.293)	(0.509)

Notes: Bold indicates significance at the 95 percent; Italicized indicates significance at 90 percent.

Table 2.4.b Regressions of Math and Reading Test Scores for Students in Sample 6 Years, with Year and School Dummies and Robust Standard Errors, 1994-99

N	14652	14652	14652	14652	14489	14489	14489	14489
F-Stat	97.26	93.68	92.38	88.88	86.06	82.85	80.35	77.31
R2	0.39	0.39	0.39	0.39	0.38	0.38	0.38	0.38
	TLI Math	TLI Math	Z-Math	Z-Math	TLI Read	TLI Read	Z-Read	Z-Read
Male	**0.432**	**0.427**	**0.033**	**0.033**	**-2.341**	**-2.345**	**-0.164**	**-0.164**
	(0.174)	(0.174)	(0.013)	(0.013)	(0.192)	(0.192)	(0.013)	(0.013)
Age on September 1st	**-2.942**	**-2.935**	**-0.216**	**-0.215**	**-2.591**	**-2.578**	**-0.174**	**-0.173**
	(0.350)	(0.349)	(0.026)	(0.026)	(0.400)	(0.400)	(0.027)	(0.027)
Black	**-8.341**	**-8.338**	**-0.640**	**-0.640**	**-7.839**	**-7.833**	**-0.535**	**-0.535**
	(0.349)	(0.349)	(0.026)	(0.026)	(0.391)	(0.391)	(0.027)	(0.027)
Hispanic	**-3.564**	**-3.579**	**-0.281**	**-0.282**	**-4.379**	**-4.390**	**-0.298**	**-0.299**
	(0.235)	(0.235)	(0.018)	(0.018)	(0.257)	(0.257)	(0.018)	(0.018)
Number of Districts	-1.926	-1.888	-0.151	-0.149	-1.008	-0.977	-0.066	-0.063
	(1.601)	(1.602)	(0.115)	(0.115)	(1.788)	(1.786)	(0.123)	(0.123)
Number of Schools	-0.422	-0.420	-0.023	-0.022	**-1.496**	**-1.496**	**-0.099**	**-0.099**
	(0.566)	(0.567)	(0.042)	(0.042)	(0.649)	(0.649)	(0.045)	(0.045)
Receives Free Lunch	**-2.317**	**-2.331**	**-0.174**	**-0.175**	**-3.103**	**-3.107**	**-0.211**	**-0.211**
	(0.262)	(0.262)	(0.020)	(0.020)	(0.287)	(0.287)	(0.020)	(0.020)
Receives Reduced Lunch	-1.287	-1.333	-0.098	-0.102	0.417	0.415	0.032	0.031
	(1.072)	(1.070)	(0.081)	(0.081)	(1.080)	(1.078)	(0.075)	(0.075)
Limited English Proficiency	**-1.996**	**-1.976**	**-0.146**	**-0.145**	**-1.909**	**-1.909**	**-0.136**	**-0.136**
	(0.827)	(0.826)	(0.058)	(0.058)	(0.890)	(0.890)	(0.060)	(0.060)
Special Education	**-7.388**	**-7.373**	**-0.559**	**-0.558**	**-8.514**	**-8.499**	**-0.584**	**-0.584**
	(0.542)	(0.543)	(0.040)	(0.040)	(0.660)	(0.660)	(0.045)	(0.045)
Gifted	**9.108**	**9.124**	**0.742**	**0.744**	**9.599**	**9.629**	**0.666**	**0.668**
	(0.225)	(0.225)	(0.018)	(0.018)	(0.252)	(0.252)	(0.018)	(0.018)
Attendance Rate	**24.616**	**24.625**	**2.061**	**2.066**	**20.961**	**21.137**	**1.560**	**1.570**
	(2.813)	(2.817)	(0.216)	(0.217)	(3.407)	(3.403)	(0.245)	(0.245)
Eventually Attends Magnet	**3.843**	**3.850**	**0.261**	**0.262**	**3.550**	**3.545**	**0.228**	**0.228**
	(0.319)	(0.320)	(0.023)	(0.023)	(0.376)	(0.377)	(0.025)	(0.025)
Magnet Percent	**-14.339**	**-16.658**	**-1.197**	**-1.343**	**-13.167**	**-14.278**	**-0.997**	**-1.086**
	(3.989)	(4.169)	(0.296)	(0.308)	(4.275)	(4.448)	(0.289)	(0.300)

Table 2.4.b continued

Kealing Non-Magnet	-0.318	-0.303	**-0.160**	**-0.159**	-0.876	-0.877	-0.106	-0.106
	(0.905)	(0.906)	(0.076)	(0.076)	(1.006)	(1.006)	(0.072)	(0.072)
Average Math/Reading Score	**1.130**	**1.189**	**0.090**	**0.093**	**1.563**	**1.587**	**0.109**	**0.112**
	(0.078)	(0.080)	(0.006)	(0.006)	(0.132)	(0.137)	(0.009)	(0.009)
Share of School White	--	-0.136	--	-0.007	--	-0.085	--	-0.006
	--	(0.099)	--	(0.007)	--	(0.107)	--	(0.007)
Share of School Mobile	--	0.011	--	-0.001	--	-0.058	--	-0.003
	--	(0.057)	--	(0.004)	--	(0.063)	--	(0.004)
Share of School Econ. Disadv.	--	0.090	--	0.008	--	0.003	--	0.002
	--	(0.078)	--	(0.006)	--	(0.083)	--	(0.006)
Share of School Gifted	--	0.120	--	0.004	--	-0.106	--	-0.005
	--	(0.076)	--	(0.006)	--	(0.079)	--	(0.005)
Constant	**39.763**	**31.950**	**-2.691**	**-3.299**	**40.288**	**42.522**	**-2.762**	**-2.819**
	(4.853)	(8.523)	(0.360)	(0.622)	(6.050)	(9.540)	(0.420)	(0.651)

Notes: Bold indicates significance at the 95 percent; Italicized indicates significance at 90 percent.

Table 2.5.a Fixed Effects Regression of Math and Reading Test Scores with School Dummies, 1994-97

N	27275	27275	27275	27275	27139	27139	27139	27139
Number of Groups	6243	6243	6243	6243	6228	6228	6228	6228
F Stat	52.21	51.25	18.01	18.92	17.50	17.06	7.55	8.11
F Stat for test of ui=0	10.78	10.81	10.80	10.81	9.08	9.09	9.10	9.11
	TLI Math	TLI Math	Z-Math	Z-Math	TLI Read	TLI Read	Z-Read	Z-Read
Number of Districts	**1.120**	**1.110**	**0.090**	**0.084**	0.320	0.325	0.026	0.022
	(0.406)	(0.405)	(0.030)	(0.030)	(0.479)	(0.479)	(0.033)	(0.033)
Number of Schools	0.059	0.033	**0.032**	*0.028*	0.155	0.137	0.026	0.023
	(0.220)	(0.220)	(0.016)	(0.016)	(0.258)	(0.258)	(0.018)	(0.018)
Receives Free Lunch	0.316	0.277	**0.054**	**0.046**	0.307	0.290	*0.029*	0.024
	(0.209)	(0.209)	(0.016)	(0.016)	(0.246)	(0.246)	(0.017)	(0.017)
Receives Reduced Lunch	-0.111	-0.100	0.008	0.005	0.511	0.505	0.030	0.028
	(0.487)	(0.486)	(0.036)	(0.036)	(0.572)	(0.572)	(0.039)	(0.039)
Limited English Proficiency	-0.204	-0.299	-0.020	-0.027	-0.197	-0.238	-0.001	-0.005
	(0.383)	(0.382)	(0.028)	(0.028)	(0.443)	(0.443)	(0.030)	(0.030)
Special Education	**-1.053**	**-1.089**	**-0.143**	**-0.142**	**-0.958**	**-0.981**	**-0.098**	**-0.097**
	(0.327)	(0.326)	(0.024)	(0.024)	(0.391)	(0.390)	(0.027)	(0.027)
Gifted	0.103	0.119	**0.044**	**0.052**	0.010	0.014	0.019	*0.022*
	(0.159)	(0.159)	(0.012)	(0.012)	(0.187)	(0.187)	(0.013)	(0.013)
Attendance Rate	**16.756**	**16.289**	**1.635**	**1.570**	**11.405**	**11.171**	**1.079**	**1.036**
	(1.275)	(1.275)	(0.095)	(0.095)	(1.481)	(1.482)	(0.101)	(0.101)
Attend Kealing Non-Magnet	**2.309**	**2.178**	0.018	0.010	1.032	0.949	0.028	0.020
	(0.847)	(0.845)	(0.063)	(0.063)	(0.995)	(0.995)	(0.068)	(0.068)
Magnet Percent	**-15.280**	**-14.255**	0.145	0.151	**21.203**	**22.179**	**0.553**	**0.814**
	(1.982)	(1.995)	(0.147)	(0.148)	(2.283)	(2.322)	(0.156)	(0.159)
Size of Peer Group	**0.034**	**0.034**	**0.002**	**0.002**	**0.028**	**0.029**	**0.002**	**0.002**
	(0.003)	(0.003)	(0.0002)	(0.0002)	(0.004)	(0.004)	(0.0003)	(0.0003)
Average Math/Reading Score	**0.766**	**0.752**	**0.004**	**0.010**	**0.404**	**0.426**	**0.004**	**0.011**
	(0.016)	(0.018)	(0.001)	(0.001)	(0.027)	(0.030)	(0.002)	(0.002)
Share of School White	--	*-0.069*	--	**0.032**	--	0.009	--	**0.023**
	--	(0.038)	--	(0.003)	--	(0.044)	--	(0.003)
Share of School Mobile	--	**0.050**	--	*0.003*	--	0.008	--	0.003
	--	(0.025)	--	(0.002)	--	(0.029)	--	(0.002)
Share of School Econ. Disadv.	--	**0.122**	--	**0.021**	--	**0.089**	--	**0.019**
	--	(0.032)	--	(0.002)	--	(0.040)	--	(0.003)
Share of School Gifted	--	**-0.146**	--	**-0.012**	--	**-0.131**	--	**-0.013**
	--	(0.032)	--	(0.002)	--	(0.037)	--	(0.003)
Constant	**23.365**	**15.568**	**-2.412**	**-4.517**	**51.730**	**44.873**	**-1.625**	**-3.494**
	(1.602)	(3.349)	(0.119)	(0.249)	(2.046)	(4.432)	(0.140)	(0.303)

Notes: Bold indicates significance at the 95 percent; Italicized indicates significance at 90 percent.

Table 2.5.b Fixed Effect Regression of Math and Reading Scores for Students in All 6 Years of Sample, with School Dummies, 1994-99

N	14652	14652	14652	14652	14489	14489	14489	14489
Number of Groups	2444	2444	2444	2444	2417	2417	2417	2417
F Stat	35.29	34.82	11.77	12.31	11.43	11.19	4.76	5.00
F Stat for test of ui=0	12.57	12.61	12.68	12.70	10.46	10.47	10.54	10.55
	TLI Math	TLI Math	Z-Math	Z-Math	TLI Read	TLI Read	Z-Read	Z-Read
Number of Districts	0.330	0.467	0.056	0.047	-0.439	-0.317	0.009	0.006
	(0.863)	(0.861)	(0.065)	(0.065)	(1.065)	(1.065)	(0.073)	(0.073)
Number of Schools	0.111	0.081	0.032	0.030	-0.235	-0.254	0.001	-0.001
	(0.339)	(0.338)	(0.025)	(0.025)	(0.392)	(0.391)	(0.027)	(0.027)
Receives Free Lunch	0.209	0.156	**0.050**	**0.041**	0.050	0.043	0.019	0.014
	(0.269)	(0.269)	(0.020)	(0.020)	(0.314)	(0.314)	(0.021)	(0.021)
Receives Reduced Lunch	-0.789	-0.843	-0.033	-0.040	0.196	0.182	0.010	0.008
	(0.648)	(0.646)	(0.049)	(0.049)	(0.747)	(0.746)	(0.051)	(0.051)
Limited English Proficiency	**-1.583**	**-1.545**	*-0.079*	*-0.091*	-0.924	-0.854	-0.047	-0.054
	(0.624)	(0.623)	(0.047)	(0.047)	(0.746)	(0.746)	(0.051)	(0.051)
Special Education	**-1.408**	**-1.378**	**-0.137**	**-0.133**	**-1.183**	**-1.166**	**-0.087**	**-0.086**
	(0.488)	(0.486)	(0.037)	(0.037)	(0.581)	(0.580)	(0.040)	(0.040)
Gifted	0.246	0.261	**0.052**	**0.059**	**0.446**	**0.444**	**0.042**	**0.045**
	(0.193)	(0.193)	(0.015)	(0.015)	(0.227)	(0.227)	(0.015)	(0.015)
Attendance Rate	**15.168**	**14.345**	**1.591**	**1.486**	**7.808**	**7.583**	**0.839**	**0.794**
	(1.990)	(1.990)	(0.149)	(0.149)	(2.256)	(2.257)	(0.154)	(0.154)
Attend Kealing Non-Magnet	1.055	0.932	-0.058	-0.067	1.054	1.011	0.035	0.031
	(1.048)	(1.045)	(0.079)	(0.078)	(1.218)	(1.217)	(0.083)	(0.083)
Magnet Percent	**-13.678**	**-12.861**	0.226	0.218	**16.928**	**17.364**	*0.345*	**0.555**
	(2.362)	(2.378)	(0.177)	(0.179)	(2.717)	(2.761)	(0.185)	(0.188)
Size of Peer Group	**0.040**	**0.040**	**0.002**	**0.002**	**0.029**	**0.028**	**0.002**	**0.002**
	(0.004)	(0.004)	(0.0003)	(0.0003)	(0.004)	(0.005)	(0.0003)	(0.0003)
Average Math/Reading Score	**0.714**	**0.697**	*0.003*	**0.009**	**0.346**	**0.334**	0.001	**0.006**
	(0.020)	(0.023)	(0.002)	(0.002)	(0.032)	(0.037)	(0.002)	(0.003)
Share of School White	--	*-0.082*	--	**0.031**	--	-0.078	--	**0.019**
	--	(0.048)	--	(0.004)	--	(0.056)	--	(0.004)
Share of School Mobile	--	0.050	--	0.004	--	0.019	--	0.003
	--	(0.032)	--	(0.002)	--	(0.036)	--	(0.002)
Share of School Econ. Disadv.	--	**0.142**	--	**0.023**	--	-0.006	--	**0.012**
	--	(0.041)	--	(0.003)	--	(0.051)	--	(0.003)
Share of School Gifted	--	**-0.158**	--	**-0.013**	--	**-0.162**	--	**-0.014**
	--	(0.039)	--	(0.003)	--	(0.045)	--	(0.003)
Constant	**29.416**	**20.839**	**-2.075**	**-4.251**	**61.459**	**63.847**	**-0.977**	**-2.254**
	(2.446)	(4.451)	(0.184)	(0.334)	(2.981)	(5.761)	(0.203)	(0.392)

Notes: Bold indicates significance at the 95 percent; Italicized indicates significance at 90 percent.

Chart 2.1.a Percent of Students in Elementary Schools Receiving TLI Math Scores, by Year

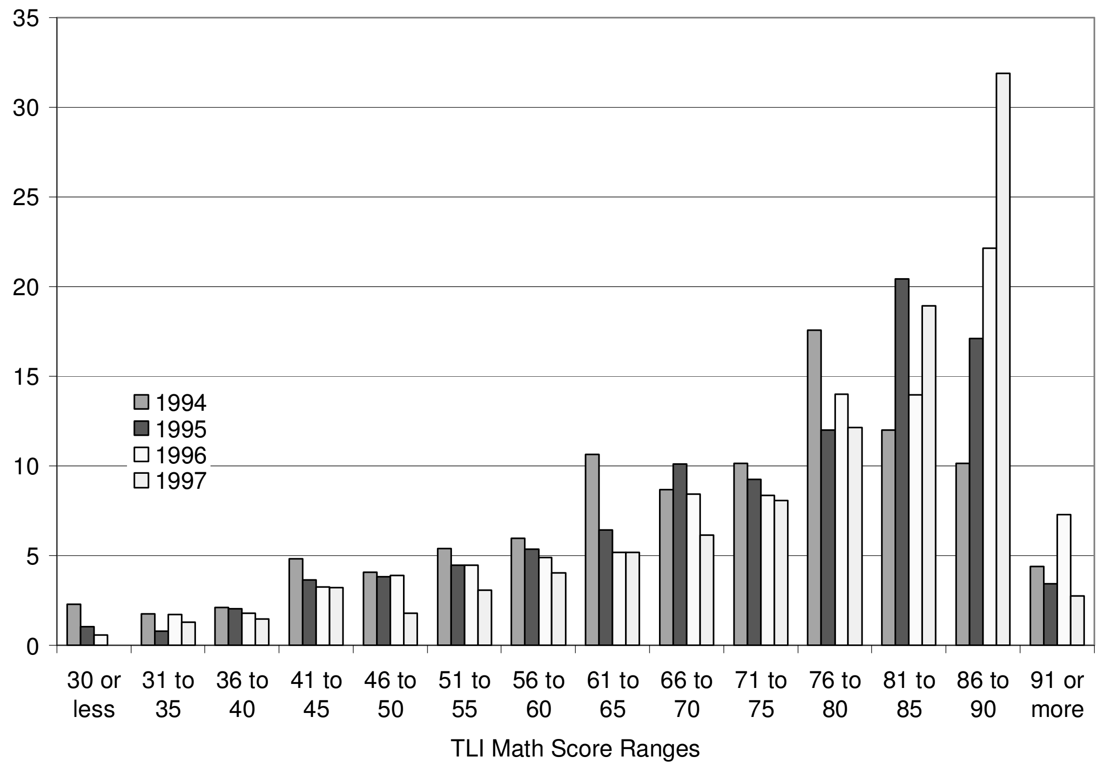


Chart 2.1.b Percentage of Students in Middle Schools Receiving TLI Math Scores, by Year

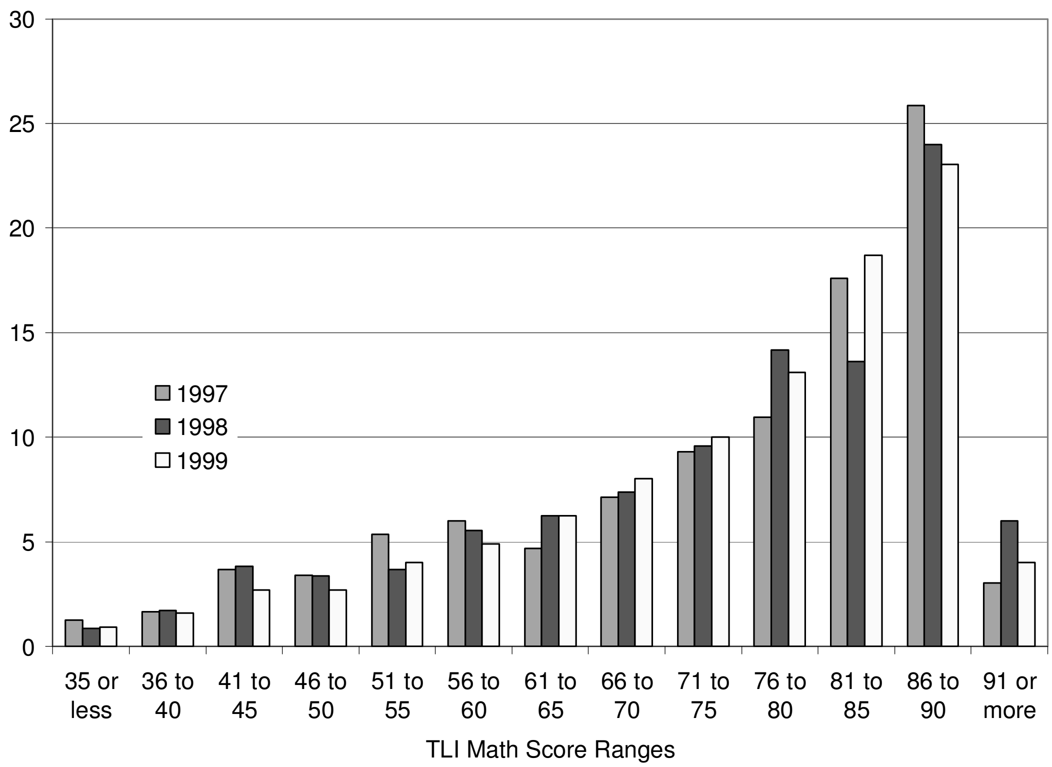


Chart 2.1.c Percentage Students in Junior High Receiving TLI Math Scores, by Year

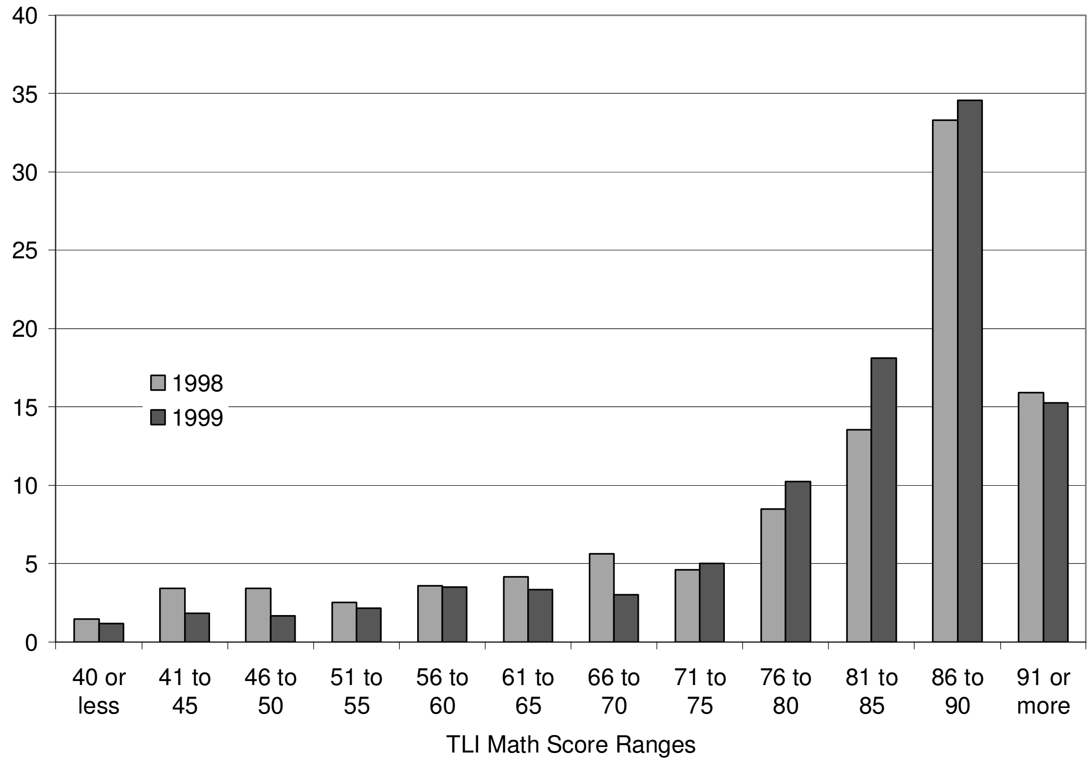


Chart 2.1.d Percentage of Kealing Students Receiving TLI Math Scores, by Year and Type

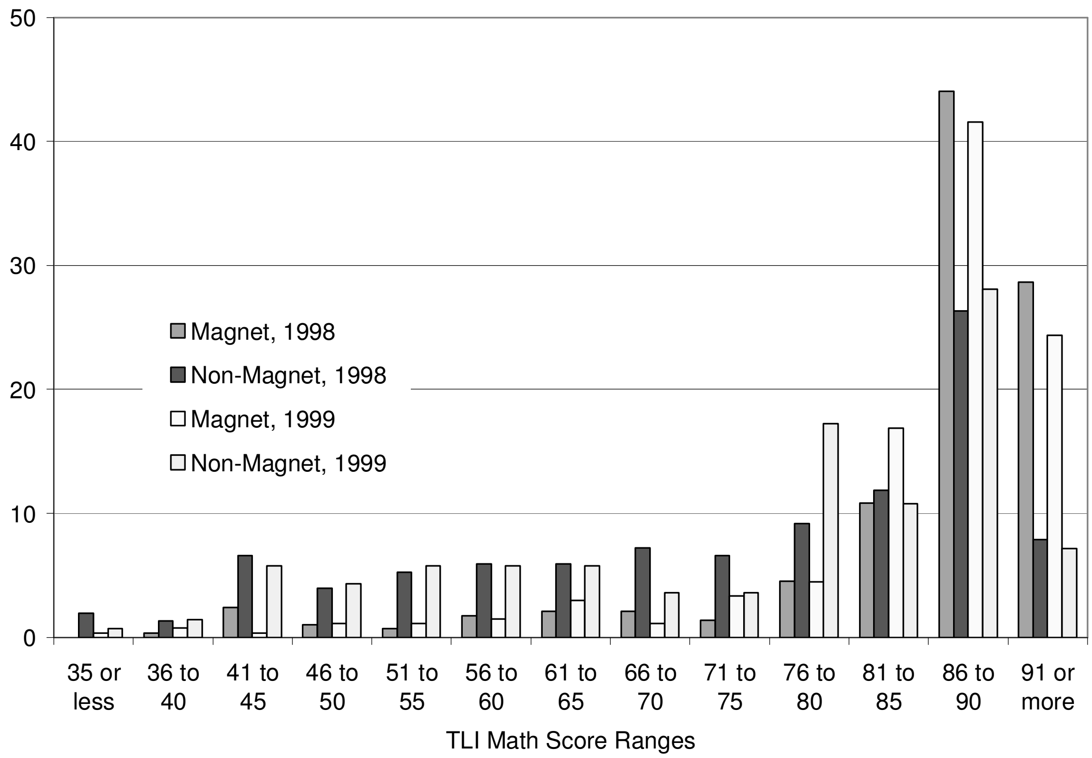


Chart 2.2.a Percent of Students in Elementary Schools Receiving TLI Reading Scores, by Year

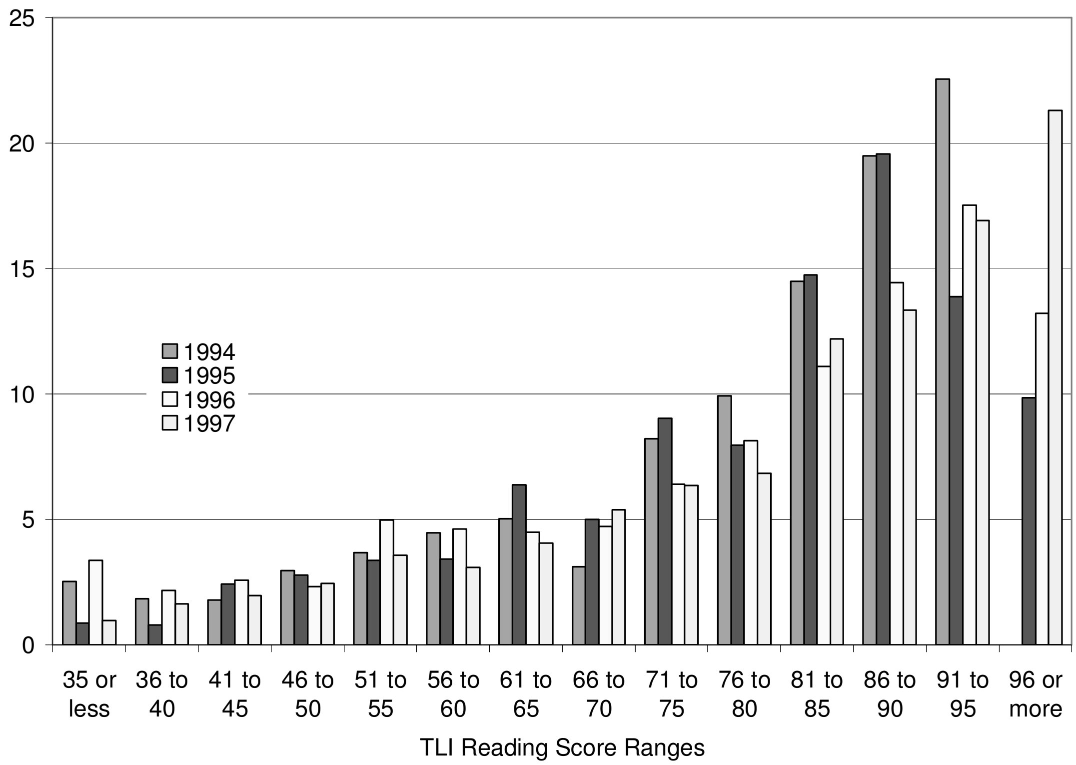


Chart 2.2.b Percent of Middle School Students Receiving TLI Reading Scores, by Year

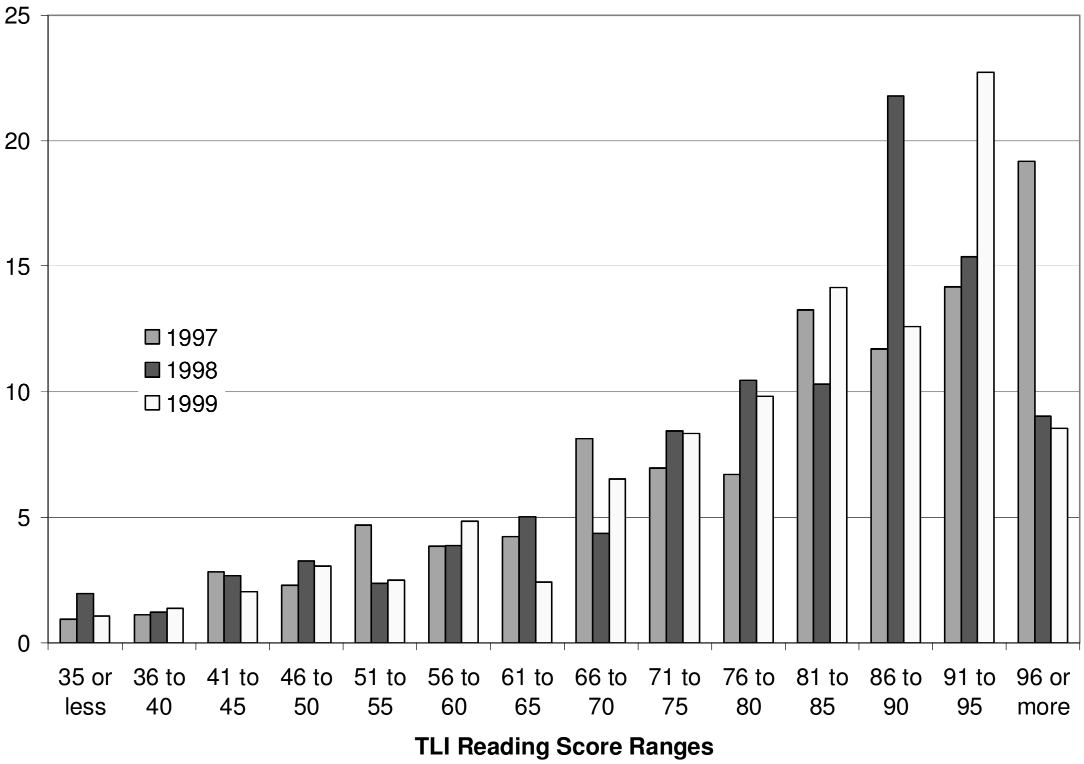


Chart 2.2.c Percent of Junior High Students Receiving TLI Reading Scores, by Year

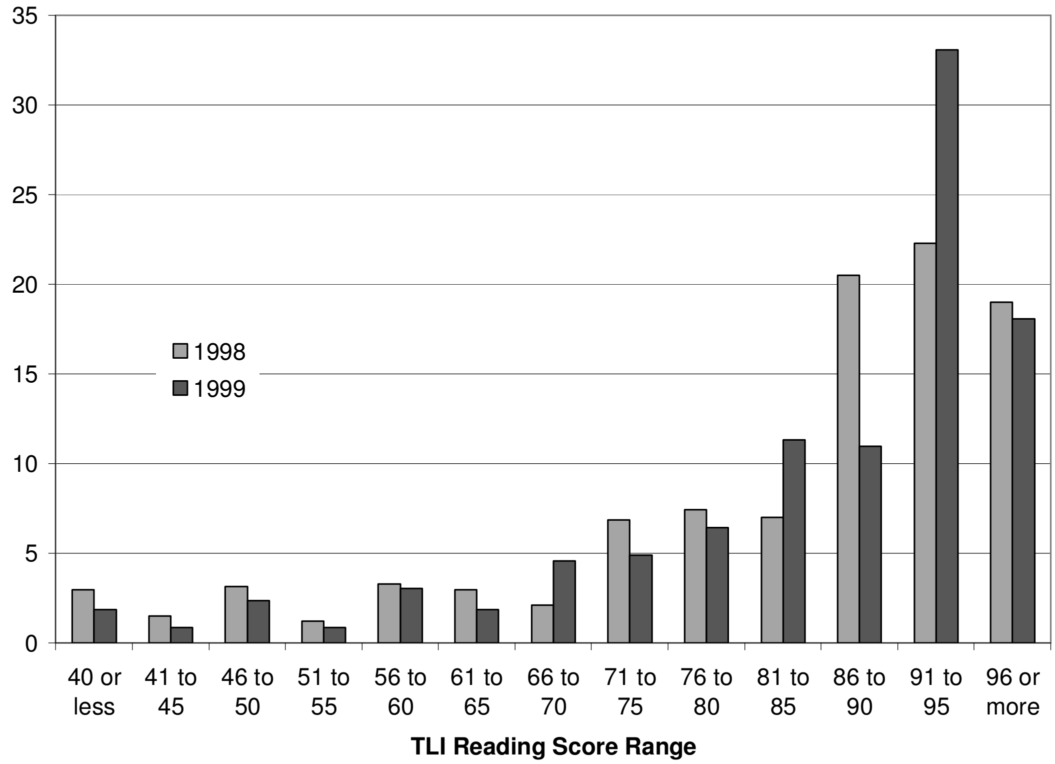
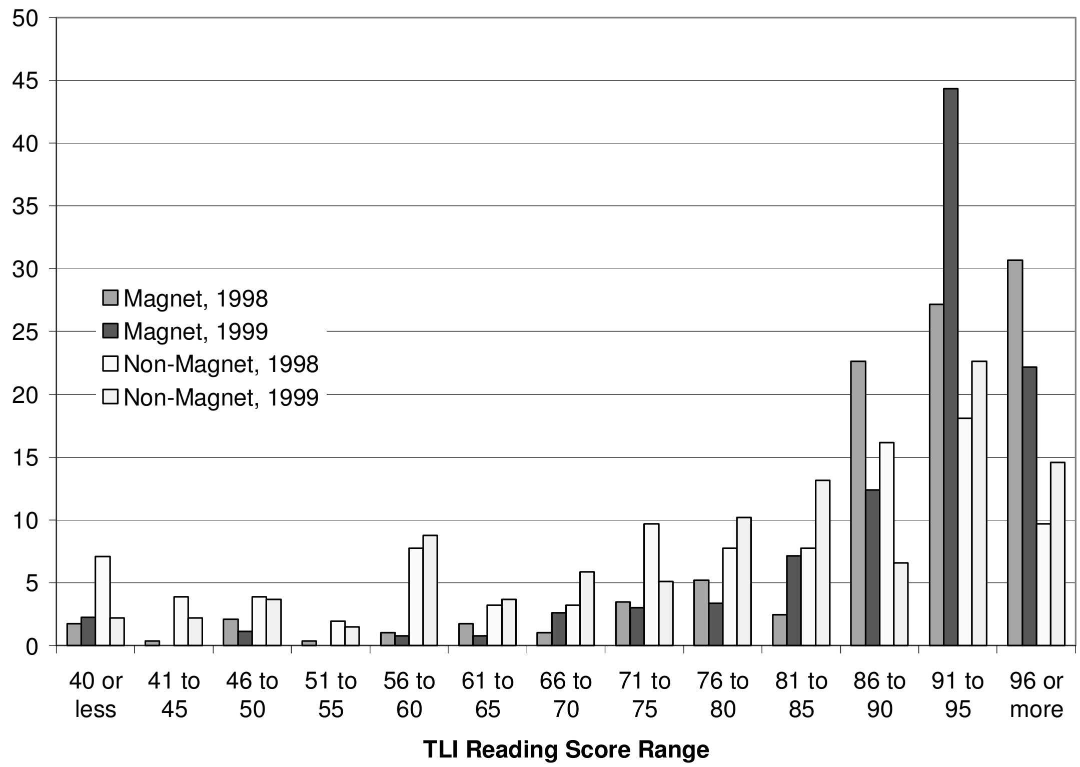


Chart 2.2.d Percent of Kealing Students Receiving TLI Reading Scores, by Year and Type



Chapter 3: Merit Pay for Public Employees: The Case of Texas High School Principals and Football Coaches

What happens to a hard-working principal at a school that the government has decided is failing? A nightmare worthy of Kafka. . . . That's the beauty of the No Child Left Behind Act. All that matters anyway is a school's performance on one test per year. It's perfect for politicians and bureaucrats in Phoenix and Washington who are far too busy to leave their offices and spend a day at a real school.

Michael Winderip (2003a)

. . . for there was no profession in the state of Texas with worse job security than that of high school football coach. Coaches were fired all the time for poor records. Sometimes it happened with the efficiency of a bloodless coup – one day the coach was there at the office decorated in the school colors and the next day he was gone, as if he had never existed. But sometimes he was paraded before the school board meeting to be torn apart by the public in a scene like something out of the Salem witch trials, or had several thousands dollars' worth of damage done to his car by rocks thrown by irate fans, or responded to a knock on the door to find someone with a shotgun who wasn't there to fire him but to complain about his son's lack of playing time.

H. G. Bissinger

INTRODUCTION

Public institutions face unique issues when attempting to monitor their agents and in motivating employees to act in their best interest. Because public entities are generally not profit-maximizing, a typical principal-agent solution, where wages are a function of profits, is not feasible. Instead, alternative monitoring and incentive schemes must be developed.

Economic research on this subject matter has confined itself primarily to public employees whose actions are subject to review by an independent agency, such as police officers and case workers employed under the Job Training Partnership Act (JTPA).[5] Incentive schemes for public school employees have proven more difficult to model. This is primarily due to public education being, in the words of Dixit (2002), a "multi-task, multi-principal, near-monopoly organization with vague and poorly observable goals." What research does exist on incentives for school employees has concentrated on teachers, since they play the largest professional role in educational production functions. Because students have multiple teachers concurrently, the actual impact of individual teachers has proven elusive to measure and therefore difficult to reward. Moreover, researchers argue that teachers unions have thwarted most attempts to reward individual teacher performance.[6] As a result, most research on teacher incentives has been of a theoretical nature, and none has considered the effect these incentives might have on production.[7]

This study will instead examine the relationship between salaries, mobility and performance records of high school principals and football coaches in the state of Texas. Principals are the counterpart to managers in an education setting and therefore are a clear nominee for study on the existence of merit pay. Moreover, some Texas school districts specifically state that principals will be evaluated based on their school's performance on key indicators.

Football coaches may seem a less obvious choice for this study, but coaching has the advantage over teaching of easily measurable outcomes (the win-loss record) as well

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5 See Prendergast (2002) and Heckman et al (1996).

6 Hanushek (1986) directly discusses that a restructuring of pay to include some element of merit would lead to a direct conflict with teachers' unions while Hoxby (1996) merely insinuates this by finding teachers' unions to be rent-seeking.

7 A notable exception would be Hanushek et al (2001b), though this looks at **average** teacher quality rather than individual teachers and outcomes..

as a unique identifiable entity responsible for that outcome – the head coach. While one can argue that a coach's responsibility extends beyond merely winning games (e.g., teaching leadership, responsibility, sportsmanship), a survey of Texas high school football websites suggests that a coach's record is the primary evaluation tool.[8] This paper finds that salaries are positively related to performance for both principals and coaches, though performance affects the tenure of coaches only. The next chapter examines theoretically how a principal-agent problem in the context of a public good can lead to a misallocation of resources, and tests whether empirically this is true for principals in Houston, Texas.

PREVIOUS LITERATURE

Research on monetary incentives for teachers is somewhat limited due to resistance by teachers' unions to the implementation of such programs. Hanushek (1986) discusses the theoretical attractiveness of merit pay as it allows administrators to reward value added by teachers and fosters greater competition. Merit pay's pragmatic limitations, however, are illustrated in Murnane's study of student gains in an urban elementary school system as a function of teacher evaluations. Murnane (1984) found only a weak correlation between evaluations and student scores, demonstrating the difficulty in isolating the impact of an individual teacher in order to reward them.

This difficulty is further demonstrated by Hanushek et al. (2001b), who examine the effects of teachers and schools on student performance by matching Texas Assessment of Academic Skills (TAAS) scores and student characteristics to average teacher characteristics by subject, grade and year. Using a fixed effects model, they

[8] Sites include (but are not limited to) www.theoldcoach.com, www.collier-sharp.com, www.harrisratings.com, www.allsports.com/highschool/pigskinprep, www.texasbob.com/index.html and www.texasfootball.com.

attribute most of the variation in student achievement to heterogeneity of teachers. Specifically, they estimate that at least 7.5 percent of the total variation in achievement gains can be explained by variation in teacher quality. While students gained significantly at schools with lower teacher turnover, there was no evidence that teacher education impacts student outcomes, and it appears that the importance of student-teacher ratio wanes as students age.

Surprisingly little research has been devoted to the impact of school administrators on student test scores. Ehrenberg et al. (1986) examine a panel of salary profiles for superintendents in the state of New York to see if superintendents are implicitly or explicitly rewarded for their performance by greater compensation or opportunities for mobility. Ehrenberg et al. control for community and individual characteristics, creating a measure of superintendent performance based on tax rates and test scores. Using the tax measurement, they find that superintendents with better scores are more likely to move to better paying districts. Using the test score measurement, however, they find that while positive student performance is associated with salary increases for superintendents who remain at their current location, it is associated with salary decreases for those who change locations. Ehrenberg et al. conclude that the current payment schemes in New York do not create strong incentives for superintendents to improve student outcomes.

Though much research has been done on the economics of coaching (Borland & Lye, 1996, Ohkusa & Ohtake, 1996, Prisinzano, 2000, to name a few), it has focused on professional sports, which are profit-maximizing entities. Teams and managers are analyzed using matching hypothesis criteria, with the records of both team members and coaches known to all parties. Wages themselves are not considered. All of the above papers find a significant match effect (though to varying degrees) for Australian Rules football, Japanese baseball and Major League baseball, respectively, suggesting the relationship is not sport specific. However, since individual information is generally not known about high school athletes, the career of such athletes is extremely short (most play only their junior and senior year for varsity squads), and high school coaches are legally barred from recruiting players, a matching model seems highly inappropriate to my research purposes.

Instead, I use a simple log-wage regression, a fixed-effect regression, and a probit to estimate the impact of an individual's performance on both wages and the probability that they remain in the dataset.

TEXAS PRINCIPALS

In the age of high stakes testing, the role of principals has evolved from one of administrator and disciplinarian to that of innovator and motivator. In no state is this more true than Texas, where the TAAS test, first initiated in 1990, has led to some principals dropping homeroom and electives in favor of tutoring, purchasing test preparation packages for students and faculty, and administering as many as three additional tests considered more challenging than the TAAS each year, so that students can chart their progress.[9]

Texas principals are hired by local school boards using a minimum of guidelines set by state legislators. While principals must be certified by the State Board for Education Certification (SBED), the qualifications are flexible enough to allow an "outstanding teacher" to substitute supervised and approved on-the-job training for part of the education requirements. In general, however, a professional administrator's certificate requires at least a master's degree, a teacher certificate, two years of classroom

[9]Morse (2000) and (2002).

experience, a completed and approved administrative internship, and completion of an approved program design.[10]

The official scope of a principal's duties includes approving teacher and staff appointments, evaluating personnel, setting education objectives, developing a campus budget, and taking responsibility for instructional leadership and campus discipline.[11] Additionally, principals are expected to attend many extra-curricular activities, which can mean 60-hour or more work weeks during the school year. Contracts are for a 12-month period, and while the number of contract days varies by district, a casual survey of district job announcements suggests a range of 232 to 245 days compared to the 187 days mandated for teachers. Principals' contracts can be for as long as five years, but one year contracts have become normal.[12]

This can lead to relatively high turnover. The SBEC reported that 12.6 percent of principals left the Texas Public Education System in 2000.[13] My own dataset suggests an even higher number, 21.2 percent for 2000. However, it should be noted that this number refers only to principals leaving the schools in the dataset, which is limited to those schools which field 11-man varsity football teams. This leaves open the possibility that those exiting may have taken positions at schools outside the dataset, or simply that there is more turnover in high schools as opposed to junior high and elementary schools.

The movement away from tenure for administrators is largely a response to pressure to improve district test scores. During his 1994-2000 term as Superintendent of the Houston School District, former U.S. Secretary of Education Rod Paige mandated that principals sign one-year contracts allowing dismissals without requiring "cause" or a

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[10]Council of Chief State School Officers (CCSSO), 2003.
[11]Ibid.
[12]Public Affairs Research Council of Alabama (PARCA), 1998.
[13]SBEC, July 14, 2002.

hearing. Bonuses of up to $5,000 were available to principals at successful schools during the same period.[14] Paige was widely applauded at the time, as the number of students passing the TAAS rose from 44 to 64 percent and the number of drop-outs fell from 6.7 percent in 1994 to 1.4 percent in 2002.[15]

Unfortunately, it appears that these figures, particularly those for drop-outs, were largely misrepresented. Texas weathered a controversy in the mid-1990s over the misclassification of some minority students as "special education" in order to exempt their scores from a school's overall ranking;[16] more recent charges suggest that administrators in the Houston school district knowingly falsified drop-out data by re-categorizing students with an "unknown" status to "transferred." In addition, at least one school has been charged with having low-performing students repeat the ninth grade only to then be promoted to the eleventh grade after their second year, thereby skipping the tenth grade – the year in which student TAAS scores are counted in a school's accountability rating.[17] The breadth of these infractions is currently being investigated by the Texas Education Agency (TEA).

TEXAS FOOTBALL

High school football in Texas has been likened to a religion. Books have been written on it; movies have been made about it; entire industries are based on it. During the 2000 season, 162,403 students at 1,092 high schools played football in Texas.[18] The 2001 *post-district season* alone generated gate and broadcasting receipts in excess of

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[14]Winerip (2003b).
[15]Dobbs (2003).
[16]Morse (2000).
[17]Dobbs (2003).
[18]Taken from an August 21, 2002, article in the *Austin American-Statesman.*

seven million dollars.[19] Football is revered by enthusiasts who visit the wing devoted to it at the Texas Sports Hall of Fame, and is cited by its critics as necessitating the passage of the 1983 education reform known as the "no-pass, no-play" rule, which limits extra-curricular activities to students in good standing. At the center of this phenomenon are the coaches.

Coaching in Texas can be a demanding task. A 1996 Associated Press survey on Class 4A and Class 5A teams found that coaches work an average of 216 days a year, 32 more days than teachers. Some coaches estimate that during football season they work at least 80 hours a week.[20] Their workload is offset by coaching staffs, which vary in size depending on whether a school has a junior-varsity and freshman program in addition to the varsity team. However, staffs in excess of fifteen coaches are not unusual, and these numbers can be augmented by including athletic trainers, volunteers and student managers.

Coaching offers little job security. New vacancies are announced as early as November, coinciding with the end of regular-season play. Randy Mayes, former head coach of Odessa Permian and mentioned in the book *Friday Night Lights*, estimates that "most coaches move every three to five years."[21] My own data sample shows that over 16 percent of coaches exit each year, with an additional 1 percent accepting coaching positions at smaller schools. Only 40 percent of coaches were in this dataset all four years.

The sport is overseen by the University Interscholastic League (UIL) which is responsible for enforcing state laws and the National Collegiate Athletics Association

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[19]No official statistic exists concerning the amount generated during the official season. This figure was constructed using the UIL Financial Report for the year ending August 31, 2001. Football gate receipts were listed as $1,068,435.54. Since statute requires that 15 percent of gross receipts for post-district games be given to UIL, this translates into more than 7 million dollars.
[20]As quoted in an October 27, 1996, article in the *San Angelo Standard-Times.*
[21]As quoted in Mackay (2000).

(NCAA) rulebook for football and sixty-three other extra-curricular activities. Among these rules are restrictions as to when practices can take place, how long they can last, the maximum number of games in a season, the minimum amount of time between games, and player eligibility. Failure to adhere to these rules can result in disqualification from district honors contests and even suspension of a program.

Additionally, UIL is in charge of district realignment, which takes place every two years. Schools are divided into six classifications (or classes) based on school populations: Six-man (94 students or less), 1A (95-179), 2A (180-344), 3A (345-899), 4A (900-1,909), and 5A (1,910 and larger). Schools cannot participate in a class if their student population exceeds its maximum; however, they can compete in classes whose minimum exceeds their student populations if they are so inclined.

THE DATA

This dataset consists of all schools which fielded 11-man high school football teams in the state of Texas for the 1999 through 2002 seasons. Principal information was taken from the TEA's Role Master and Teacher Master files from the Public Education Information Management System (PEIMS) Fall Snapshot for 1999 through 2002. In cases where there was more than one principal listed for a school, the person with the highest wages for the role of principal was used.[22] Information on school size and performance measurements was obtained from the TEA's Academic Excellence Indicator System (AEIS).

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[22]Multiple principals are common for schools which combine elementary and secondary education. However, there were a number of large, urban high schools which listed as many as eight principals, although the bulk were not full-time. Presumably, this is due to the required internship that principals must complete before receiving their Administration Certificate. While the superfluous principals were dropped from the dataset, the total number of principals per school was included, as was the gradespan. Additionally, the school's performance was counted in the lagged performance variables of those principals in case they emerged later as a chief principal.

Team records are taken from the "Data Poll Football Pages," which include the team, sport district, class, district record, overall record and team ranking, as well as a "power number" which measures season's performance while accounting for the difficulty of the district, the number of new starters, and the closeness of the games (among other qualities). These records are then matched to the TEA's school records in order to obtain information about the district and school.

Coaches' names are taken from the Collier Sharp Football Report and cross-checked using "Dave Campbell's Texas Football" magazine. In the case of disagreement, successive years were also compared. (Dave Campbell's magazine comes out prior to the season, whereas the Collier Sharp report is posted during the season.) If this did not clarify the name of the actual coach for a given year, the school was contacted. These names are then matched to team records.

Employment information (wages, age, education, roles, share of time, subjects taught, number of schools employed by, etc.) was taken from the TEA's Role Master and Teacher Master files from the PEIMS Fall Snapshot for 1999 through 2002. Coaches were matched by hand and had a match rate of 98.9 in 1999, 99.6 in 2000, 99.7 in 2001 and 99.6 in 2002. While principals were taken directly from PEIMS, some schools did not list principals in the Fall Snapshots. As a result, their match rate was 95.5 in 1999, 96.2 in 2000, 96.2 in 2001 and 97.1 in 2002.

There are 1,027 unique schools in the sample. Between 1999 and 2002, a total of twenty-seven schools exited the dataset, due to either consolidation or their inability to field an 11-man team. In the same period, forty-one new schools entered the dataset. 1,598 unique individuals served as principals at these schools during this period as did 1,467 unique coaches.

Tables 3.1 and 3.2 give summary statistics of principals and coaches respectively, by class for the entire dataset.[23] Larger schools appear more diverse in their choice of both principals and coaches, having a smaller share of whites and males for the former and of whites for the latter than their smaller counterparts. This is possibly due to these schools being more likely to be situated in an urban area, which would have a more varied community. Larger schools also have better-educated principals and coaches who are less likely to teach at all, and in the case of coaches, less likely to teach academic courses, such as math, science and social studies.[24] Age and income also increase by class, suggesting an employment path for both.

The ratios of total pay to either the average district base salary for all teachers or teachers in the same experience bracket also increased by class, but these figures are somewhat biased upward. The only available comparison to coaches' and principals' pay is average teacher base salaries which, since teachers may also receive bonuses for taking on additional responsibilities, would tend to overstate the coaches' and principals' wage premium. However, any overstatement is at least partially offset by the fact that teachers are ineligible for the bonuses principals may receive for school performance on TAAS and the travel and housing stipends coaches' salaries can include, which for the 2000 coach of Highland Park in Dallas amounted to a total of $21,000.[25] Moreover, the 1996 AP study points out that football coaches in Class 4A and 5A make roughly 75 percent more than teachers,[26] which exceeds my measurement.

While the majority of variables rise or fall smoothly across classes, two do not: the number of principals in Table 3.1, and the number of schools in Table 3.2. The

[23]Individual year tables are found in the Appendix B at the end of this paper.

[24]Teaching duties instead tend to include physical education, vocational education, and non-specified subjects.

[25] Tijerina (2000).

[26] No equivalent study exists for principals, but generally their base is significantly higher than that of teachers.

number of principals tends to be large at smaller schools because schools in small districts often consolidate primary and secondary schools, resulting in multiple principals. The reason for the large increase in 5A schools is probably due to principals serving internships. By similar logic, coaches at larger schools generally do not work at other schools (by teaching classes in junior high or elementary schools or holding a district position), since they already carry a heavy student load. As school size falls, it makes sense for districts to economize by having coaches serve multiple schools. In extremely small districts, however, the entire student population may be consolidated into one school, and so Class 1A coaches may serve fewer schools than their 2A counterparts.

For principals, the share of time devoted to acting as principal or teacher is included in the summary table, though only the dummy for whether the principal taught is included in the regression analysis, as the share devoted to other roles and the number of principals who fill concurrent roles is trivial, particularly as school size increases. In the case of coaches, however, while only the share of time spent as teacher and athletic director are listed in Table 3.2, the share spent as department head and in other non-teaching, non-administrative positions are included in estimation, as the proportion of coaches with concurrent positions is larger. The behavior of the athletic director variable is extremely interesting: it peaks in 3A with 1A and 5A both being significantly smaller. It should be noted, however, that while the number of coaches serving as athletic director in class 3A is more than twice that of 5A, the average share conditional on serving as an athletic director is higher for 5A.

Tables 3.3.a and 3.3.b show annual employment changes for principals and coaches respectively, from the autumn of 1999-through the autumn of 2002. While the majority of both principals and coaches remain at their schools throughout the range, coaches were more likely to either switch schools with a resulting pay raise or cut.

Principals were far more likely to exit the dataset completely. A survey done by the Western Sports Guide corroborates this for coaches, finding that most coaches leave a position to accept administrative jobs, since only Class 1A and 2A schools allow administrators (such as principals and vice-principals) to also coach. They further found that 4 percent go on to coach college football, 7 percent retire, and 11 percent are forced out and unable to find new coaching jobs.[27] No similar survey is available for principals.

THE MODEL

There are two possibilities for how performance can affect an individual's financial well-being: if by performing well they receive extra money for a job well done (or lose money for a job not well done), or if by performing well they are able to advance in their career (or conversely, performing badly causes them to lose their position). While these scenarios may seem very similar, they are, from an economic modeling standpoint, extremely different.

If performance is a factor in the individual's income, then by controlling for other influences on wages (such as age, education and job descriptions) a simple log-wage analysis will demonstrate how performance influences wages. However, because contracts are signed prior to the football season and bonuses cannot be determined until after the school year, one must take into account the previous year's performance.[28] Due to the panel nature of this dataset, I run both a log-wage OLS model using robust error

[27]Memorandum from Len Lo Presto at the Western Sports Guide regarding an inquiry. The survey was an internal one, the results of which have not been presented to me personally.

[28]Current performance was also examined, the results of which can be found in Appendix B at the end of this paper. In the regressions for coaches, overall winning percent had a slightly weaker effect. Pbnum, the measure of performance over the season given team inputs, was mostly the same, and rank had a slightly stronger effect. In the regressions for principals, dropout was stronger in the fixed effects model, attendance was the same, graduation was slightly weaker, and math was the same or stronger.

terms and a fixed-effect model with individual constant terms. The regressions are as follows:

3.1 $$\ln wage_t = \beta_i X_{it} + \delta_t performance_{t-1} + \varepsilon_t$$

Wages are the total wages[29] an individual receives, and *Xit* is a matrix: individual characteristics such as age, education, race, which are typically included in any wage analysis; the roles taken on by individuals to account for additional duties; and the size of the district, as larger districts have argued that smaller districts are better able to invest more in fewer educators. The performance variable for principals[30] includes dropout, attendance and graduation rates as well as the percentage of students passing the Math TAAS; for coaches the performance variable is either the winning percentage of the coach over the sample, the team's post-season ranking or the "pbnum," which measures how well a team performs over the course of the season, given its inputs.[31] The fixed-effects model, which assumes different intercept terms for different individuals, was run with the same regressors (omitting only those constant over time).

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[29]A variable called "bonus pay" is available in the PEIMS dataset, and so an attempt was made to use this as the regressor. However, the number of principals receiving it was trivial enough to render it a poor fit for this model. An attempt to use it for coaches was even less successful, owing largely to the fact that teachers taking on additional responsibilities receive extra compensation in the form of "bonus pay," making coaches who teach – who typically earn less than non-teaching coaches – the main recipients of "bonus pay."

[30]So many performance variables were included for principals because they each measure a unique aspect of the school, whereas the performance measures for coaches are just variants of each other.

[31] For a more detailed understanding of this metric and how it is computed, see Brian Roger's explanation at http://www/dpoll.com. In general, a pre-season rating is given to each team based on its performance the previous five seasons, the number of returning starters and the experience of the returning starters. This number (the predicted line) is updated over the course of the season. After each game, the difference between the two opposing team's "predicted line" and the actual score is evaluated in order to determine how efficient each team is. At the end of the season, an overall "Power Number" or "pbnum" is awarded to each team.

In addition, a dummy variable for the Houston school district is included in the principals' analysis and is then interacted with the performance variables. This is done to account for the fact that after 1994, Houston principals were offered one year contracts, renewal of which was subject to these same performance measures. The interactive term should show if this evaluation technique was unique to Houston or not.

In order to consider the possibility that performance affects only whether a principal or coach is retained or not, I run a probit model on whether they leave the school they were at as well as whether they leave the dataset entirely:

3.2 $$Prob(Leave = 1) = \Phi(\beta_i X_{it} + \delta_t performance_t + \varepsilon > 0)$$

X_{it} is the same matrix of individual characteristics that the wage regressions used, but now the performance measure is for the current period. Performance measures for principals consist of attendance rates, dropout rates and TAAS performance, and are used simultaneously, while the performance variable for coaches is either this season's record, this season's pbnum, the coach's record,[32] or the rank of the team for the season.

RESULTS

Tables 3.4 and 3.5 show the results for the robust OLS and fixed-effect regressions. Intriguingly, the numbers of schools in a district has a positive effect for principals but a negative effect for coaches. The variable was included because of concerns raised by coaches that large districts have many schools and therefore many positions to fill. This would, holding all else equal, result in large districts paying less. Why this would be the case for coaches and not principals is not entirely clear, though it

[32]This is the total win-loss record for all periods up to and including the current one.

could be argued that since coaching has no official accreditation requirements, unlike that of principals, larger districts create a much larger pool of potential coaches, keeping wages down.

Age and age-squared follow the usual pattern, and having an advanced degree has a significant and positive effect on wages, as expected. White principals tend to make more, though the effect is reduced when the Houston dummies are added and is only a significant factor for coaches when using the lagged winning percent. Teaching is negative and significant for principals but is insignificant for coaches, perhaps because it's so pervasive. However, the dummy for whether a coach teaches any academic class is negative and significant, suggesting that coaches do better to specialize in coaching and physical education. The number of schools served is insignificant for coaches; the number of principals and grades is insignificant for principals. Shares of time spent in a specific role is positive for coaches acting as both athletic director and department head in the OLS models, as well as shares of time spent in other, non-teaching, non-administrative positions.[33]

The lagged performance variables are significant only in the OLS models for both principals and coaches. The coaches' performance variables are, as expected, positive, underscoring that coaches are rewarded monetarily for a successful football season. The principals' variables, however, behave less predictably. The dropout variable is insignificant (which might be of some comfort, given recent events, to Houston administrators) and the attendance variable, while significant, has the opposite sign expected. This may be explained by the fact that attendance is negatively correlated with school size, and larger schools pay principals more, which masks the true effect of attendance on principal pay. Only the graduation and math TAAS variables behave in a

[33]Such positions include athletic trainer, non-campus professional, educational aid, visiting teacher, teacher facilitator, teacher supervisor, vocational education coordinator and counselor.

manner which supports principals receiving bonuses based on their performance. Additionally, the Houston dummies merely suggest that Houston principals are paid less given their attributes and that Houston math scores weakly have a negative impact on wages.

The fact that all of the performance variables are insignificant in the fixed-effect model could be explained by an individual effect, since the null that individual error terms equal zero is rejected. This seems probable, given the employer would likely observe random effects which might affect the performance variables but might not actually be the principal's or coach's fault. However, this does go against the fact that one-year contracts are becoming more standard for principals and against the anecdotal evidence of coaches: while there are several legacies among Texas high school football coaches, there are also stories of coaches who lead a team to a state championship game yet are fired two years later because they didn't qualify for the playoffs.

When examining the probability that a principal leaves (as shown in Tables 3.6, 3.7, and 3.8[34]), the results are even more surprising. None of the performance variables are significant when considering whether the principal leaves the sample entirely, and only the TAAS variable has any effect when examining if a principal leaves a school. Adding the Houston dummies has absolutely no effect, suggesting that Houston's policies are no stricter than those of the rest of the state and that despite policies to the contrary, principals in the state of Texas are not being held accountable for a school's performance.

On the other hand, performance significantly affects the probability of coaches leaving either the school or the sample in the manner expected using any measure. Interestingly, the effect is larger for coaches leaving the sample rather than simply leaving the school, which might be due to the performance measures being fairly

[34]Individual year probits are found in Appendix B at the end of this paper.

transparent: other schools are unlikely to hire a coach released from his contract after an unsuccessful season. All the measures were significant at the 95 percent level for both the probability of leaving the school as well as leaving the sample, but winning percentages and the coach's historical record had the largest marginal effect for leaving the sample (-.32 and -.36 respectively).

There is, however, one point of concern with this estimation: all principals and coaches who remained in the sample were treated the same. In truth, a small number switched to better or worse positions at other schools. This is somewhat addressed by the probability that they left the school, but additionally separate probits were run which looked at the probability that a principal or coach were exited or had a loss in pay and found no appreciable difference. More troubling is the fact that I do not know whether principals and coaches that left the sample did so voluntarily. While I attempted to correct for this by considering age in the probit, I do not know if they instead accepted a better position which simply didn't involve being a principal or coach at a Texas high school.

CONCLUDING REMARKS

This chapter has examined the impact of performance on wages of high school principals and football coaches. Results indicate that coaches, as well as principals to a lesser degree, receive monetary incentives to perform well. However, while a coach's performance also affects tenure, it does not seem that the same can be said for principals. This is important because it establishes that merit pay does in fact exist for public educators, but to different degrees depending on the role. While principals find that performance affects their wage levels, coaches find it additionally affects whether they retain their position.

This disparity between treatment of coaches and principals in light of their behavior is in all likelihood not due to a heightened need to make coaches more accountable than other staff members. Instead, it is probably the result of the transparency of both the coach's objective and the outcome of their performance. Since principals have much more diverse duties, evaluating them is clearly more complicated, and so one would expect the effectiveness of merit pay to be lessened.

As more and more school systems attempt to introduce some form of performance pay for teachers and other employees, it is important to note that their success may be uneven due to the difficulty in finding appropriate measures. In addition, if only certain aspects of performance are linked to pay, employees may divert their energies to those activities which are more tangibly rewarding. In the next chapter, I will examine whether merit pay leads to an inefficient allocation of resources for principals in Texas.

Table 3.1 Summary Statistics for Principals All Years, by class

	A	2A	3A	4A	5A
Number	502	794	808	845	881
Percentage					
White	93.03%	88.92%	84.90%	68.40%	69.58%
Male	85.46%	88.16%	83.17%	72.19%	72.76%
Advanced Degree(s)	87.65%	88.54%	93.07%	96.69%	96.94%
Masters	85.66%	86.27%	88.86%	87.93%	86.72%
Doctorate	1.99%	2.27%	4.21%	8.76%	10.22%
Teach	23.90%	16.62%	10.64%	7.34%	3.41%
Mean Values					
Age	45.82	46.17	47.66	49.41	49.91
	(7.36)	(7.59)	(7.24)	(6.85)	(6.72)
Total Pay (in 1000s of 2002 dollars)	57.57	60.87	65.70	78.57	89.09
	(5.51)	(5.33)	(6.66)	(9.54)	(9.47)
Total Pay/ Average Teacher Base Pay	1.55	1.63	1.72	1.95	2.14
	(0.16)	(0.15)	(0.17)	(0.19)	(0.21)
Total Pay/ Experience Teacher Base Pay	1.41	1.48	1.52	1.67	1.80
	(0.21)	(0.20)	(0.19)	(0.23)	(0.23)
Number of Principals at School	1.09	1.08	1.04	1.07	1.13
	(0.30)	(0.34)	(0.21)	(0.33)	(0.53)
Number of Grades at School	6.14	4.40	4.04	4.04	3.98
	(2.77)	(1.45)	(0.44)	(0.73)	(0.79)
Average Share of Time as:					
Principal	0.82	0.87	0.92	0.95	0.98
	(0.29)	(0.28)	(0.24)	(0.18)	(0.12)
Teacher	0.12	0.11	0.07	0.04	0.02
	(0.26)	(0.27)	(0.24)	(0.17)	(0.12)

Standard Deviations appear in parenthesis

Table 3.2 Summary Statistics for Head Coaches All Years, by class

	A	2A	3A	4A	5A
Number	532	837	835	870	901
Percentage					
White	90.60%	94.62%	89.09%	78.94%	77.53%
Advanced Degree(s)	13.02%	17.22%	29.74%	45.57%	57.95%
Teach	94.33%	92.11%	74.91%	78.09%	75.59%
Academic Teachers	69.42%	43.56%	8.98%	14.33%	7.54%
Mean Values					
Age	40.09	41.83	43.22	45.63	47.37
	(7.71)	(7.86)	(7.20)	(7.32)	(7.68)
Total Pay (in 1000s of 2002 dollars)	49.57	54.19	58.95	65.26	71.64
	(66.21)	(5.54)	(6.68)	(9.88)	(11.81)
Total Pay/ Average Teacher Base Pay	1.33	1.45	1.55	1.63	1.73
	(0.16)	(0.15)	(0.18)	(0.25)	(0.29)
Total Pay/ Experience Teacher Base Pay	1.26	1.33	1.39	1.41	1.47
	(0.13)	(0.13)	(0.16)	(0.23)	(0.25)
Number of Schools	1.31	1.41	1.22	1.07	1.03
	(0.51)	(0.54)	(0.44)	(0.28)	(0.19)
Average Share of Time as:					
Teacher	0.86	0.72	0.52	0.64	0.65
	(0.27)	(0.36)	(0.43)	(0.44)	(0.45)
Athletic Director	0.12	0.27	0.47	0.31	0.17
	(0.25)	(0.35)	(0.43)	(0.42)	(0.36)

Standard Deviations appear in parenthesis

Table 3.3.a Changes in Principals' Position

	remain at school	change with pay increase	change with pay decrease	exits data set	total
1999-00	**672**	38	5	227	942
2000-01	733	**29**	1	196	959
2001-02	709	40	**5**	204	958

Table 3.3.b Changes in Coaches' Position

	remain at school	change with pay increase	change with pay decrease	exits data set	total
1999-00	749	**74**	9	154	986
2000-01	775	61	**10**	152	998
2001-02	765	59	9	**163**	996

Table 3.4 Wage Regressions for High School Principals with Year and Class Controls

N	2005	2005	2005	2005
Number of Groups	-	1037	-	1037
F Stat	325.38	114.99	277.93	92.65
R-squared	0.7546	-	0.7569	-
	R. OLS	FE	R. OLS	FE
schools in district	**0.006**	**0.019**	**0.007**	**0.020**
	(0.001)	(0.003)	(0.001)	(0.003)
age	**0.012**	0.072	**0.012**	0.069
	(0.002)	(0.049)	(0.002)	(0.049)
age squared/100	**-0.010**	**-0.024**	**-0.009**	**-0.023**
	(0.002)	(0.009)	(0.003)	(0.009)
white	**0.015**	-	**0.014**	-
	(0.006)	-	(0.006)	-
male	*0.010*	-	*0.010*	-
	(0.005)	-	*(0.005)*	-
master's degree	**0.042**	-	**0.040**	-
	(0.009)	-	(0.009)	-
ph.d	**0.080**	-	**0.076**	-
	(0.013)	-	(0.013)	-
teaches	**-0.020**	0.003	**-0.019**	0.003
	(0.006)	(0.005)	(0.007)	(0.005)
number of principals	-0.009	0.0002	-0.008	0.001
	(0.006)	(0.005)	(0.006)	(0.005)
number of grades	-0.003	0.001	-0.003	0.0005
	(0.002)	(0.002)	(0.002)	(0.002)
lagged dropout rate	-0.001	-0.002	-0.001	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
lagged attendance rate	**-0.005**	0.001	**-0.005**	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
lagged graduation rate	**0.001**	0.0002	**0.001**	0.0002
	(0.000)	(0.0002)	(0.000)	(0.0002)
lagged math TAAS	**0.001**	0.00003	**0.002**	0.0001
	(0.000)	(0.0003)	(0.000)	(0.0003)

Table 3.4 continued

Houston dummy	-	-	**-1.009**	-
	-	-	(0.400)	-
Houston*dropout lag	-	-	-0.006	0.001
	-	-	(0.011)	(0.005)
Houston*attendance lag	-	-	0.007	-0.0002
	-	-	(0.005)	(0.010)
Houston*graduation lag	-	-	0.001	-0.0003
	-	-	(0.002)	(0.002)
Houston*math TAAS lag	-	-	0.002	**-0.004**
	-	-	(0.001)	(0.002)
constant	**11.263**	**8.145**	**11.305**	**8.211**
	(0.149)	(2.388)	(0.153)	(2.384)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table 3.5 Wage Regressions for High School Football Coaches with Year and Class Controls

N	3341	3341	3341	3341
Number of Groups	-	1248	-	1248
F Stat	377.03	132.47	396.55	132.77
R-squared	0.6577	-	0.6736	-
	R. OLS	FE	R. OLS	FE
schools in district	**-0.007**	**-0.003**	**-0.006**	**-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
age	**0.031**	**0.047**	**0.030**	**0.047**
	(0.002)	(0.023)	(0.002)	(0.023)
age squared/100	**-0.027**	**-0.040**	**-0.026**	**-0.039**
	(0.002)	(0.007)	(0.002)	(0.007)
white	**0.024**	-	**0.012**	-
	(0.006)	-	(0.006)	-
graduate degree	**0.028**	0.004	**0.025**	0.004
	(0.004)	(0.010)	(0.004)	(0.010)
total schools assigned	-0.0003	-0.0037	-0.0011	-0.0039
	(0.004)	(0.005)	(0.004)	(0.005)
teaches	*-0.012*	0.009	**-0.013**	0.009
	(0.006)	(0.006)	(0.006)	(0.006)
teaches academic subject	**-0.053**	**-0.019**	**-0.047**	**-0.020**
	(0.005)	(0.006)	(0.005)	(0.006)
share as athletic director	**0.026**	0.010	**0.025**	0.010
	(0.006)	(0.007)	(0.006)	(0.007)
share as department head	**0.080**	*0.057*	**0.079**	*0.056*
	(0.015)	(0.024)	(0.014)	(0.024)
share as other non-teaching, non-administrative roles	**0.031**	-0.002	**0.033**	-0.002
	(0.010)	(0.013)	(0.010)	(0.013)

Table 3.5 continued

lagged winning percent	**0.069**	0.0004	-	-
	(0.008)	(0.007)	-	-
lagged pbnum	-	-	**0.003**	0.0003
	-	-	(0.0002)	(0.0002)
constant	**10.301**	**9.866**	**10.065**	**9.826**
	(0.053)	(1.020)	(0.054)	(1.020)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table 3.6 Probability Principal Leaves, With Year Controls

N	2852	2852	2852	2852
Log Likelihood	-1474.68	-1607.20	-1473.24	-1605.59
LR Chi2	72.63	59.49	75.52	62.72
Pseudo R2	0.024	0.02	0.03	0.02
	Leaves Sample	Leaves School	Leaves Sample	Leaves School
district size	**-0.021**	**-0.026**	**-0.024**	**-0.028**
	(0.008)	(0.008)	(0.010)	(0.010)
numbers of students (100s)	**-0.013**	**-0.010**	**-0.013**	**-0.011**
	(0.004)	(0.003)	(0.004)	(0.003)
age	**-0.079**	**-0.078**	**-0.076**	**-0.074**
	(0.031)	(0.031)	(0.032)	(0.031)
age squared (100s)	**0.102**	**0.094**	**0.100**	**0.089**
	(0.032)	(0.032)	(0.034)	(0.033)
masters degree	-0.071	-0.096	-0.076	-0.101
	(0.106)	(0.102)	(0.107)	(0.102)
Ph.D	0.067	0.025	0.065	0.021
	(0.150)	(0.146)	(0.151)	(0.146)
male	-0.097	-0.029	-0.097	-0.030
	(0.068)	(0.066)	(0.068)	(0.067)
white	-0.013	0.026	-0.010	0.028
	(0.075)	(0.072)	(0.075)	(0.072)
teach	*0.156*	0.127	*0.157*	0.128
	(0.083)	(0.081)	(0.083)	(0.081)
dropout rate	0.025	0.030	0.024	0.029
	(0.027)	(0.026)	(0.028)	(0.027)
attendance rate	-0.015	-0.018	-0.021	-0.023
	(0.020)	(0.020)	(0.021)	(0.020)
Math Spring TAAS	-0.007	**-0.010**	-0.007	**-0.010**
	(0.005)	(0.004)	(0.005)	(0.005)

Table 3.6 continued

Houston	-	-	-13.748	-13.001
	-	-	(9.766)	(9.500)
Houston* Dropout Rate	-	-	0.015	-0.007
	-	-	(0.148)	(0.146)
Houston*Attendance	-	-	0.137	0.125
	-	-	(0.112)	(0.109)
Houston*Math TAAS	-	-	0.015	0.020
	-	-	(0.029)	(0.029)
Constant	2.992	*3.671*	*3.525*	**4.127**
	(1.979)	(1.917)	(2.034)	(1.967)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table 3.7 Probability Coach Leaves Sample, All Years

N	2962	2962	2962	2962	2962
Log Likelihood	-1202.80	-1211.57	-1209.61	-1222.35	-1195.19
LR Chi2	238.71	221.16	225.08	199.60	253.92
Pseudo R2	0.09	0.08	0.09	0.08	0.10
district size	-0.007	**-0.016**	-0.009	*-0.015*	-0.010
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
age	**-0.089**	**-0.092**	**-0.078**	**-0.092**	**-0.084**
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
age squared (100s)	**0.123**	**0.128**	**0.114**	**0.127**	**0.119**
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
White	-0.103	0.016	-0.098	-0.003	-0.063
	(0.085)	(0.086)	(0.085)	(0.085)	(0.087)
Advanced Degree	-0.003	-0.012	-0.005	-0.010	-0.004
	(0.068)	(0.067)	(0.067)	(0.067)	(0.068)
Teach	-0.097	-0.045	-0.078	-0.048	-0.084
	(0.118)	(0.118)	(0.118)	(0.118)	(0.119)
Academic	**0.178**	*0.129*	**0.181**	*0.135*	**0.167**
	(0.075)	(0.075)	(0.075)	(0.075)	(0.076)
Athletic Director Share	-0.008	0.013	0.010	0.002	0.010
	(0.106)	(0.106)	(0.106)	(0.105)	(0.106)
Share of time, non-management, non teaching	**-0.613**	**-0.589**	**-0.603**	**-0.571**	**-0.621**
	(0.221)	(0.220)	(0.222)	(0.218)	(0.250)
overall winning percent	**-1.413**	-	-	-	**-0.775**
	(0.120)	-	-	-	(0.250)
Pbnum	-	**-0.031**	-	-	**-0.024**
	-	(0.003)	-	-	(0.009)
Coach's Record	-	-	**-1.589**	-	**-0.542**
	-	-	(0.141)	-	(0.254)
Rank	-	-	-	**0.005**	**-0.003**
	-	-	-	(0.001)	(0.002)
Constant	1.116	**3.854**	0.924	-0.205	**3.969**
	(0.736)	(0.778)	(0.735)	(0.739)	(1.337)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table 3.8 Probability Coach Leaves School, All Years

N	2962	2962	2962	2962	2962
Log Likelihood	-1542.13	-1547.48	-1549.14	-1550.22	-1541.34
LR Chi2	124.23	113.51	110.20	108.04	125.80
Pseudo R2	0.04	0.04	0.03	0.03	0.04
district size	*-0.012*	**-0.016**	*-0.013*	**-0.016**	*-0.012*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
age	**-0.096**	**-0.098**	**-0.093**	**-0.098**	**-0.097**
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
age squared (100s)	**0.117**	**0.120**	**0.115**	**0.120**	**0.118**
	(0.033)	(0.033)	(0.033)	(0.032)	(0.033)
White	-0.117	-0.065	-0.121	-0.073	-0.108
	(0.077)	(0.078)	(0.077)	(0.078)	(0.079)
Advanced Degree	0.004	-0.001	0.001	0.001	0.002
	(0.060)	(0.060)	(0.060)	(0.069)	(0.060)
Teach	0.011	0.039	0.027	0.037	0.015
	(0.104)	(0.104)	(0.104)	(0.104)	(0.104)
Academic	**0.136**	0.112	**0.137**	*0.116*	*0.132*
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Athletic Director Share	0.084	0.090	0.091	0.086	0.086
	(0.094)	(0.094)	(0.094)	(0.094)	(0.094)
Share of time, non-management, non teaching	*-0.339*	*-0.320*	*-0.322*	*-0.316*	*-0.340*
	(0.184)	(0.182)	(0.183)	(0.182)	(0.184)
overall winning percent	**-0.709**	-	-	-	**-0.657**
	(0.104)	-	-	-	(0.223)
Pbnum	-	**-0.015**	-	-	-0.010
	-	(0.002)	-	-	(0.008)
Coach's Record	-	-	**-0.706**	-	0.027
	-	-	(0.124)	-	(0.229)
Rank	-	-	-	**0.003**	-0.001
	-	-	-	(0.000)	(0.001)
Constant	**1.439**	**2.734**	**1.357**	0.809	**2.680**
	(0.677)	(0.712)	(0.676)	(0.683)	(1.213)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Chapter 4: Principals as Agents: The Case of Houston Public Schools

> *The right says that, in the private sector, pay and performance are related. I look at the CEOs of American corporations, and if there's a connection between pay and performance there, I missed it.*
>
> *Molly Ivins*

INTRODUCTION

In the never-ending quest to improve public education, researchers and officials have sought to increase both the competitiveness and the accountability of American public schools. Competition between schools, it is believed, allows failing schools to close, with their students being absorbed into more successful programs. Accountability, either through student or staff evaluations, is a means of determining which programs and persons are succeeding and which are not.

To this end, reformists have suggested applying business tactics to education, pointing to the success many parochial and private schools have achieved both financially and academically. Critical to this success, it is argued, is the flexibility with which private schools are able to make decisions, unencumbered by contract restrictions imposed by teacher unions and at least some of the regulations mandated by the state. The suggestion is that by lifting these restrictions, public schools will become more competitive with their private counterparts.

But is imposing a competitive model on an inherently un-competitive institution a good idea? After all, private schools are able to reap the returns of improved reputations by increasing tuition rates as well as restrict admittance to students they feel best suited to their programs, options that are unavailable to public schools. Without the same ability to respond to market forces, the requirements placed on public schools may result in unforeseen and undesirable outcomes.

This paper explores one of the policy reforms aimed at increasing competition in Texas public schools, namely merit pay for school principals. Having established in the previous chapter that merit pay does exist on some level for high school football coaches and principals, this chapter models an incentive scheme similar to one adopted by the Houston School District and demonstrates how it could result in agents providing an inefficient level of the public good. The chapter then describes the incentive program adopted by the Houston Independent School District in December of 1994 and analyzes whether this program resulted in an improvement in educational outcomes for Houston schools as compared to other schools in the state. It finds a significant improvement in Houston's dropout statistics but a significant decline in attendance rate, compared to the rest of the state. Houston did not present a significant change, positive or negative, in any of the other performance measures when compared to the rest of the state. This suggests that while the performance incentives were not as effective as the administration had hoped, they also did not adversely affect overall education production, as measured by college board scores.

PREVIOUS LITERATURE

The standard treatment of incentives with regard to public goods is to consider the theoretical award of a government contract to a private company, such as in Laffont (1987). In these cases, the distribution of costs is widely known, though only the firm knows its actual costs of undertaking the endeavor. These costs can be mitigated by the firm's exertion of effort, but the effort is costly and so will be undertaken only if suitable inducements exist. This involves the sharing of risk to different degrees.

Hart *et al.* (1997) extend this model by allowing providers to both reduce cost and improve quality through their efforts, though costs and quality are negatively correlated. Additionally, the principal and agent are allowed to renegotiate the contract after costs and innovations are initially realized. Consequently, private ownership results in "excessively strong incentives" to reduce costs and moderate incentives to produce quality innovations. Conversely, public ownership gives weaker incentives for each goal. This implies that costs will always be higher in the case of public ownership, but because cost reductions impair overall quality, it is unclear if overall quality will be higher or lower in the case of public ownership, which leads to unclear policy implications in the case of schooling.

Tirole (1994) discusses more thoroughly the problems with the design of incentives in the public sector. Incentives are of limited use, according to Tirole, due to the fact that government agencies pursue multiple goals and have non-measurable aspects of social welfare. These dual limitations generally result in agents being offered "low-powered incentives," in which the agent receives only a small fraction of their marginal product. Tirole goes on to argue that division of labor within the government is an attempt to create competition between multiple principals with dissonant objectives, which can result in effective overall policies.

Empirical applications of the basic principal-agent model are presented in Predergast (2002) and Hoxby (1995). Prendergast discusses internal versus external monitoring of public agencies, specifically the Los Angeles Police Department. Noting that internal monitors tend to have different preferences from consumers, Prendergast finds that the use of the Internal Affairs division, which acts as an external agency, to investigate complaints against officers has resulted in a decrease in officers' crime-fighting activities as they attempt to avoid inquiries into their behavior.

Hoxby (1995) analyzes the impact on educational quality of cost reduction incentives for schools that are funded through local property taxes, or by more egalitarian methods. Following the hypothesis proposed by Tiebout, individuals sort themselves into school districts by setting the marginal utility derived from the school equal to its price, in this case property taxes. The actual costs of the school are reported to the school board, though effort is not, and the board is able to derive the quality from the price and enrollment. As such, local school boards are able to make contracts based on both quality and costs. When finances are aggregated, however, the quality mechanism no longer exists; only a cost incentive can be created. Thus, Hoxby's model predicts lower costs for any given level of quality in states that locally finance education. This conclusion is supported by a small but significant negative relationship between the share of school funding by a state and its high school completion rate.

My model will instead focus on an education production function whose inputs are for either verifiable or non-verifiable student outcomes. Verifiable outcomes include attendance, math proficiency, spelling, and other tangible qualities; non-verifiable outcomes include more abstract thinking and oratorical skills. Agents, in this case school principals or administrators, allocate inputs subject to a government budget constraint (in the case of public schools) or are able to charge a price for the education output and maximize profits (in the case of private schools). These administrators, however, can shirk from their duties, which will increase their utility but lower output. In order to combat this, a private versus public incentive scheme is analyzed.

THEORETICAL MODEL

Assume that education output of a school takes the form of

4.1 $E = Av^{\alpha}n^{\beta}$

E = Educational output

A = Scale parameter

v = Verifiable inputs

n = Non-verifiable inputs

Also assume that α and β both fall between the interval of zero and one, and that therefore education is increasing in both *v* and *n* at a decreasing rate.

The principal knows the actual form of the production function, but the government, which delegates production decisions to the principal, observes only a measurable result, *T*, which is a function of only the verifiable inputs, *v*. The principal's utility is a function of both education output, which is a public good, and wages, which are initially assumed to be constant. Education and wages are assumed to be additively separable in the utility function. The principal must choose how to allocate limited resources between verifiable and non-verifiable inputs. The Lagrangian representing this maximization problem takes the form of

4.2 $$L = Av^{\alpha}n^{\beta} + w + \lambda(G - p_v v - p_n n)$$

G = available resources

P_v = price of verifiable inputs

P_n = price of non-verifiable inputs

Assuming interior solutions, the first-order conditions are

4.3 $$\frac{\partial L}{\partial v} = \alpha A v^{\alpha-1} n^{\beta} - \lambda p_v = 0$$

4.4 $$\frac{\partial L}{\partial n} = \beta A v^{\alpha} n^{\beta - 1} - \lambda p_n = 0$$

4.5 $$\frac{\partial L}{\partial \lambda} = G - p_v v - p_n n = 0$$

Setting 4.3 and 4.4 equal to each other, we're able to solve for *v*,

4.6 $$v = \frac{\alpha p_n n}{\beta p_v}$$

Substituting this into 4.5 we can solve for *n**,

4.7 $$n^* = \frac{\beta G}{(\alpha + \beta) p_n}$$

And *v**,

4.8 $$v^* = \frac{\alpha G}{(\alpha + \beta) p_v}$$

And an educational output of

4.9 $$E = A\left(\frac{G}{\alpha + \beta}\right)^{\alpha + \beta} \left(\frac{\alpha}{p_v}\right)^{\alpha} \left(\frac{\beta}{p_n}\right)^{\beta}$$

The problem becomes more interesting, however, if the principal must also choose her effort level, *e*. Expending effort is costly but results in a greater educational output. Specifically, the utility function becomes

4.10 $U = f(e)Av^{\alpha}n^{\beta} + g(e)w$

The choice between working hard and shirking is represented by the following values for *e:*

$$e = \begin{cases} 1, \\ or \\ 0 \end{cases}$$

And furthermore, the increase in output is represented by either

4.11 f(0) < 1

4.12 f(1) = 1

While the cost of exerting effort is represented by either

4.13 c(1) = C

4.14 c(0) = 0

So the utility the principal derives when "shirking" their duties is

4.15 $U_{e=0} = f(0)Av^{\alpha}n^{\beta} + w - c(0) = f(0)Av^{\alpha}n^{\beta} + w$

Utility for expending their full effort is

4.16 $U_{e=1} = Af(1)v^{\alpha}n^{\beta} + w - c(1) = Av^{\alpha}n^{\beta} + w - C$

I assume that $U_{e=0} > U_{e=1}$, so the principal will choose to expend the minimum effort level, which will result in a lower education output.

The new maximization problem is represented by the following Lagrangian:

4.17 $L^{effort} = f(e)Av^{\alpha}n^{\beta} + w - c(e) + \lambda(G - p_v v - p_n n)$

Despite lowering effort, the principal continues to choose the efficient allocation of t^* and n^*; however, the new educational output is lowered by f(0), that is,

4.18 $E' = f(0)\left(\frac{G}{\alpha+\beta}\right)^{\alpha+\beta}\left(\frac{\alpha}{p_v}\right)^{\alpha}\left(\frac{\beta}{p_n}\right)^{\beta}$

In order to encourage the principal to work harder, the government could ideally be able to condition their income on educational output. However, only the measurable output, *T,* is observable to the government. Therefore, the government designs an incentive scheme where the principal earns a bonus (paid from a separate account and therefore not included in *G*) based on *T* that will discourage them from shirking. That is, the government alters the principal's pay scheme so that their utility function takes the form

4.19 $U = f(e)Av^{\alpha}n^{\beta} + w - c(e) + \delta T(v,e)$

T takes the form

4.20 $T(v,e) = f(e)v^{\alpha}$

To insure that the principal chooses not to shirk, the government sets $\delta*$ so that

4.21 $U_{e=0} = f(0)Av^{\alpha}n^{\beta} + w + f(0)\delta v^{\alpha} \leq Av^{\alpha}n^{\beta} + w - C + \delta v^{\alpha} = U_{e=1}$

Solving for $\delta*$ at the optimum

4.22 $$\delta* = \frac{C-(1-f(0))Av^{\alpha}n^{\beta}}{T(v,1)-T(v,0)} = \frac{C}{(1-f(0))\left(\frac{\alpha G}{(\alpha+\beta)p_v}\right)^{\alpha}} - A\left(\frac{\beta G}{(\alpha+\beta)p_n}\right)^{\beta} > 0$$

we can now examine the new maximization problem for the principal.

4.23 $L'' = Av^{\alpha}n^{\beta} + w - C + \delta^{*}v^{\alpha} + \lambda(G - p_v v - p_n n)$

The new first order conditions are now

4.24 $$\frac{\partial L''}{\partial v} = \alpha Av^{\alpha-1}n^{\beta} + \delta\alpha v^{\alpha-1} - \lambda p_v = 0$$

4.25 $$\frac{\partial L''}{\partial n} = \beta Av^{\alpha}n^{\beta-1} - \lambda p_n = 0$$

4.26 $$\frac{\partial L''}{\partial \lambda} = G - p_v v - p_n n = 0$$

Setting equations 4.24 and 4.25 equal to each other, we can define

4.27 $$v = \frac{\alpha p_n n}{\beta p_v}\left(1 + \frac{\delta}{An^{\beta}}\right)$$

The result is a set of transcendental equations which do not net a unique solution. However, by comparing equations 4.6 and 4.27 it becomes clear that v^* has increased, and given that prices and G have not changed, the allocation of n^* must necessarily fall. In response to the new incentives, the principal puts more of the government's resources into the input that directly affects income. In doing so, the resource allocation is no longer at the optimal level. As a result, educational output falls. While the incentive scheme successfully assures that principals do not shirk their duties, it has the unintentional outcome of inducing principals to over-utilize verifiable outcomes, resulting in an overall decline in educational productivity.

THE HOUSTON PROGRAM

In 1990, the Houston Independent School District adopted a "Declaration of Beliefs and Visions" which sought, among other things, to decentralize decision making and emphasize professional management in response to depressed test scores and public opinion, coupled with a high dropout rate and a rapidly increasing student population. Then-superintendent Rod Paige felt that management accountability would encourage schools to respond quickly and effectively to the challenges faced by this large, urban school district.

Paige argued that a school's response time had been hindered in the past due to the Texas Contract Nonrenewal Act (TCNA), which governed administrators' contracts and made removing them a costly and protracted legal undertaking. Instead, districts began to offer current principals and superintendents special one-year contracts that waived the TCNA's due process, along with a signing bonus of $7,500 and $15,000 respectively. Newly hired administrators had no choice but to accept the new contracts.

The new contracts allow the district to remove an administrator at any time and without cause, simply by paying them the balance of their contract. (The minimum buyout is two months' salary, while the maximum is one year's salary.) Additionally, the district can elect to not renew the contract when it expires, without the school board's approval.

The decision to renew contracts is based on performance standards, including measurable objectives specific to a school's improvement goals. Objectives include student attendance rates, staff attendance rates, share of student body passing the state assessment, dropout rates, and parental participation rates. Interestingly, the principals select from these objectives which areas are to be included in their performance review with the district superintendent.

The new contracts were first offered in December of 1994 for administrators who report directly to the superintendent; the following summer they were offered to all administrators, principal and higher. Almost 95 percent of those eligible accepted the new contracts in the first year. Between 1995 and 1998, four principals left voluntarily, one was not renewed and six others were given the option of retirement or non-renewal. In addition, one business administrator was bought out of his contract, and two district superintendents were not renewed. Meanwhile, student test scores have consistently risen while the dropout rate has declined significantly.

These last two outcomes, however, have become suspect in the past year (as mentioned in the previous chapter). That administrators trying to meet their performance standards might have corrupted both dropout and TAAS data has interesting implications for our research here: while the Houston contracts might have led to an increase in measured objectives, these may well overstate any educational accomplishments that were a result of the adoption of the new contracts.

THE DATA

Data for this chapter were obtained from the Texas Education Agency's (TEA) Academic Excellence Indicator System (AEIS). This dataset consists of detailed school- and district-level observations of student, faculty and school characteristics from 1993 to the present. This paper concentrates on the years 1993 to 2000, corresponding with Rod Paige's tenure as Superintendent of the Houston School District and the changes he implemented in administrators' contracts.

Observations were restricted to those schools that include secondary students, as these schools report scores on aptitude tests taken by their students but not administered by the school. Administrators have weaker incentives to improve these scores, and so, if not strongly correlated with those metrics which administrators do have incentives to increase, these may be a better measure for the school's overall educational productivity.

Observations were further limited to those which contained all the metrics considered in the economic model. Roughly 200 schools were dropped each year for this reason, for a total of 1885 observations. The dropped observations were predominantly from smaller schools with a larger minority presence that were outside the Houston district. The econometric results were unchanged by this restriction.

Summary statistics for all schools in the dataset appear in Table 4.1. The share of these schools which are in the Houston School District is fairly constant over the entire time period. The average number of full-time teachers increases somewhat over the period, as do real salaries. Both tenure and experience are fairly stable, though the share of staff belonging to a minority group increases significantly from 1993 to 2000. The student-teacher ratio and average enrollment seem to move in tandem, suggesting the actual size of a given faculty is relatively constant.

Texas schools became more diverse over the time period, a phenomenon which appears to be driven primarily by increases in the Hispanic population. The changing student population also increases its share of economically disadvantaged students by approximately the same percentage point. Interestingly, though, the share that is bilingual increases by less than two tenths of a percentage point despite the influx of Hispanic students.

Both the share of the student body labeled "special education" and the share labeled "gifted" increases by roughly two percentage points between 1993 and 2000, while the share taking advance courses increases by more than six percentage points, suggesting that more of these classes are being offered. The attendance rate is flat over the period, though the dropout rate decreases significantly. An increasing share of students passed the TAAS exit exams over the period, though the number initially falls over several years.

The share of students receiving scores on the college boards above the critical amount[35] increases by more than 50 percent during the sample. However, this increase masks the fact that the share of students taking the college boards falls slightly over the period, and is probably due to the restructuring of the SAT in 1996, which increased average test scores by 100 points. The fall in the share of students taking the college boards corresponds to the implementation of the "10 Percent Rule," the Texas policy which guarantees admittance into any public university in Texas for students graduating in the top 10 percent of their high school class. In the case of the University of Texas at

[35]Critical level is defined as more than 1000 on the SAT; more than 24 on the ACT.

Austin, these students are not required to submit college board scores when applying to the university. As such, the decline may be due to top students opting not to take the tests. If this were strictly the case, however, one would expect a decline in overall ACT scores, which were not reassessed during the time period. Instead, these scores remain fairly stable.

Table 4.2 looks specifically at Houston schools in the sample. Notice that the number of full-time equivalent teachers is much larger in Houston than in the rest of the state, but that it fell significantly over the time period. Meanwhile, salaries increased in real terms by over $4,000, slightly more than the state average. Both tenure and experience are higher in Houston than the state's average, and both are increasing, which may either be the cause or the result of the salary increases. Regardless, Houston teachers appear to be less transitory than those in other parts of the state. They also appear to be more diverse, as demonstrated in the share of staff that is minority.

The average size of Houston schools appears to have declined over time, though student-teacher ratios remained stable, which is likely the result of more schools opening over the course of the time period. Whites are a minority of the student body, and their share of it continues to decline. Blacks, who are the largest demographic group at the beginning of the time period, cede their position at the end to Hispanics, whose share increased by eight percentage points (more than double the increase state-wide).

While the student body in Houston becomes less mobile over the time period and is relatively stable in its share of bilingual students, the proportion of the student body considered "economically disadvantaged" more than doubles. This indicates that Houston serves an increasingly at-risk population. The share of students labeled "special education" and "gifted and talented" in Houston follows the same patterns as those of the state, as does the share taking advanced courses. Attendance rates are lower than the state average but increase slightly, while dropout rates follow the reverse pattern.

Finally, the share of students passing the TAAS exit exams in Houston increases by more than the state average - after an initial and somewhat prolonged drop. Though the share of students taking the college boards falls by more than the state average, and the share receiving scores above the critical amount increased by much less than the state average, average ACT scores are extremely stable. All of this suggests that Houston is lagging behind the state in its educational gains, but that this might be due to the increasing burdens placed upon it by the decline in its students' socio-economic status.

Charts 4.1 through 4.5 compare Houston's performance on various education output measures to that of all other schools in the state of Texas. While attendance at schools throughout the state showed a steady, if slight, increase over the time period, attendance at Houston schools was far more noisy, with no appreciable gains over the time period. Houston's performance on dropout rates was far more impressive, with a steep decline over the period as they converged toward the rest of the state's rate. Houston's TAAS pass rates mostly track the rest of the state's, though they do close the gap slightly over the time period. The share of students taking college boards behaves erratically at Houston schools. While the measure is better behaved at other schools in the state, it falls for both over the period. Average ACT scores are relatively stable for non-Houston schools, but are noisier and have a noticeable drop in 1997 as well as 1999 and 2000. Overall, Houston consistently performed worse than the rest of the state on all the performance measures, but was able to reduce the discrepancies on a few.

RESULTS

To measure the effect of the new contract policy on Houston schools versus other schools in Texas, we compare the change in educational outcomes before and after the policy is adopted. We do this for schools in the Houston school district and those outside of it. This comparison yields a "difference in difference" or double difference estimator of

$$4.28 \qquad \Delta^2_{schools} = \left(ED^{Y2}_{HOUSTON} - ED^{Y1}_{HOUSTON}\right) - \left(ED^{Y2}_{NON-HOUSTON} - ED^{Y1}_{NON-HOUSTON}\right)$$

"ED" is a metric of average school education output, "Y2" is the period after the Houston contracts were adopted, and "Y1" was the period prior to the contract's adoption.

Tables 4.3 and 4.4 present the difference in means for the performance measures, without controlling for school characteristics. Only the dropout rates appear significant in either table, though it should be noted that Table 4.4 uses an extremely small sample size to represent the Houston school district. In general, the Houston schools performed relatively better than non-Houston schools in dropout rates, TAAS pass rates, and the share taking the college boards over the longer time period. In the shorter time period they performed better only in the dropout rate measure.

Table 4.5 presents OLS regression models with robust standard errors where the 1993-1994 and 1994-1995 school years are the equivalent of "Y1," and the 1995-1996 through 2000-2001 school years are "Y2." Included in the analysis are a series of independent variables to control for school effects, the impact of which appears to vary by the dependent variables. Teacher salary positively enters into TAAS pass rates and ACT scores, and negatively affects dropout rates, while the reverse is true for student-teacher ratios. This relationship between teacher salary and scores is not unusual and in general should not be taken to infer that higher salaries cause higher test scores. However, because this is a difference-in-difference model rather than a simple OLS regression model, a causal effect is more plausible.

The share of staff that is minority has a negative effect on most of the measures, but this is likely due to inner-city schools, which tend to have lower scores than their suburban counterparts, having a more diverse staff. Enrollment adversely affects attendance and dropout rates, but has a positive and significant effect on taking college boards and average ACT scores. This could imply that while students are somewhat overlooked at large schools, they benefit from greater emphasis on post-secondary education. More intriguingly, teacher experience has significant and undesirable effects on attendance, dropout rates and TAAS pass rates, but it positively affects the share of students taking college boards as well as average ACT scores. This suggests that older teachers may have different objectives than newer teachers who earned their certification after the state adopted the TAAS test.

The effects of student body characteristics are less surprising, with the possible exception of the effects of the share of economically disadvantaged and special education students have on attendance and dropout rates. While conventional wisdom would suggest that both of these variables would enter negatively into attendance and positively into dropout rates, the reverse is unequivocally true in the case of economic status, and only appears to hold for special education with regard to attendance. This could be due to these students' being eligible for certain programs, such as free or reduced lunch and special tutoring, which encourage their attendance but end once they drop out of school.

Being part of the Houston school district increased dropout rates and diminished ACT scores. Interestingly, the share of students passing the TAAS throughout the state was actually lower after the 1994-1995 school year despite the overall increase by the end of the time period, as indicated in the summary tables. The share of students taking the college boards also fell, but again, this could be due to the adoption of the 10 percent rule. More positively, attendance increased and dropout rates declined.

Critical to our analysis, though, is the effect of the new contracts on Houston schools, or the variable "Houston*After." Attendance rates appear to have fallen significantly in Houston after the adoption of the new policy, contrary to expectations and the stated goal. Neither TAAS pass rates nor average ACT scores significantly improve after the new contracts, and the share taking the college boards doesn't significantly change either. Only dropout rates appear to have been significantly affected by the policy change in the intended manner, decreasing by more than four percentage points after the adoption of the new contracts. However, given that these are the metrics that appear to be most sensitive to manipulation by administrators, the fact that the contracts appear to have their desired effect upon only this one measure makes the effectiveness of the contracts suspect.

However, the success of the one-year contracts was touted throughout the state resulting in similar policies being adopted outside of Houston, which might obscure the effect of the contracts in our time period. Therefore, to better isolate the effects of the contracts, Table 4.6 looks at the same metrics, but Y1=1993-1994 school year and Y2=1997-1998 school year. These years were the two years either before or after the adoption of the Houston contracts.

The effect of the staff and student characteristics appear to decline with the additional restriction. Of note, salary now enters positively into the share of students taking the college boards, but the data now excludes the years after the adoption of the 10 percent rule, so this is not entirely unexpected. The share of the student body labeled "economically disadvantaged" continues to increase attendance rates, but the same cannot be said for the share of special education students.

Attendance rates are significantly higher in Houston, though only at the 90 percent level, as are dropout rates, though average ACT scores are significantly less. The "After 1994" variable has the same effect on the performance measures in the restricted dataset as in the full. Finally, the effect on Houston schools after the adoption of the contracts mirrors that of the less restricted dataset: only the decline in dropout rates is significant after the adoption of the new contracts.

CONCLUDING REMARKS

The hope of the Houston school district when adopting one-year contracts for its administrators was to improve accountability, thus making schools more responsive to the needs and goals of their student bodies. However, given principals were evaluated on a limited number of measurable results - which they themselves were allowed to select - the incentives to improve school performance seem to be subjugated to the needs of principals to appease their evaluators. To this end, only one of the measures, dropout rates, by which principals were evaluated appears to have improved under the adoption of the contracts. That measure is now the subject of an investigation by the TEA in response to allegations that principals at multiple schools in Houston falsified student records to improve the dropout measure.

Clearly schools need to be evaluated on their productivity, but it is important that evaluators recognize that there is an element of education which is not quantifiable, at least by any currently available measures. While this makes determining the success of programs more difficult, ignoring this when creating incentives can have detrimental effects. Additional time and resources need to be devoted to determining more effective means to improve school accountability, but that is left to further research as it is beyond the scope of this chapter.

This chapter presents a theoretical model which predicts that making wages conditional on measurable outcomes of education results in an overemphasis on these measurable education outcomes and an overall decline in education. The model is loosely based on a policy implemented by the Houston school district for the 1995-1996 school year. The model's conclusions are then tested by comparing the impact of the Houston policies on education versus those for the rest of the state.

The empirical findings support the theoretical conclusions, in that only one measure improved for the Houston school district after the policy change, and that measure's increase appears to have no correlation with other measures of educational progress. However, the theoretical prediction that overall educational output would fall once targeted incentives were enacted is not demonstrated by the empirical analysis. This would lead one to conclude that while the incentives may have been costly and not as effective as hoped, they were also not detrimental to Houston's overall educational performance.

Table 4.1 Summary Statistics for All Schools and Years of Sample

	All Years	1993	1994	1995	1996	1997	1998	1999	2000
Observations	8249	1000	1021	1034	1009	1034	1045	1037	1069
Percent of Schools in Houston	2.4%	2.5%	2.4%	2.5%	2.4%	2.2%	2.4%	2.3%	2.3%
School's Teacher FTE	60.84	55.50	57.20	58.69	61.29	62.40	62.98	63.95	64.33
	(48.44)	(44.68)	(45.30)	(46.34)	(48.19)	(49.61)	(50.16)	(50.75)	(51.17)
Ave Teacher Salary (1996 1000s dollars)	32.88	31.12	30.88	32.07	32.49	32.97	33.12	35.46	34.76
	(3.30)	(3.12)	(3.08)	(3.13)	(2.77)	(2.60)	(2.87)	(2.86)	(3.01)
Log of Ave Salary (1996 dollars)	10.40	10.34	10.33	10.37	10.38	10.40	10.40	10.47	10.45
	(0.10)	(0.10)	(0.10)	(0.10)	(0.08)	(0.08)	(0.09)	(0.08)	(0.09)
Tenure	7.78	7.72	7.71	7.71	7.78	7.77	7.83	7.86	7.84
	(2.49)	(2.55)	(2.54)	(2.51)	(2.44)	(2.47)	(2.44)	(2.43)	(2.52)
Experience	12.70	12.46	12.47	12.49	12.60	12.70	12.84	12.95	13.09
	(2.34)	(2.34)	(2.32)	(2.31)	(2.30)	(2.34)	(2.33)	(2.37)	(2.38)
Share of Staff, Minority	17.66	15.73	16.29	16.72	17.22	17.91	18.44	19.00	19.83
	(21.89)	(20.67)	(21.16)	(21.06)	(21.52)	(21.59)	(22.29)	(22.83)	(23.47)
Student-Teacher Ratio	13.43	13.76	13.69	13.56	14.23	13.29	13.19	12.97	12.83
	(5.84)	(2.94)	(2.89)	(3.02)	(14.69)	(2.93)	(2.95)	(2.90)	(2.91)
Enrollment	909.07	856.52	875.01	888.61	927.50	929.83	931.36	932.33	928.67
	(838.00)	(797.41)	(802.34)	(813.16)	(843.95)	(860.08)	(859.46)	(861.59)	(859.10)
Share of Student Body, White	58.46	59.96	59.37	59.31	59.25	58.33	58.00	57.22	56.39
	(29.50)	(28.82)	(29.37)	(29.42)	(29.42)	(29.49)	(29.69)	(29.57)	(30.04)
Share Black	11.06	11.27	11.38	11.27	11.02	11.11	10.82	10.74	10.90
	(16.89)	(17.19)	(17.40)	(17.18)	(16.86)	(17.03)	(16.43)	(16.27)	(16.82)
Share Hispanic	28.91	27.32	27.79	27.92	28.19	29.03	29.50	30.39	31.01
	(28.48)	(28.07)	(28.44)	(28.51)	(28.39)	(28.40)	(28.47)	(28.48)	(28.90)
Share Econ. Disadvantaged	35.43	33.34	34.09	34.32	34.59	36.19	36.26	36.73	37.76
	(20.51)	(19.54)	(19.73)	(20.25)	(20.14)	(20.78)	(20.59)	(20.97)	(21.58)
Share Mobility	18.81	18.97	19.39	19.19	18.78	18.66	18.62	18.23	18.68
	(7.27)	(6.47)	(7.43)	(7.27)	(6.36)	(6.79)	(8.10)	(7.56)	(7.86)
Share Bilingual	3.61	3.38	3.62	3.66	3.62	3.58	3.50	3.73	3.75
	(6.65)	(7.08)	(7.28)	(7.07)	(6.85)	(6.21)	(6.09)	(6.45)	(6.08)
Share Special Ed.	13.14	11.56	12.23	12.90	13.12	13.63	13.94	13.86	13.77
	(5.05)	(4.60)	(4.87)	(4.98)	(4.82)	(4.99)	(5.76)	(4.96)	(4.80)
Share Gifted and Talented	9.68	8.15	8.90	9.27	9.33	9.78	10.37	10.83	10.73
	(8.18)	(6.30)	(7.96)	(8.04)	(8.14)	(8.43)	(9.05)	(8.76)	(8.57)
Share Taking Advanced Classes	16.21	12.13	12.97	15.17	15.25	19.85	18.70	16.69	18.63
	(9.07)	(7.19)	(7.55)	(8.29)	(8.14)	(9.36)	(9.07)	(8.77)	(10.57)

Table 4.1 continued

Attendance Rate	94.31	93.90	94.10	94.11	94.27	94.31	94.38	94.58	94.78
	(2.24)	(2.28)	(2.25)	(2.50)	(2.22)	(2.18)	(2.18)	(2.15)	(2.00)
Dropout Rate	1.82	3.45	2.51	1.84	1.57	1.49	1.40	1.24	1.18
	(1.91)	(3.01)	(2.28)	(1.62)	(1.32)	(1.31)	(1.43)	(1.22)	(1.16)
Share Passing TAAS Exit Exams	46.95	46.52	53.11	38.61	39.09	42.46	44.27	53.28	57.76
	(15.45)	(14.36)	(14.18)	(14.06)	(14.14)	(14.32)	(13.37)	(13.69)	(13.41)
Share Taking College Boards	64.63	64.77	65.98	66.07	65.66	65.64	62.89	62.86	63.30
	(15.70)	(15.51)	(15.56)	(15.47)	(12.20)	(15.70)	(15.52)	(15.65)	(16.52)
Share Above Critical (1000 SAT; 24 ACT)	18.65	13.90	14.30	14.74	20.69	20.93	21.37	21.64	21.32
	(12.16)	(9.59)	(10.08)	(10.15)	(12.20)	(12.65)	(12.57)	(12.95)	(12.66)
Average ACT Score	19.77	19.75	19.70	19.69	19.77	19.77	19.84	19.84	19.80
	(1.78)	(1.71)	(1.77)	(1.73)	(1.78)	(1.83)	(1.78)	(1.81)	(1.85)

Standard Deviations appear in parenthesis

Table 4.2 Summary Statistics for All Houston Schools and Years of Sample

	All Years	1993	1994	1995	1996	1997	1998	1999	2000
Observation	197	25	25	26	24	23	25	24	25
School's Teacher FTE	93.86	91.35	91.65	90.63	99.30	97.59	98.39	96.26	86.46
	(38.07)	(35.72)	(36.50)	(41.59)	(39.42)	(41.22)	(41.24)	(38.34)	(33.45)
Ave Teacher Salary (1996 1000s dollars)	37.93	36.42	35.94	37.56	36.83	37.50	37.75	40.49	41.02
	(2.25)	(1.45)	(1.43)	(1.55)	(1.51)	(1.70)	(1.47)	(1.35)	(1.20)
Log of Ave Salary (1996 dollars)	10.54	10.50	10.49	10.53	10.51	10.53	10.54	10.61	10.62
	(0.06)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.03)	(0.03)
Tenure	11.92	11.84	11.81	11.72	11.70	11.68	11.53	12.23	12.84
	(1.88)	(1.97)	(1.98)	(1.85)	(1.82)	(1.93)	(1.86)	(1.81)	(1.72)
Experience	14.47	14.24	14.29	14.23	14.13	14.11	13.90	14.43	16.36
	(2.02)	(2.06)	(1.96)	(1.88)	(1.83)	(1.91)	(1.92)	(1.77)	(1.97)
Share of Staff, Minority	57.27	54.09	56.44	54.42	55.46	55.77	58.37	61.98	61.73
	(18.64)	(18.04)	(18.60)	(19.02)	(19.28)	(19.73)	(18.80)	(17.74)	(18.70)
Student-Teacher Ratio	18.26	18.58	18.45	18.23	18.41	18.30	17.46	17.75	18.90
	(2.03)	(1.92)	(1.67)	(2.50)	(1.86)	(1.52)	(1.94)	(1.90)	(2.53)
Enrollment	1751.62	1735.16	1725.64	1715.15	1867.04	1820.30	1742.72	1754.08	1664.56
	(805.41)	(786.39)	(784.01)	(883.19)	(844.42)	(843.45)	(813.38)	(828.82)	(753.87)
Share of Student Body, White	12.71	14.26	13.06	14.79	13.33	12.38	12.56	10.00	11.08
	(15.54)	(16.00)	(15.61)	(17.36)	(15.50)	(15.94)	(15.97)	(12.81)	(16.25)
Share Black	42.37	43.94	45.40	42.78	41.25	41.47	40.90	42.90	40.20
	(31.36)	(32.39)	(32.77)	(32.40)	(31.92)	(32.54)	(31.57)	(30.86)	(30.64)
Share Hispanic	41.48	37.74	38.64	38.85	41.69	42.49	42.94	43.53	46.21
	(28.56)	(28.92)	(28.84)	(28.74)	(29.57)	(30.24)	(29.00)	(27.49)	(28.79)
Share Econ. Disadvantaged	40.05	25.68	27.89	28.21	30.23	49.32	45.24	55.20	60.06
	(19.36)	(9.93)	(10.84)	(11.27)	(10.74)	(17.09)	(17.01)	(16.83)	(20.00)
Share Mobility	25.20	25.95	28.42	27.26	23.53	24.22	24.22	23.54	24.20
	(10.72)	(9.24)	(10.98)	(13.82)	(9.27)	(11.75)	(11.01)	(9.93)	(9.22)
Share Bilingual	7.83	7.89	7.96	7.60	8.47	7.83	6.91	7.71	8.30
	(7.36)	(7.38)	(7.28)	(7.72)	(7.86)	(7.78)	(7.10)	(6.62)	(7.97)
Share Special Ed.	10.18	9.70	9.48	9.05	9.64	9.78	10.69	11.62	11.51
	(5.04)	(4.99)	(5.14)	(4.94)	(4.49)	(4.72)	(4.98)	(5.59)	(5.42)
Share Gifted and Talented	10.76	10.09	8.75	9.49	9.81	10.57	12.20	10.59	14.54
	(19.64)	(21.04)	(20.37)	(22.01)	(15.48)	(23.81)	(21.66)	(10.76)	(20.81)
Share Taking Advanced Classes	13.69	9.58	9.04	11.80	12.60	16.94	18.07	15.14	16.67
	(10.85)	(8.18)	(7.39)	(10.64)	(10.67)	(13.49)	(12.23)	(10.38)	(10.35)

Table 4.2 continued

Attendance Rate	90.68	91.12	90.32	89.56	91.21	90.81	90.66	90.59	91.21
	(3.94)	(3.89)	(4.03)	(5.38)	(3.44)	(4.24)	(3.82)	(3.53)	(2.95)
Dropout Rate	4.14	9.34	8.29	4.64	3.03	2.02	1.71	1.91	1.84
	(4.41)	(6.05)	(4.58)	(3.35)	(2.63)	(1.87)	(1.54)	(2.59)	(1.66)
Share Passing TAAS Exit Exams	37.21	36.97	41.26	28.78	29.22	30.56	34.17	45.65	50.92
	(19.79)	(18.90)	(16.40)	(18.86)	(19.23)	(20.55)	(19.17)	(18.84)	(16.60)
Share Taking College Boards	58.68	61.38	56.90	59.09	61.90	59.55	55.03	57.51	58.23
	(18.97)	(19.22)	(18.41)	(18.90)	(17.27)	(20.48)	(19.86)	(20.21)	(19.07)
Share Above Critical (1000 SAT; 24 ACT)	13.58	11.83	10.89	12.97	14.40	15.86	16.24	14.21	12.51
	(15.95)	(14.14)	(13.88)	(14.88)	(15.89)	(19.74)	(17.03)	(17.20)	(15.97)
Average ACT Score	17.99	17.96	17.93	18.12	18.21	17.77	18.28	17.95	17.65
	(2.18)	(1.89)	(2.04)	(2.53)	(2.03)	(2.37)	(2.13)	(2.35)	(2.25)

Standard Deviations appear in parenthesis

Table 4.3 Difference of Means for All Years

	Non-Houston			Houston			Overall
	1993-94	1995-00	Difference	1993-94	1995-00	Difference	
Number of Observations	1971	6081	--	50	147	--	--
Attendance Rate	94.08	94.50	0.41	90.72	90.66	-0.06	-0.48
	(2.15)	(2.08)	(0.06)	(3.94)	(3.96)	(0.65)	(3.96)
Dropout Rate	2.83	1.42	-1.41	8.81	2.55	-6.27	**-4.86**
	(2.44)	(1.31)	(0.06)	(5.33)	(2.56)	(0.78)	(2.56)
TAAS	50.12	46.23	-3.89	39.11	36.57	-2.55	1.34
	(14.46)	(15.39)	(0.38)	(17.64)	(20.48)	(3.01)	(20.49)
Take College Boards	65.54	64.53	-1.01	59.14	58.53	-0.62	0.39
	(15.43)	(15.63)	(0.40)	(18.77)	(19.10)	(3.09)	(19.10)
Average ACT	19.77	19.83	0.06	17.94	18.00	0.06	0.00
	(1.71)	(1.76)	(0.04)	(1.95)	(2.26)	(0.33)	(2.26)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%
Standard Errors appear in parenthesis

Table 4.4 Difference of Means 1993 and 1997

	Non-Houston			Houston			Overall
	1993	1997	Difference	1993	1997	Difference	
Number of Observations	975	1011	--	25	23	--	--
Attendance Rate	93.97	94.39	0.42	91.12	90.81	-0.31	-0.73
	(2.18)	(2.04)	(0.09)	(3.89)	(4.24)	(1.18)	(4.25)
Dropout Rate	3.30	1.48	-1.83	9.34	2.02	-7.32	**-5.50**
	(2.74)	(1.29)	(0.10)	(6.05)	(1.87)	(1.27)	(1.87)
TAAS	46.76	42.73	-4.04	36.97	30.56	-6.42	-2.38
	(14.15)	(14.04)	(0.63)	(18.90)	(20.55)	(5.71)	(20.56)
Take College Boards	64.86	65.78	0.91	61.38	59.55	-1.83	-2.75
	(15.41)	(15.56)	(0.69)	(19.22)	(20.48)	(5.75)	(20.49)
Average ACT	19.79	19.81	0.02	17.96	17.77	-0.19	-0.21
	(1.69)	(1.79)	(0.08)	(1.89)	(2.37)	(0.62)	(2.37)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%
Standard Errors appear in parenthesis

Table 4.5 Robust OLS for All Years

Observations	8249	8249	8249	8249	8249
F-Stat	341.92	131.08	351.34	115.57	696.16
R-Squared	0.53	0.36	0.39	0.21	0.52
Dependent Variable	Attendance Rate	Dropout Rate	TAAS	Take Test	Ave ACT
Log of Ave Salary (1996 dollars)	**1.200**	**-1.612**	**53.149**	3.406	**0.892**
	(0.296)	(0.305)	(2.402)	(2.692)	(0.237)
Experience	**-0.066**	**0.090**	**-0.422**	**0.313**	**0.035**
	(0.010)	(0.010)	(0.081)	(0.092)	(0.008)
Share of Staff, Minority	**-0.020**	0.001	**-0.109**	-0.022	**-0.029**
	(0.002)	(0.002)	(0.013)	(0.016)	(0.001)
Student-Teacher Ratio	-0.017	**0.007**	**-0.124**	**-0.183**	0.001
	(0.013)	(0.003)	(0.035)	(0.072)	(0.001)
Enrollment (100s)	**-0.038**	**0.008**	0.027	**0.079**	**0.038**
	(0.005)	(0.003)	(0.021)	(0.030)	(0.002)
Share of Student Body, White	**0.022**	**-0.013**	**0.177**	**0.048**	**0.012**
	(0.002)	(0.001)	(0.012)	(0.014)	(0.001)
Share Econ. Disadvantaged	**0.029**	**-0.008**	**-0.035**	-0.017	**-0.015**
	(0.002)	(0.002)	(0.013)	(0.017)	(0.001)
Share Mobility	**-0.129**	**0.072**	**-0.353**	**-0.590**	**-0.027**
	(0.009)	(0.006)	(0.027)	(0.033)	(0.003)
Share Bilingual	**-0.012**	0.008	-0.003	**-0.092**	0.001
	(0.005)	(0.005)	(0.025)	(0.035)	(0.003)
Share Special Ed.	**-0.035**	**-0.013**	-0.043	-0.073	**-0.030**
	(0.007)	(0.005)	(0.041)	(0.047)	(0.004)
Share Gifted and Talented	0.004	**-0.024**	**0.113**	**0.178**	-0.001
	(0.002)	(0.002)	(0.017)	(0.019)	(0.002)
Share Taking Advanced Classes	**0.022**	**-0.009**	**0.230**	**0.268**	**0.024**
	(0.002)	(0.002)	(0.018)	(0.021)	(0.002)
Houston Dummy	0.171	**4.584**	-2.549	1.537	**-0.543**
	(0.379)	(0.652)	(1.608)	(1.884)	(0.185)
After 1994	**0.277**	**-1.188**	**-8.742**	**-3.003**	-0.008
	(0.049)	(0.058)	(0.363)	(0.433)	(0.037)
Houston*After	**-1.284**	**-4.580**	1.642	-0.976	0.167
	(0.442)	(0.673)	(1.922)	(2.093)	(0.214)
Constant	**83.611**	**18.361**	**-496.956**	33.760	**10.581**
	(3.027)	(3.113)	(24.324)	(27.333)	(2.397)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%
Standard Errors appear in parenthesis

Table 4.6 Robust OLS for 1993 and 1997

Observations	2034	2034	2034	2034	2034
F-Stat	98.75	52.98	130.72	35.76	169.18
R-Squared	0.5619	0.4184	0.4357	0.2082	0.5091
Mean Square Error	1.486	1.9209	10.918	13.94	1.2641
Dependent Variable	Attendance Rate	Dropout Rate	TAAS	Take Test	Ave ACT
Log of Ave Salary (1996 dollars)	0.484	1.065	**13.306**	**23.168**	0.061
	(0.632)	(0.906)	(4.776)	(6.410)	(0.553)
Experience	**-0.069**	**0.090**	0.256	0.038	**0.064**
	(0.020)	(0.025)	(0.156)	(0.199)	(0.017)
Share of Staff, Minority	**-0.024**	0.005	**-0.131**	-0.011	**-0.031**
	(0.005)	(0.005)	(0.023)	(0.032)	(0.003)
Student-Teacher Ratio	**-0.192**	0.025	**-0.400**	**-1.490**	-0.016
	(0.023)	(0.029)	(0.150)	(0.189)	(0.017)
Enrollment (100s)	0.004	0.006	**0.171**	**0.313**	**0.047**
	(0.008)	(0.009)	(0.044)	(0.065)	(0.005)
Share of Student Body, White	**0.018**	**-0.008**	**0.148**	*0.046*	**0.010**
	(0.003)	(0.004)	(0.022)	(0.027)	(0.002)
Share Econ. Disadvantaged	**0.020**	-0.002	**-0.088**	-0.029	**-0.017**
	(0.003)	(0.005)	(0.024)	(0.033)	(0.003)
Share Mobility	**-0.130**	**0.112**	**-0.411**	**-0.613**	**-0.028**
	(0.013)	(0.013)	(0.051)	(0.060)	(0.007)
Share Bilingual	-0.012	0.017	0.058	-0.059	0.004
	(0.012)	(0.013)	(0.043)	(0.072)	(0.006)
Share Special Ed.	**-0.041**	-0.008	**-0.281**	-0.063	**-0.040**
	(0.011)	(0.012)	(0.074)	(0.086)	(0.008)
Share Gifted and Talented	0.006	**-0.024**	0.073	**0.176**	-0.004
	(0.004)	(0.007)	(0.034)	(0.043)	(0.004)
Share Taking Advanced Classes	**0.013**	**-0.011**	**0.158**	**0.213**	**0.017**
	(0.004)	(0.005)	(0.037)	(0.042)	(0.004)
Houston Dummy	*0.974*	**4.061**	1.753	4.299	**-0.570**
	(0.538)	(1.023)	(2.464)	(3.049)	(0.274)
After 1994	**0.296**	**-1.756**	**-5.320**	**-3.198**	0.031
	(0.093)	(0.115)	(0.644)	(0.812)	(0.071)
Houston*After	*-1.410*	**-5.262**	-1.005	-1.912	0.031
	(0.829)	(1.066)	(3.434)	(3.983)	(0.410)
Constant	**93.717**	-10.454	*-85.794*	**-150.674**	**19.372**
	(6.406)	(9.259)	(48.446)	(64.966)	(5.607)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%
Standard Errors appear in parenthesis

Chart 4.1 Average Attendance Rates of Houston and Non-Houston Schools

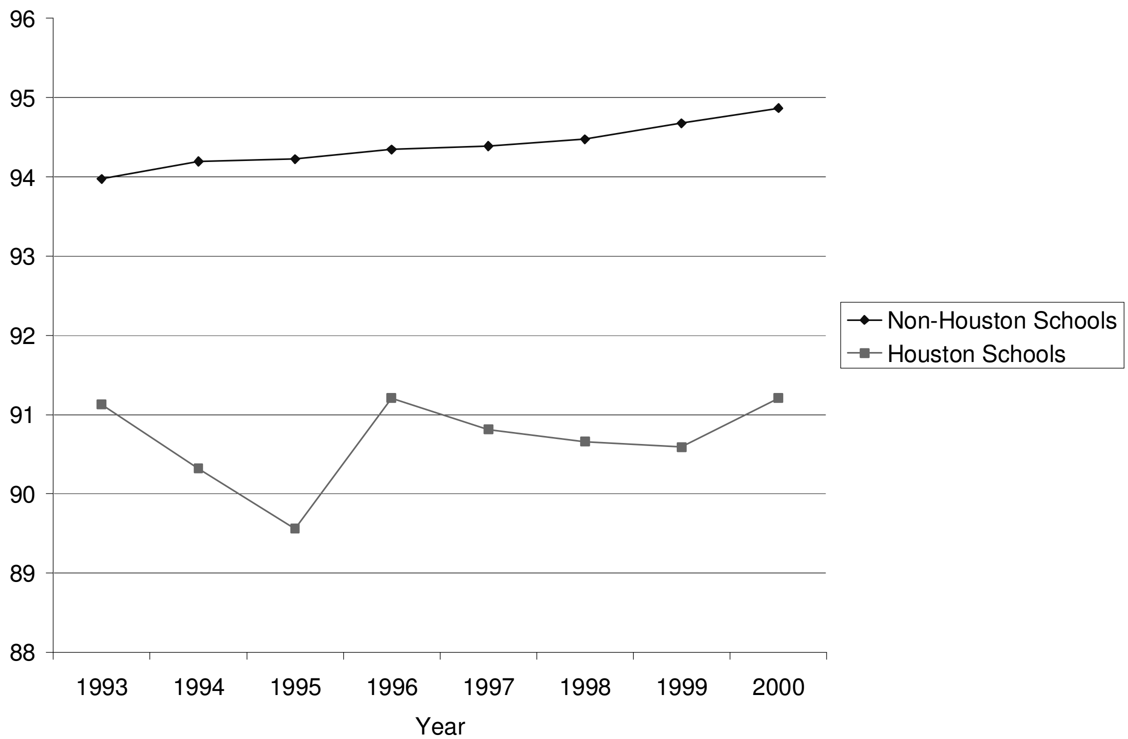


Chart 4.2 Average Dropout Rates for Houston and Non-Houston Schools

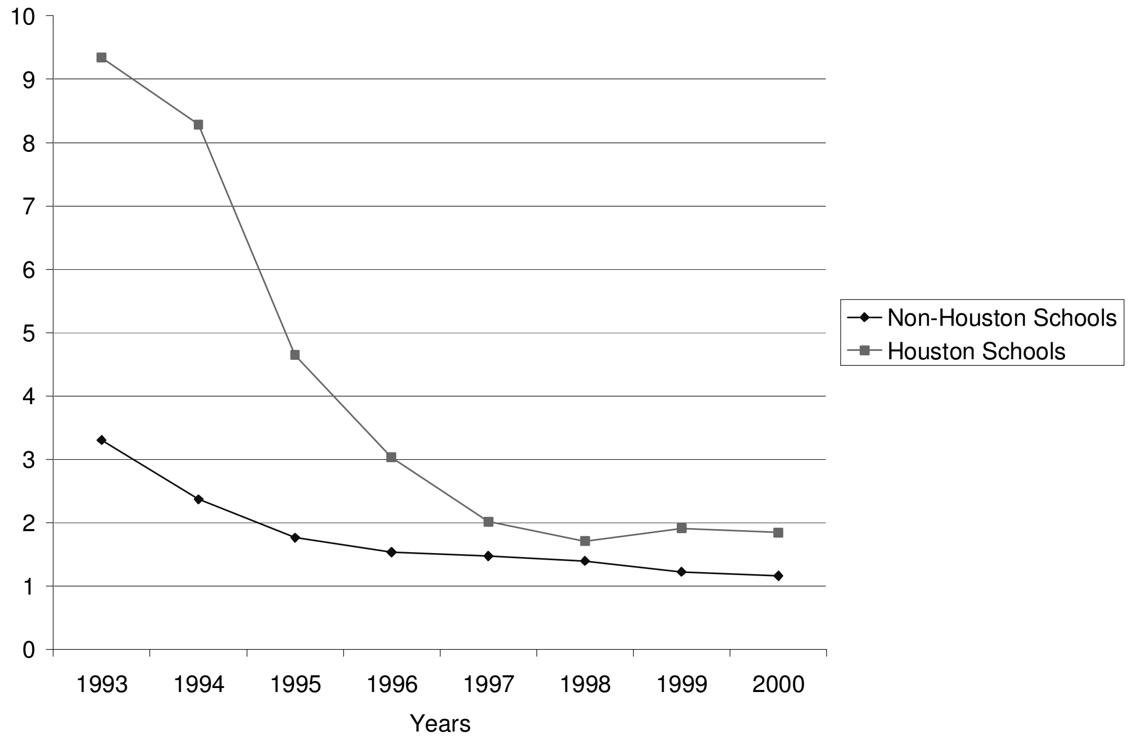


Chart 4.3 Share of Houston and Non-Houston Schools Passing TAAS Test

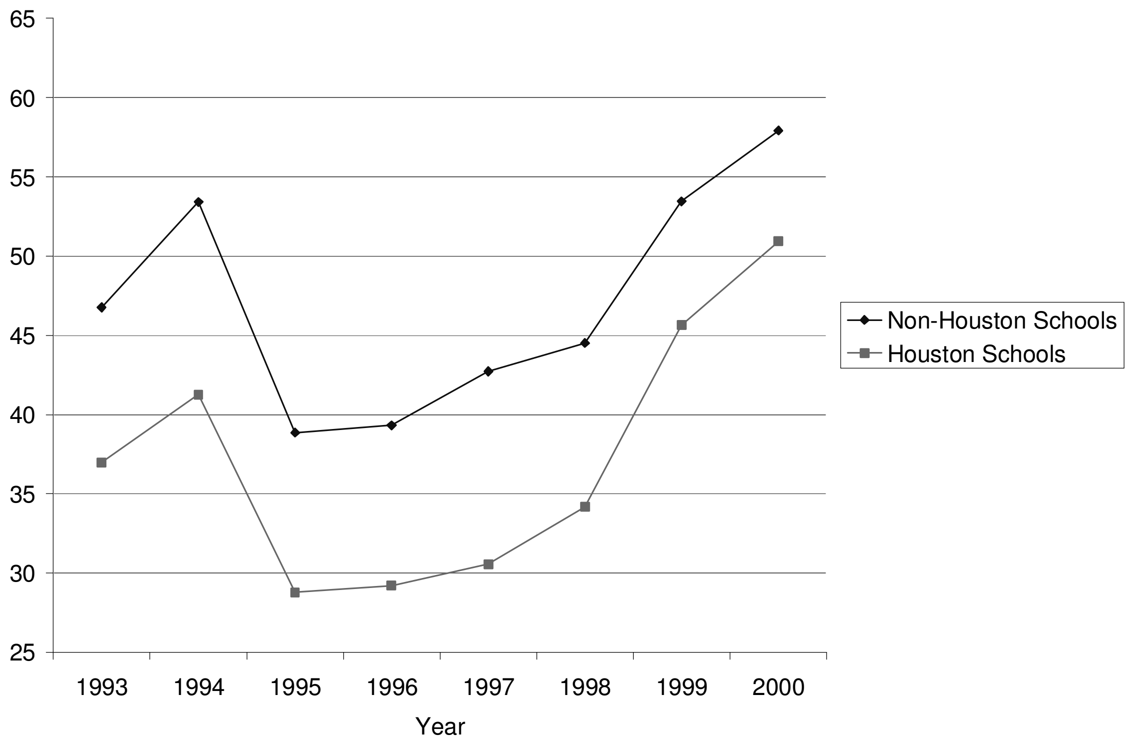
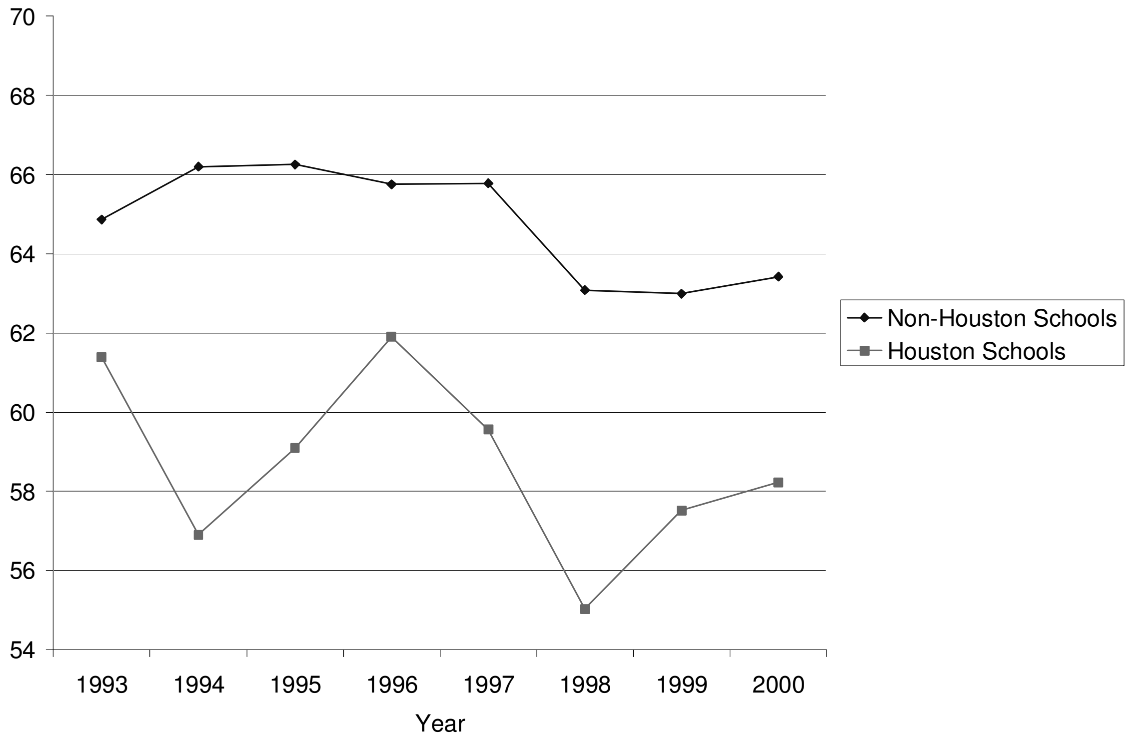


Chart 4.4 Share of Students Taking College Boards at Houston and Non-Houston Schools



Chapter 5: Conclusion

All education springs from some image of the future. If the image of the future held by society is grossly inaccurate, its education system will betray its youth.

~ Alvin Toffler.

The previous three chapters have sought to examine different attempts at reform of the Texas school system, as well as evaluate how successful these programs are at meeting their stated goals. In doing so, it is hoped that a better understanding of both the benefits as well as potential hazards of such programs can be identified. This is particularly important because many of the reforms adopted by the state of Texas now shape the national education agenda.

Chapter One developed a theoretical model that incorporates teachers' time constraints and instructional methods, varying student responses to these methods depending on their ability, peer effects, and high-ability students in a classroom being replaced by low-ability students, into a measure of student performance. Given the assumptions about the marginal returns of lecturing, it is clear that once high-ability students exit the class, the amount of time a teacher devotes to lecturing should fall. However, how teachers adjust individual time between high- and low-ability students is ambiguous, as it depends on how large is the increase in the share of low-ability students.

Teachers' responses to varying levels of student ability could change dramatically, however, if the incentives or utility function for teachers changed. For instance, it would be interesting to see how the allocation time varied if teachers had to maximize the number of students reaching some threshold versus the average performance of the class. Alternatively, if teachers preferred to work with one type of student to another, they might respond very differently to a change in the class makeup. Finally, it would also be interesting to consider a continuum of student ability and test how large variances would affect teacher responses to shifts in average student ability. While these alternative assumptions were beyond the scope of this paper, they would provide additional insights into effective sorting methods of students and are potential areas of further study.

Using the Austin Independent School District to test the theory, a cohort of students was followed from the third through the eighth grade. After identifying those students who attended Kealing Magnet School in the seventh and eighth grade, controls measure how their presence affected non-magnet students. If individual effects are not controlled for, the presence of magnet students has a significant and negative effect on both math and reading scores. Once individual effects are controlled for, however, the presence of magnet students appears to have a positive effect on reading scores, which is largely unexplainable.

One of the particular objectives of this chapter was to consider how the presence of magnet students affects those students who attend a magnet school (Kealing) but are not in the magnet program, since there has been a good deal of debate over whether these students garner any benefit from their proximity to magnet students. Contrary to presupposition, the economic model found no negative effect to attending the Kealing non-magnet program, and when individual effects were controlled for, it appears that in some instances attendance may even enhance reading scores.

This last conclusion is so surprising that it seems to warrant further investigation. Indeed, because the dataset itself did not identify magnet students, attendance at a known feeder school to the non-magnet program and subsequent attendance at Kealing was deemed sufficient to identify magnet students, a condition which clearly over-identifies non-magnet students and may in turn under-identify the effect on non-magnet students. Future research should consider looking at other programs that better delineate between magnet and non-magnet students.

Chapter Two examines linkages between performance and pay as well as tenure for high school principals and coaches in the state of Texas. Examining schools fielding 11-man football teams, coaches are evaluated based on their personal characteristics and how well their teams performed using a variety of metrics. Principals at these same schools were evaluated based on their own qualifications as well as how the schools fared by a set of state objectives.

Lagged performance variables were significant in OLS regression models on pay for both principals and coaches, strongly suggesting that merit pay of some form exists in Texas. The measures tended to be stronger and more consistent in the coaches' estimates than for those of principals, but this disparity is attributed to the fact that principals have a much broader job description than coaches and so the measures used were less strongly correlated. Performance measures were uniformly insignificant in the fixed-effects models, but this would be the case if strong individual effects existed, as is suggested by the data. Finally, performance appears to affect only whether coaches will leave a school or the entire sample, while performance has no effect on principals.

This last conclusion is a bit sweeping, however. No information is available as to why coaches or principals left a school or the sample – that is, whether the exit was voluntary or not. While some steps were taken to address this, it is still unclear if coaches or principals leaving the sample accepted better positions or not, and if this omission results in an over- or understatement of the effect performance measures have on income. While the censoring of this data can never be completely addressed, it may be possible to match coaches and principals to the "Texas Workforce" dataset now under construction at the Green Center at the University of Texas at Dallas, which would make possible a more complete evaluation of the effects of performance on pay for these two types of workers.

Chapter Three continues the discussion of pay and performance by examining an incentive scheme employed by the Houston Independent School District for its principals and other administrators. A simple model mirrors the Houston scheme: principals are rewarded based on the output of only one of the two inputs of education. This inequity leads to a misallocation of resources as principals invest more and more in the input for which their marginal utility is greater, despite the fact that this same input's marginal returns to education continue to fall. As a result, while principals are acting rationally, education output falls while costs increase.

This theory is then tested by comparing a series of metrics for Houston high schools to other Texas high schools both before and after the incentive scheme was adopted. Houston schools significantly improved their dropout statistics, but attendance rates, another dimension upon which administrators were to be evaluated, significantly fell. None of the other measures displayed a significant change, leading to the conclusion that while the incentive scheme was not as effective as the administration hoped, it was also not as deleterious to overall educational output, as the analysis of the theoretical model would suggest.

The dataset used to test the Houston policy was limited to high schools, as it was believed that ACT scores and the share of students taking college boards would serve as proxies for overall education output. However, this restriction grossly limited the number of schools in the Houston School District to fewer than thirty each year. The diminutiveness of this test group may have masked the true effect of the policy.

In response to this possible shortcoming, it would be interesting to look at all publicly managed schools in Texas – both primary and secondary – and determine whether the Houston incentive program had a different effect on outcomes in a larger population. It should be noted, however, that because most of the data collected by the state is used to evaluate principals on their performance, some independent proxy must be identified and used in order to determine the effect on overall performance by the scheme, rather than just those measures which bonuses were based upon, and if so, in a positive or negative way. But this task is left to future research.

This thesis closely examines two pillars of education reform: school choice and merit pay. Because national education policy is being shaped by Texas's experience, a close inspection of the reforms adopted by this state is both warranted and desirable. While the actual analysis of these programs produced mixed and at times ambiguous results, it is hoped that with further study the true costs and benefits of Texas's reforms will be revealed and that students across the nation will ultimately benefit.

Appendices

APPENDIX A

From the objective function, the following first-order conditions were derived:

A.1 $$\frac{\partial \Phi_N}{\partial t_l} = Nn_l\left(\frac{\partial \phi_l}{\partial t_l} - n_l N\frac{\partial \phi_l}{t_p} - (1-n_l)N\frac{\partial \phi_h}{\partial t_p}\right) = 0$$

A.2 $$\frac{\partial \Phi_N}{\partial t_h} = N(1-n_l)\left(\frac{\partial \phi_h}{\partial t_h} - Nn_l\frac{\partial \phi_l}{\partial t_p} - (1-n_l)N\frac{\partial \phi_h}{\partial t_p}\right) = 0$$

As well as the following second order condition:

A.3 $$\Phi_{ll} = Nn_l\left(\frac{\partial^2 \phi_l}{\partial t_l^2} + n_l^2 N^2\frac{\partial^2 \phi_l}{\partial t_p^2} + (1-n_l)n_l N^2\frac{\partial^2 \phi_h}{\partial t_p^2}\right)$$

A.4 $$\Phi_{hh} = N(1-n_l)\left(\frac{\partial^2 \phi_h}{\partial t_h^2} + (1-n_l)n_l N^2\frac{\partial^2 \phi_l}{\partial t_p^2} + (1-n_l)^2 N^2\frac{\partial^2 \phi_h}{\partial t_p^2}\right)$$

A.5 $$\Phi_{lh} = N^3(1-n_l)n_l\left(n_l\frac{\partial^2 \phi_l}{\partial t_p^2} + (1-n_l)\frac{\partial \phi_h}{\partial t_p^2}\right)$$

A.6 $$\Phi_{hl} = N^3(1-n_l)n_l\left(n_l\frac{\partial^2 \phi_l}{\partial t_p^2} + (1-n_l)\frac{\partial \phi_h}{\partial t_p^2}\right)$$

Which form the following matrix:

A.7 $$\begin{bmatrix} \Phi_{ll} & \Phi_{lh} \\ \Phi_{hl} & \Phi_{hh} \end{bmatrix}$$

To show that the matrix of second-order conditions is negative semi-definite, the determinants of the principal minors of the matrix must alternate in sign. It is clear that

Φ_{ll} must be negative from A3), since the second derivatives are all assumed to be negative, N is positive and n_l is positive and less than one. Proving the determinant of the Hessian is positive requires solving:

A.8 $$\Phi_{ll}\Phi_{hh} - \Phi_{hk}\Phi_{lh}$$

Substituting in the actual equations and simplifying the determinant garners:

A.9 $$|H| = N^2(1-n_l)n_l \frac{\partial^2\phi_l}{\partial t_l^2}\frac{\partial^2\phi_h}{\partial t_h^2} + N^4(1-n_l)^2 n_l^2\left(\frac{\partial^2\phi_l}{\partial t_p^2}\frac{\partial^2\phi_l}{\partial t_l^2} + \frac{\partial^2\phi_h}{\partial t_p^2}\frac{\partial^2\phi_h}{\partial t_h^2}\right) + N^4(1-n_l)n_l\left((1-n_l)^2\frac{\partial^2\phi_h}{\partial t_p^2}\frac{\partial^2\phi_l}{\partial t_l^2} + n_l^2\frac{\partial^2\phi_l}{\partial t_p^2}\frac{\partial^2\phi_h}{\partial t_h^2}\right)$$

This can be assigned the following signs:

A.10 $$|H| = pos * neg * neg + pos * (neg * neg + neg * neg) + pos * (pos * neg * neg + pos * neg * neg) = pos + pos + pos > 0$$

Having shown that the Hessian is negative semi-definite, it is now possible to evaluate the comparative statics, specifically, $\partial t_l/\partial n_l$ and $\partial t_h/\partial n_l$. Note first that at the optimum, equations A.1 and A.2 are equal to zero and so the expression can be simplified:

A.11 $$\frac{\partial\Phi_N}{\partial t_l} = \frac{\partial\phi_l}{\partial t_l} - n_l N\frac{\partial\phi_l}{t_p} - (1-n_l)N\frac{\partial\phi_h}{\partial t_p} = 0$$

A.12 $$\frac{\partial\Phi_N}{\partial t_h} = \frac{\partial\phi_h}{\partial t_h} - n_l N\frac{\partial\phi_l}{\partial t_p} - (1-n_l)N\frac{\partial\phi_h}{\partial t_p} = 0$$

Which in turn produce reduced second-order conditions:

A.13 $\Phi^*_{ll} = \frac{\partial^2\phi_l}{\partial t_l^2} + n_l^2 N^2 \frac{\partial^2\phi_l}{\partial t_p^2} + (1-n_l)n_l N^2 \frac{\partial^2\phi_h}{\partial t_p^2}$

A.14 $\Phi^*_{hh} = \frac{\partial^2\phi_h}{\partial t_h^2} + (1-n_l)n_l N^2 \frac{\partial^2\phi_l}{\partial t_p^2} + (1-n_l)^2 N^2 \frac{\partial^2\phi_h}{\partial t_p^2}$

A.15 $\Phi^*_{lh} = N^2(1-n_l)\left(n_l \frac{\partial^2\phi_l}{\partial t_p^2} + (1-n_l)\frac{\partial\phi_h}{\partial t_p^2}\right)$

A.16 $\Phi^*_{hl} = N^2 n_l\left(n_l \frac{\partial^2\phi_l}{\partial t_p^2} + (1-n_l)\frac{\partial\phi_h}{\partial t_p^2}\right)$

To find $\partial t_l/\partial n_l$, begin by taking the derivative of A10) and A11) with respect to n_l. This yields:

A.17

$$\frac{\partial^2\phi_l}{\partial t_l \partial n_l} = \left(\frac{\partial^2\phi_l}{\partial t_l^2} - n_l N \frac{\partial^2\phi_l}{\partial t_p^2}\frac{\partial t_p}{\partial t_l} - (1-n_l)N\frac{\partial^2\phi_h}{\partial t_p^2}\frac{\partial t_p}{\partial t_l}\right)\frac{\partial t_l}{\partial n_l}$$

$$+\left(-n_l N \frac{\partial^2\phi_l}{\partial t_p^2}\frac{\partial t_p}{\partial t_h} - (1-n_l)N\frac{\partial^2\phi_h}{\partial t_p^2}\frac{\partial t_p}{\partial t_h}\right)\frac{\partial t_h}{\partial n_l} + \left(\frac{\partial^2\phi_l}{\partial t_l^2}\frac{\partial t_l}{\partial t_p} - n_l N\frac{\partial^2\phi_l}{\partial t_p^2} - (1-n_l)N\frac{\partial^2\phi_h}{\partial t_p^2}\right)\frac{\partial t_p}{\partial n_l}$$

$$+\left(-n_l N \frac{\partial^2\phi_l}{\partial t_p^2}\frac{\partial t_p}{\partial \overline{\Theta}} - (1-n_l)N\frac{\partial^2\phi_h}{\partial t_p^2}\frac{\partial t_p}{\partial \overline{\Theta}}\right)\frac{\partial \overline{\Theta}}{\partial n_l} + N\left(\frac{\partial\phi_h}{\partial t_p} - \frac{\partial\phi_l}{\partial t_p}\right) = 0$$

Which can be rewritten as:

A.18 $\Phi^*_{\ln} = \Phi^*_{ll}\frac{\partial t_l}{\partial n_l} + \Phi^*_{lh}\frac{\partial t_h}{\partial n_l} + \Phi^*_{lp}\frac{\partial t_p}{\partial n_l} + \Phi^*_{l\overline{\Theta}}\frac{\partial \overline{\Theta}}{\partial n_l} + N\left(\frac{\partial\phi_h}{\partial t_p} - \frac{\partial\phi_h}{\partial t_p}\right) = 0$

A.19

$$\frac{\partial^2\Phi_N}{\partial t_h \partial n_l}=\left(-n_l N\frac{\partial^2\phi_l}{\partial t_p^2}\frac{\partial t_p}{\partial t_l}-(1-n_l)N\frac{\partial^2\phi_h}{\partial t_p^2}\frac{\partial t_p}{\partial t_l}\right)\frac{\partial t_l}{\partial n_l}$$
$$+\left(\frac{\partial^2\phi_h}{\partial t_h^2}-n_l N\frac{\partial^2\phi_l}{\partial t_p^2}\frac{\partial t_p}{\partial t_h}-(1-n_l)N\frac{\partial^2\phi_h}{\partial t_p^2}\frac{\partial t_p}{\partial t_h}\right)\frac{\partial t_h}{\partial n_l}+\left(\frac{\partial^2\phi_h}{\partial t_h^2}\frac{\partial t_h}{\partial t_p}-n_l N\frac{\partial^2\phi_l}{\partial t_p^2}-(1-n_l)N\frac{\partial^2\phi_h}{\partial t_p^2}\right)\frac{\partial t_p}{\partial n_l}$$
$$+\left(-n_l N\frac{\partial^2\phi_l}{\partial t_p^2}\frac{\partial t_p}{\partial\overline{\Theta}}-(1-n_l)N\frac{\partial^2\phi_h}{\partial t_p^2}\frac{\partial t_p}{\partial\overline{\Theta}}\right)\frac{\partial\overline{\Theta}}{\partial n_l}+N\left(\frac{\partial\phi_h}{\partial t_p}-\frac{\partial\phi_l}{\partial t_p}\right)=0$$

Which can be rewritten as:

A.20 $$\Phi^*_{hn}=\Phi^*_{hl}\frac{\partial t_l}{\partial n_l}+\Phi^*_{hh}\frac{\partial t_h}{\partial n_l}+\Phi^*_{hp}\frac{\partial t_p}{\partial n_l}+\Phi^*_{h\overline{\Theta}}\frac{\partial\overline{\Theta}}{\partial n_l}+N\left(\frac{\partial\phi_h}{\partial t_p}-\frac{\partial\phi_h}{\partial t_p}\right)=0$$

Equations A.18 and A.20 can be rewritten as:

A.21 $$\begin{bmatrix}\frac{\partial t_l}{\partial n_l}\\ \frac{\partial t_h}{\partial n_l}\end{bmatrix}=\begin{bmatrix}\Phi^*_{ll} & \Phi^*_{lh}\\ \Phi^*_{hl} & \Phi^*_{hh}\end{bmatrix}^{-1}\begin{bmatrix}-\Phi^*_{lp}\frac{\partial t_p}{\partial n_l}-\Phi^*_{l\overline{\Theta}}\frac{\partial t_{\overline{\Theta}}}{\partial n_l}-N\left(\frac{\partial\phi_h}{\partial t_p}-\frac{\partial\phi_l}{\partial t_p}\right)\\ -\Phi^*_{hp}\frac{\partial t_p}{\partial n_l}-\Phi^*_{h\overline{\Theta}}\frac{\partial t_{\overline{\Theta}}}{\partial n_l}-N\left(\frac{\partial\phi_h}{\partial t_p}-\frac{\partial\phi_l}{\partial t_p}\right)\end{bmatrix}$$

Using Cramer's Rule, the following partials emerge:

A.22 $$\frac{\partial t_l}{\partial n_l}=\frac{\begin{vmatrix}\left[-\Phi^*_{lp}\frac{\partial t_p}{\partial n_l}-\Phi^*_{l\overline{\Theta}}\frac{\partial t_{\overline{\Theta}}}{\partial n_l}-N\left(\frac{\partial\phi_h}{\partial t_p}-\frac{\partial\phi_l}{\partial t_p}\right)\right] & \left[\Phi^*_{lh}\right]\\ \left[-\Phi^*_{hp}\frac{\partial t_p}{\partial n_l}-\Phi^*_{h\overline{\Theta}}\frac{\partial t_{\overline{\Theta}}}{\partial n_l}-N\left(\frac{\partial\phi_h}{\partial t_p}-\frac{\partial\phi_l}{\partial t_p}\right)\right] & \left[\Phi^*_{hh}\right]\end{vmatrix}}{\begin{vmatrix}\Phi^*_{ll} & \Phi^*_{lh}\\ \Phi^*_{hl} & \Phi^*_{hh}\end{vmatrix}}$$

A.23 $$\frac{\partial t_h}{\partial n_l} = \frac{\begin{vmatrix} [\Phi^*_{ll}] & \left[-\Phi^*_{lp} \dfrac{\partial t_p}{\partial n_l} - \Phi^*_{l\overline{\Theta}} \dfrac{\partial t_{\overline{\Theta}}}{\partial n_l} - N\left(\dfrac{\partial \phi_h}{\partial t_p} - \dfrac{\partial \phi_l}{\partial t_p} \right) \right] \\ [\Phi^*_{hl}] & \left[-\Phi^*_{hp} \dfrac{\partial t_p}{\partial n_l} - \Phi^*_{h\overline{\Theta}} \dfrac{\partial t_{\overline{\Theta}}}{\partial n_l} - N\left(\dfrac{\partial \phi_h}{\partial t_p} - \dfrac{\partial \phi_l}{\partial t_p} \right) \right] \end{vmatrix}}{\begin{vmatrix} \Phi^*_{ll} & \Phi^*_{lh} \\ \Phi^*_{hl} & \Phi^*_{hh} \end{vmatrix}}$$

The determinant of the Hessian has already been shown to be positive and the simplification does not alter this. Therefore, the sign of the numerator will determine the effect on the amount of individual time spent with each type of student, once the share of students that are lower-ability increases.

Noting the following relationships,

A.24 $$\frac{\partial t_p}{\partial n_l} = N(t_h - t_l) < 0$$

A.25 $$\frac{\partial \overline{\Theta}}{\partial n_l} = \Theta_l - \Theta_h < 0$$

A.26 $$\Phi^*_{lp} = -\frac{1}{n_l N}\frac{\partial^2 \phi_l}{\partial t_l^2} - n_l N \frac{\partial^2 \phi_l}{\partial t_p^2} - (1 - n_l) N \frac{\partial^2 \phi_h}{\partial t_p^2}$$

A.27 $$\Phi^*_{l\overline{\Theta}} = -n_l N \frac{\partial^2 \phi_l}{\partial t_p \partial \overline{\Theta}} - (1 - n_l) N \frac{\partial^2 \phi_h}{\partial t_p \partial \overline{\Theta}}$$

A.28 $$\Phi^*_{hp} = -\frac{1}{(1 - n_l)N}\frac{\partial^2 \phi_h}{\partial t_h^2} - n_l N \frac{\partial^2 \phi_l}{\partial t_p^2} - (1 - n_l) N \frac{\partial^2 \phi_h}{\partial t_p^2}$$

A.29 $$\Phi^*_{h\overline{\Theta}} = -n_l N \frac{\partial^2 \phi_l}{\partial t_p \partial \overline{\Theta}} - (1 - n_l) N \frac{\partial^2 \phi_h}{\partial t_p \partial \overline{\Theta}}$$

These can be substituted into the numerator of A.22. With simplification this yields:

A.30
$$\frac{\partial^2\phi_l}{\partial t_l^2}(t_h - t_l)\frac{1}{n_l}\left[\frac{\partial^2\phi_h}{\partial t_h^2} + (1-n_l)N^2\left(n_l\frac{\partial^2\phi_l}{\partial t_p^2} + (1-n_l)\frac{\partial^2\phi_h}{\partial t_p^2}\right)\right]$$
$$-\frac{\partial^2\phi_h}{\partial t_h^2}\left[(\Theta_h - \Theta_l)\left(n_l N\frac{\partial^2\phi_l}{\partial t_p\partial\overline{\overline{\Theta}}} + (1-n_l)N\frac{\partial^2\phi_h}{\partial t_p\partial\overline{\overline{\Theta}}}\right) + N\left(\frac{\partial\phi_h}{\partial t_p} - \frac{\partial\phi_l}{\partial t_p}\right)\right]$$

Which as a negative minus a negative, is indeterminate. Similarly, substituting the above into the numerator of A.23 yields:

A.31
$$\frac{\partial^2\phi_h}{\partial t_h^2}(t_h - t_l)\frac{1}{1-n_l}\left[\frac{\partial^2\phi_l}{\partial t_l^2} + n_l N^2\left(n_l\frac{\partial^2\phi_l}{\partial t_p^2} + (1-n_l)\frac{\partial^2\phi_h}{\partial t_p^2}\right)\right]$$
$$-\frac{\partial^2\phi_l}{\partial t_l^2}\left[(\Theta_h - \Theta_l)\left(n_l N\frac{\partial^2\phi_l}{\partial t_p\partial\overline{\overline{\Theta}}} + (1-n_l)N\frac{\partial^2\phi_h}{\partial t_p\partial\overline{\overline{\Theta}}}\right) + N\left(\frac{\partial\phi_h}{\partial t_p} - \frac{\partial\phi_l}{\partial t_p}\right)\right]$$

Which is also a negative minus a negative and is therefore indeterminate.

The expression for $\partial t_l/\partial n_l$ and $\partial t_h/\partial n_l$, can now be written as:

A.32
$$\frac{\partial t_l}{\partial n_l} = \frac{\left[\frac{\partial^2\phi_l}{\partial t_l^2}(t_h - t_l)\frac{1}{n_l}\Phi^*_{hh}\right] - \frac{\partial^2\phi_h}{\partial t_h^2}\left[(\Theta_l - \Theta_h)\Phi^*_{h\overline{\Theta}} + N\left(\frac{\partial\phi_h}{\partial t_p} - \frac{\partial\phi_l}{\partial t_p}\right)\right]}{\Phi^*_{ll}\Phi^*_{hh} - \Phi^*_{lh}\Phi^*_{hl}}$$

A.33
$$\frac{\partial t_h}{\partial n_l} = \frac{\left[\frac{\partial^2\phi_h}{\partial t_h^2}(t_h - t_l)\frac{1}{1-n_l}\Phi^*_{ll}\right] - \frac{\partial^2\phi_l}{\partial t_l^2}\left[(\Theta_l - \Theta_h)\Phi^*_{h\overline{\Theta}} + N\left(\frac{\partial\phi_h}{\partial t_p} - \frac{\partial\phi_l}{\partial t_p}\right)\right]}{\Phi^*_{ll}\Phi^*_{hh} - \Phi^*_{lh}\Phi^*_{hl}}$$

The denominators for both A.32 and A.33 are positive. The numerators for both A.32 and A.33 involve a negative first term minus a negative second term. As a result, the marginal effects of both $\partial t_l/\partial n_l$ and $\partial t_h/\partial n_l$, are indeterminant. As stated in the text, this lends itself to two interpretations. The first would be that if the first term dominates, teachers respond to the new mix of students by reducing both lecture time as well as individual time, which would result in a decrease in educational output for both higher and lower-ability students. If the second term dominates, the reduction in lecture time is so large that teachers may respond by increasing, at least marginally, individual time with students which may in turn increase educational output, at least for lower-ability students.

However, if we examine the case where initially the shares of high-ability and low-ability students are the same, that is n_l equals .5, some further observations can be made. Since the denominators are the same for both $\partial t_l/\partial n_l$ and $\partial t_h/\partial n_l$, equation A.31 can be subtracted from A.30 to determine which marginal effect is greater. Doing this and then simplifying produces:

A.34
$$\frac{\left(\frac{\partial^2\phi_l}{\partial t_l^2}-\frac{\partial^2\phi_h}{\partial t_h^2}\right)}{\left[.5N^2(t_h-t_l)\left(\frac{\partial^2\phi_l}{\partial t_p^2}+\frac{\partial^2\phi_h}{\partial t_p^2}\right)+.5N(\Theta_h-\Theta_l)\left(\frac{\partial^2\phi_l}{\partial t_p\partial\overline{\overline{\Theta}}}+\frac{\partial^2\phi_h}{\partial t_p\partial\overline{\overline{\Theta}}}\right)+N\left(\frac{\partial\phi_h}{\partial t_p}-\frac{\partial\phi_l}{\partial t_p}\right)\right]}$$

Signing this expression:

A.35 $$\left(\frac{\partial^2\phi_l}{\partial t_l^2}-\frac{\partial^2\phi_h}{\partial t_h^2}\right)(positive)$$

This is in effect the difference in how quickly diminishing returns of individual time sets in for lower-ability students versus higher-ability students. Since it is assumed that lower-ability students benefit more from individual time than higher-ability students, their diminishing returns should be smaller. Since the second derivative of both is negative, $\partial t_l/\partial n_l$ should be larger than $\partial t_h/\partial n_l$. That is, if both are negative and teachers in response to an increase in the share of students that are low ability decrease the amount of time they spend with each low ability student, they decrease the amount they spend with high ability students more. Alternatively, if both are positive, then teachers will increase the amount of time they spend with each lower-ability student by more than they increase it for higher ability students. Finally, while it is possible that teachers would decrease the amount of time spent with lower-ability students, they will not do this if they are going to increase the amount of time spent with higher-ability students.

APPENDIX B

Table B.1.a 1999 Summary Statistics for Principals, by class

	A	2A	3A	4A	5A
Number	121	201	199	207	214
Percentage					
White	94.21%	90.05%	85.93%	70.05%	70.56%
Male	85.95%	91.04%	87.44%	73.91%	73.36%
Advanced Degree(s)	82.64%	90.05%	92.46%	95.65%	96.73%
Masters	80.99%	89.05%	88.44%	86.47%	85.98%
Doctorate	1.65%	1.00%	4.02%	9.18%	10.75%
Teach	24.79%	11.94%	11.56%	7.73%	4.67%
Mean Values					
Age	45.29	46.86	47.82	49.21	50.13
	(7.59)	(7.47)	(7.00)	(6.48)	(6.62)
Experience	18.70	19.71	22.16	21.92	25.16
	(8.86)	(8.45)	(8.07)	(9.00)	(7.72)
Total Pay (1000s)	52.79	56.47	60.48	71.33	81.12
	(5.12)	(4.61)	(5.97)	(8.24)	(8.45)
Bonus Pay	298.69	156.73	107.31	282.93	264.75
	(2414.89)	(1589.39)	(560.42)	(862.27)	(828.71)
Total Pay/ Average Teacher Base Pay	1.50	1.58	1.68	1.92	2.11
	(0.16)	(0.13)	(0.17)	(0.20)	(0.21)
Total Pay/ Experience Teacher Base Pay	1.36	1.42	1.46	1.66	1.74
	(0.19)	(0.20)	(0.19)	(0.25)	(0.23)
Number of Principals at School	1.09	1.08	1.04	1.09	1.11
	(0.29)	(0.36)	(0.20)	(0.30)	(0.48)
Number of Grades at School	6.43	4.44	4.05	4.06	4.02
	(2.99)	(1.54)	(0.37)	(0.73)	(0.83)
Average Share of Time as:					
Principal	0.80	0.90	0.91	0.95	0.97
	(0.31)	(0.25)	(0.26)	(0.17)	(0.15)
Teacher	0.13	0.07	0.08	0.04	0.03
	(0.28)	(0.23)	(0.25)	(0.17)	(0.15)

Standard Deviations appear in parenthesis

Table B.1.b 2000 Summary Statistics for Principals, by class

	A	2A	3A	4A	5A
Number	126	199	202	208	224
Percentage					
White	92.06%	87.44%	84.16%	69.23%	71.43%
Male	85.71%	87.94%	83.66%	73.08%	75.00%
Advanced Degree(s)	90.48%	88.94%	92.57%	97.12%	96.43%
Masters	87.30%	86.43%	87.62%	87.02%	87.05%
Doctorate	3.17%	2.51%	4.95%	10.10%	9.38%
Teach	24.60%	13.57%	10.89%	7.69%	3.13%
Mean Values					
Age	46.24	45.68	47.21	49.70	49.62
	(7.74)	(7.58)	(7.47)	(6.55)	(6.87)
Experience	19.18	18.29	21.75	24.10	24.18
	(8.80)	(8.68)	(8.05)	(7.43)	(8.06)
Total Pay (1000s)	54.68	57.70	62.52	74.67	84.47
	(5.06)	(5.00)	(6.67)	(8.76)	(8.92)
Bonus Pay	124.60	188.08	61.91	253.80	250.03
	(723.95)	(1720.84)	(317.92)	(707.53)	(830.60)
Total Pay/Average Teacher Base Pay	1.53	1.62	1.72	1.96	2.15
	(0.16)	(0.15)	(0.18)	(0.18)	(0.20)
Total Pay/Experience Teacher Base Pay	1.38	1.48	1.51	1.63	1.80
	(0.16)	(0.22)	(0.19)	(0.17)	(0.25)
Number of Principals at School	1.10	1.07	1.04	1.08	1.13
	(0.29)	(0.32)	(0.21)	(0.39)	(0.49)
Number of Grades at School	6.10	4.43	4.01	3.99	3.97
	(2.73)	(1.42)	(0.16)	(0.18)	(0.79)
Average Share of Time as:					
Principal	0.82	0.88	0.92	0.96	0.98
	(0.29)	(0.29)	(0.24)	(0.16)	(0.11)
Teacher	0.12	0.10	0.08	0.04	0.02
	(0.25)	(0.27)	(0.24)	(0.15)	(0.10)

Standard Deviations appear in parenthesis

Table B.1.c 2001 Summary Statistics for Principals, by class

	A	2A	3A	4A	5A
Number	119	199	206	213	221
Percentage					
White	93.28%	89.45%	84.47%	67.14%	68.78%
Male	86.55%	86.93%	81.55%	71.36%	73.30%
Advanced Degree(s)	91.60%	88.44%	93.20%	97.18%	96.38%
Masters	89.08%	85.93%	89.32%	88.73%	86.88%
Doctorate	2.52%	2.51%	3.88%	8.45%	9.50%
Teach	24.37%	17.59%	9.71%	7.04%	2.26%
Mean Values					
Age	46.01	45.45	47.96	49.22	49.80
	(7.13)	(7.52)	(7.28)	(7.09)	(6.73)
Experience	18.92	18.46	21.71	23.23	24.37
	(8.41)	(7.77)	(8.43)	(8.36)	(7.78)
Total Pay (1000s)	56.25	59.43	64.38	77.26	87.84
	(5.35)	(4.89)	(6.46)	(9.26)	(9.54)
Bonus Pay	133.45	401.63	100.13	212.80	273.45
	(971.70)	(2900.80)	(413.70)	(629.66)	(857.26)
Total Pay/Average Teacher Base Pay	1.57	1.65	1.75	1.97	2.18
	(0.16)	(0.14)	(0.15)	(0.18)	(0.21)
Total Pay/Experience Teacher Base Pay	1.42	1.49	1.54	1.69	1.83
	(0.18)	(0.18)	(0.19)	(0.25)	(0.24)
Number of Principals at School	1.10	1.09	1.06	1.07	1.10
	(0.33)	(0.35)	(0.26)	(0.32)	(0.45)
Number of Grades at School	6.15	4.36	4.09	4.09	3.98
	(2.70)	(1.37)	(0.75)	(1.01)	(0.77)
Average Share of Time as:					
Principal	0.82	0.87	0.94	0.95	0.98
	(0.30)	(0.28)	(0.22)	(0.19)	(0.11)
Teacher	0.13	0.11	0.06	0.04	0.02
	(0.27)	(0.27)	(0.22)	(0.17)	(0.11)

Standard Deviations appear in parenthesis

Table B.1.d 2002 Summary Statistics for Principals, by class

	A	2A	3A	4A	5A
Number	136	195	201	217	222
Percentage					
White	92.65%	88.72%	85.07%	67.28%	67.57%
Male	83.82%	86.67%	80.10%	70.51%	69.37%
Advanced Degree(s)	86.03%	86.67%	94.03%	96.77%	98.20%
Masters	85.29%	83.59%	90.05%	89.40%	86.94%
Doctorate	0.74%	3.08%	3.98%	7.37%	11.26%
Teach	22.06%	23.59%	10.45%	6.91%	3.60%
Mean Values					
Age	45.75	46.70	47.66	49.50	50.11
	(7.02)	(7.74)	(7.24)	(7.26)	(6.68)
Experience	17.98	18.09	20.82	23.50	25.13
	(8.73)	(8.47)	(8.42)	(8.03)	(7.72)
Total Pay (1000s)	58.84	61.84	66.73	80.62	91.17
	(5.61)	(6.00)	(6.56)	(10.30)	(9.38)
Bonus Pay	945.51	1239.81	909.70	860.89	857.98
	(796.40)	(3249.91)	(627.34)	(848.67)	(959.89)
Total Pay/Average Teacher Base Pay	1.60	1.67	1.75	1.96	2.13
	(0.15)	(0.16)	(0.16)	(0.21)	(0.21)
Total Pay/Experience Teacher Base Pay	1.48	1.52	1.56	1.70	1.82
	(0.27)	(0.20)	(0.20)	(0.25)	(0.21)
Number of Principals at School	1.09	1.08	1.02	1.06	1.17
	(0.31)	(0.34)	(0.16)	(0.31)	(0.66)
Number of Grades at School	5.91	4.36	4.03	4.03	3.95
	(2.65)	(1.50)	(0.22)	(0.72)	(0.78)
Average Share of Time as:					
Principal	0.82	0.84	0.92	0.95	0.98
	(0.28)	(0.31)	(0.25)	(0.19)	(0.11)
Teacher	0.11	0.14	0.08	0.05	0.02
	(0.24)	(0.30)	(0.24)	(0.18)	(0.11)

Standard Deviations appear in parenthesis

Table B.2.a 1998 Summary Statistics for Head Coaches, by class

	A	2A	3A	4A	5A
Number	93	156	167	170	170
Percentage					
White	93.55%	96.15%	89.82%	80.00%	75.29%
Advanced Degree(s)	13.98%	16.03%	29.94%	51.18%	62.35%
Teach	100.00%	97.44%	79.64%	81.18%	77.65%
Academic Teachers	NA	NA	NA	NA	NA
Mean Values					
Age	38.19	41.65	42.81	45.07	47.15
	(7.83)	(7.37)	(7.32)	(7.50)	(7.32)
Experience	13.87	17.10	18.43	20.59	23.18
	(7.61)	(7.35)	(7.47)	(7.52)	(7.56)
Total Pay (1000s)	42.66	47.05	50.68	55.34	60.84
	(5.85)	(4.88)	(5.79)	(8.09)	(9.52)
Total Pay/Average Teacher Base Pay	1.31	1.44	1.55	1.64	1.74
	(0.16)	(0.14)	(0.18)	(0.26)	(0.29)
Total Pay/Experience Teacher Base Pay	1.25	1.29	1.37	1.40	1.43
	(0.11)	(0.10)	(0.14)	(0.19)	(0.23)
Number of Schools	1.30	1.41	1.22	1.10	1.04
	(0.51)	(0.55)	(0.44)	(0.32)	(0.19)
Average Share of Time as:					
Teacher	0.78	0.63	0.49	0.57	0.58
	(0.22)	(0.31)	(0.39)	(0.41)	(0.41)
Athletic Director	0.08	0.22	0.42	0.34	0.13
	(0.18)	(0.33)	(0.42)	(0.43)	(0.31)

Standard Deviations appear in parenthesis

Table B.2.b 1999 Summary Statistics for Head Coaches, by class

	A	2A	3A	4A	5A
Number	126	212	207	214	216
Percentage					
White	94.44%	94.34%	89.86%	79.44%	75.93%
Advanced Degree(s)	11.90%	16.51%	30.43%	48.60%	60.65%
Teach	97.62%	94.34%	82.61%	77.57%	74.54%
Academic Teachers	73.02%	46.70%	12.08%	15.42%	8.33%
Mean Values					
Age	39.13	42.23	43.12	45.30	47.44
	(7.76)	(7.93)	(7.55)	(7.31)	(7.46)
Experience	14.07	17.20	18.66	20.66	23.26
	(7.74)	(7.93)	(7.57)	(7.60)	(7.87)
Total Pay (1000s)	46.14	50.59	54.01	59.32	65.63
	(6.08)	(4.80)	(5.77)	(8.78)	(11.39)
Total Pay/Average Teacher Base Pay	1.30	1.41	1.50	1.60	1.70
	(0.15)	(0.14)	(0.16)	(0.24)	(0.26)
Total Pay/Experience Teacher Base Pay	1.25	1.29	1.35	1.38	1.42
	(0.12)	(0.11)	(0.13)	(0.20)	(0.21)
Number of Schools	1.28	1.41	1.22	1.09	1.03
	(0.47)	(0.53)	(0.44)	(0.31)	(0.16)
Average Share of Time as:					
Teacher	0.88	0.76	0.57	0.62	0.62
	(0.24)	(0.35)	(0.42)	(0.44)	(0.46)
Athletic Director	0.11	0.23	0.42	0.34	0.19
	(0.23)	(0.34)	(0.42)	(0.43)	(0.37)

Standard Deviations appear in parenthesis

Table B.2.c 2000 Summary Statistics for Head Coaches, by class

	A	2A	3A	4A	5A
Number	133	211	209	216	225
Percentage					
White	87.97%	95.73%	89.00%	78.70%	76.00%
Advanced Degree(s)	13.53%	18.96%	28.71%	46.30%	58.67%
Teach	96.24%	94.79%	78.47%	81.48%	76.89%
Academic Teachers	70.68%	45.02%	8.61%	12.50%	8.00%
Mean Values					
Age	40.32	41.90	42.56	45.66	47.32
	(7.74)	(8.07)	(7.32)	(7.20)	(7.89)
Experience	14.93	17.08	17.66	20.97	22.92
	(7.88)	(7.86)	(7.85)	(7.32)	(8.42)
Total Pay (1000s)	47.34	51.59	55.59	61.72	67.51
	(6.30)	(5.39)	(6.79)	(9.28)	(10.81)
Total Pay/Average Teacher Base Pay	1.32	1.44	1.53	1.62	1.72
	(0.16)	(0.15)	(0.18)	(0.26)	(0.30)
Total Pay/Experience Teacher Base Pay	1.25	1.32	1.39	1.39	1.46
	(0.12)	(0.13)	(0.17)	(0.21)	(0.25)
Number of Schools	1.29	1.40	1.26	1.07	1.03
	(0.50)	(0.54)	(0.47)	(0.28)	(0.17)
Average Share of Time as:					
Teacher	0.86	0.72	0.53	0.66	0.65
	(0.26)	(0.37)	(0.43)	(0.42)	(0.45)
Athletic Director	0.12	0.27	0.45	0.29	0.18
	(0.23)	(0.35)	(0.43)	(0.41)	(0.37)

Standard Deviations appear in parenthesis

Table B.2.d 2001 Summary Statistics for Head Coaches, by class

	A	2A	3A	4A	5A
Number	129	212	210	215	227
Percentage					
White	89.92%	94.81%	90.00%	80.00%	77.53%
Advanced Degree(s)	13.18%	17.92%	30.48%	45.58%	57.71%
Teach	95.35%	95.28%	75.24%	82.33%	79.30%
Academic Teachers	68.22%	45.28%	7.62%	13.95%	7.93%
Mean Values					
Age	40.54	41.35	43.15	45.85	47.44
	(7.49)	(7.47)	(7.07)	(7.23)	(7.68)
Experience	14.90	16.39	18.12	21.04	23.15
	(7.51)	(7.52)	(7.43)	(7.52)	(8.17)
Total Pay (1000s)	48.15	52.53	57.78	64.76	70.51
	(6.22)	(5.64)	(6.37)	(9.54)	(12.02)
Total Pay/Average Teacher Base Pay	1.33	1.46	1.57	1.66	1.75
	(0.15)	(0.15)	(0.17)	(0.25)	(0.32)
Total Pay/Experience Teacher Base Pay	1.26	1.35	1.42	1.45	1.49
	(0.13)	(0.13)	(0.16)	(0.24)	(0.26)
Number of Schools	1.32	1.43	1.17	1.07	1.04
	(0.50)	(0.54)	(0.40)	(0.27)	(0.21)
Average Share of time as:					
Teacher	0.86	0.72	0.51	0.65	0.67
	(0.27)	(0.35)	(0.43)	(0.43)	(0.44)
Athletic Director	0.13	0.27	0.49	0.30	0.17
	(0.25)	(0.35)	(0.43)	(0.42)	(0.35)

Standard Deviations appear in parenthesis

Table B.2.e 2002 Summary Statistics for Head Coaches, by class

	A	2A	3A	4A	5A
Number	141	202	207	223	226
Percentage					
White	89.44%	93.07%	87.44%	77.13%	80.97%
Advanced Degree(s)	14.08%	15.84%	29.47%	42.15%	55.75%
Teach	88.65%	83.58%	63.29%	71.17%	71.56%
Academic Teachers	67.61%	37.13%	7.73%	15.70%	6.19%
Mean Values					
Age	40.28	41.89	44.02	45.74	47.22
	(7.85)	(8.01)	(6.83)	(7.57)	(7.65)
Experience	14.55	16.67	19.01	20.36	22.83
	(8.31)	(7.96)	(7.46)	(8.15)	(8.33)
Total Pay (1000s)	50.02	54.89	60.68	66.62	73.48
	(6.99)	(5.50)	(6.61)	(10.45)	(11.24)
Total Pay/Average Teacher Base Pay	1.36	1.48	1.59	1.63	1.72
	(0.17)	(0.15)	(0.18)	(0.27)	(0.29)
Total Pay/Experience Teacher Base Pay	1.30	1.37	1.40	1.42	1.50
	(0.14)	(0.16)	(0.16)	(0.28)	(0.26)
Number of Schools	1.36	1.41	1.21	1.06	1.04
	(0.55)	(0.54)	(0.44)	(0.26)	(0.21)
Average Share of time as:					
Teacher	0.84	0.67	0.49	0.63	0.67
	(0.29)	(0.37)	(0.42)	(0.45)	(0.43)
Athletic Director	0.15	0.32	0.51	0.30	0.17
	(0.28)	(0.36)	(0.42)	(0.43)	(0.35)

Standard Deviations appear in parenthesis

Table B.3.a Probability Principal Leaves after 1999-00 School Year

	Leaves Sample	Leaves School	Leaves Sample	Leaves School
N	942	942	942	942
Log Likelihood	-519.58	-554.99	-519.26	-544.55
LR Chi2	21.38	18.73	22.02	19.61
Pseudo R2	0.02	0.02	0.02	0.02
district size	*-0.027*	**-0.029**	-0.028	-0.028
	(0.015)	(0.015)	(0.018)	(0.017)
numbers of students (100s)	-0.006	-0.004	-0.006	-0.003
	(0.006)	(0.006)	(0.006)	(0.006)
age	*-0.098*	**-0.112**	*-0.096*	**-0.110**
	(0.054)	(0.053)	(0.056)	(0.054)
age squared (100s)	**0.117**	**0.126**	**0.115**	**0.123**
	(0.056)	(0.056)	(0.058)	(0.057)
masters degree	**-0.337**	**-0.350**	**-0.343**	**-0.363**
	(0.165)	(0.162)	(0.167)	(0.164)
Ph.D	*-0.463*	-0.378	*-0.468*	-0.393
	(0.257)	(0.248)	(0.260)	(0.250)
male	*-0.210*	-0.090	*-0.215*	-0.093
	(0.117)	(0.116)	(0.118)	(0.117)
white	-0.110	-0.026	-0.107	-0.023
	(0.127)	(0.124)	(0.127)	(0.125)
teach	0.091	-0.112	0.090	-0.113
	(0.144)	(0.145)	(0.144)	(0.145)
dropout rate	0.024	0.046	0.023	0.044
	(0.046)	(0.045)	(0.047)	(0.046)
attendance rate	-0.016	-0.005	-0.013	-0.003
	(0.037)	(0.036)	(0.037)	(0.036)
Math Spring TAAS	0.001	-0.004	0.0004	-0.005
	(0.007)	(0.007)	(0.007)	(0.007)

Table B.3.a continued

Houston	--	--	7.571	7.078
	--	--	(18.389)	(18.060)
Houston* Dropout Rate	--	--	0.072	0.069
	--	--	(0.254)	(0.254)
Houston*Attendance	--	--	-0.113	-0.116
	--	--	(0.219)	(0.215)
Houston*Math TAAS	--	--	0.031	0.039
	--	--	(0.044)	(0.044)
Constant	3.307	3.234	3.096	3.050
	(3.548)	(3.456)	(3.617)	(3.521)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table B.3.b Probability Principal Leaves after 2000-01 School Year

N	952	952	952	952
Log Likelihood	-473.35	-502.66	-469.34	-499.26
LR Chi2	37.37	35.84	45.37	42.64
Pseudo R2	0.04	0.03	0.05	0.04
	Leaves Sample	Leaves School	Leaves Sample	Leaves School
district size	*-0.024*	**-0.029**	-0.020	-0.027
	(0.015)	(0.015)	(0.017)	(0.017)
numbers of students (100s)	**-0.020**	**-0.019**	**-0.022**	**-0.020**
	(0.006)	(0.006)	(0.007)	(0.006)
age	*-0.096*	-0.086	**-0.140**	**-0.117**
	(0.053)	(0.053)	(0.060)	(0.059)
age squared (100s)	**0.120**	*0.104*	**0.169**	**0.139**
	(0.056)	(0.056)	(0.064)	(0.063)
masters degree	0.142	0.075	0.136	0.071
	(0.199)	(0.190)	(0.201)	(0.191)
Ph.D	*0.500*	0.314	*0.474*	0.295
	(0.264)	(0.258)	(0.267)	(0.261)
male	0.040	0.099	0.036	0.096
	(0.123)	(0.121)	(0.124)	(0.122)
white	0.096	0.144	0.076	0.128
	(0.133)	(0.131)	(0.134)	(0.131)
teach	0.122	0.114	0.149	0.135
	(0.148)	(0.144)	(0.149)	(0.145)
dropout rate	-0.035	-0.017	-0.039	-0.019
	(0.050)	(0.049)	(0.051)	(0.050)
attendance rate	-0.039	-0.036	-0.057	-0.052
	(0.036)	(0.036)	(0.037)	(0.037)
Math Spring TAAS	**-0.020**	**-0.023**	**-0.017**	**-0.020**
	(0.008)	(0.008)	(0.008)	(0.008)

Table B.3.b continued

Houston	--	--	**-54.283**	**-48.048**
	--	--	(23.631)	(23.311)
Houston* Dropout Rate	--	--	-0.017	-0.148
	--	--	(0.622)	(0.667)
Houston*Attendance	--	--	**0.620**	**0.549**
	--	--	(0.265)	(0.264)
Houston*Math TAAS	--	--	-0.036	-0.030
	--	--	(0.070)	(0.070)
Constant	*6.492*	*6.419*	**8.942**	**8.454**
	(3.521)	(3.468)	(3.718)	(3.638)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table B.3.c Probability Principal Leaves after 2001-02 School Year

N	958	958	958	958
Log Likelihood	-471.21	-538.18	-469.33	-536.29
LR Chi2	28.42	21.43	32.18	25.23
Pseudo R2	0.03	0.02	0.03	0.02
	Leaves Sample	Leaves School	Leaves Sample	Leaves School
district size	-0.014	-0.021	-0.026	*-0.029*
	(0.013)	(0.013)	(0.018)	(0.016)
numbers of students (100s)	**-0.012**	-0.008	*-0.012*	-0.008
	(0.006)	(0.006)	(0.006)	(0.006)
age	-0.036	-0.031	-0.015	-0.011
	(0.056)	(0.054)	(0.058)	(0.056)
age squared (100s)	0.062	0.045	0.038	0.024
	(0.058)	(0.057)	(0.060)	(0.058)
masters degree	0.107	0.102	0.106	0.100
	(0.204)	(0.190)	(0.205)	(0.191)
Ph.D	0.243	0.230	0.253	0.239
	(0.277)	(0.262)	(0.279)	(0.264)
male	-0.093	-0.078	-0.111	-0.095
	(0.117)	(0.111)	(0.118)	(0.112)
white	-0.024	-0.020	-0.009	-0.008
	(0.131)	(0.124)	(0.132)	(0.124)
teach	*0.265*	**0.373**	*0.264*	**0.372**
	(0.145)	(0.138)	(0.145)	(0.138)
dropout rate	0.066	0.051	0.065	0.051
	(0.045)	(0.044)	(0.046)	(0.045)
attendance rate	0.007	-0.011	0.003	-0.014
	(0.035)	(0.033)	(0.035)	(0.033)
Math Spring TAAS	-0.005	-0.002	-0.008	-0.005
	(0.010)	(0.009)	(0.010)	(0.010)

Table B.3.c continued

Houston	--	--	-19.730	-19.732
	--	--	(22.022)	(21.116)
Houston* Dropout Rate	--	--	0.120	0.116
	--	--	(0.251)	(0.249)
Houston*Attendance	--	--	0.100	0.092
	--	--	(0.227)	(0.219)
Houston*Math TAAS	--	--	0.120	0.127
	--	--	(0.086)	(0.088)
Constant	-0.650	1.007	-0.478	1.149
	(3.382)	(3.208)	(3.453)	(3.271)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table B.4.a Probability Coach Leaves Sample after 1999-00 School Year

N	975	975	975	975	975
Log Likelihood	-402.98	-401.58	-404.26	-408.08	-397.33
LR Chi2	80.63	83.43	78.07	70.43	91.94
Pseudo R2	0.09	0.09	0.09	0.08	0.10
district size	-0.103	-0.022	-0.018	-0.020	-0.020
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
age	-0.038	-0.032	-0.029	-0.038	-0.028
	(0.055)	(0.056)	(0.055)	(0.056)	(0.056)
age squared (100s)	0.064	0.059	0.057	0.065	0.054
	(0.061)	(0.062)	(0.061)	(0.061)	(0.062)
White	-0.060	0.137	-0.061	0.093	0.052
	(0.152)	(0.156)	(0.152)	(0.154)	(0.161)
Advanced Degree	0.029	0.026	0.031	0.025	0.029
	(0.117)	(0.117)	(0.117)	(0.116)	(0.117)
Teach	-0.012	0.033	0.006	0.034	0.009
	(0.210)	(0.033)	(0.211)	(0.211)	(0.212)
Academic	0.201	0.116	0.192	0.151	0.140
	(0.130)	(0.131)	(0.130)	(0.129)	(0.133)
Athletic Director Share	-0.107	-0.086	-0.087	-0.095	-0.086
	(0.185)	(0.185)	(0.185)	(0.184)	(0.186)
Share of time, non-management, non teaching	-0.596	-0.600	*-0.609*	-0.592	*-0.608*
	(0.368)	(0.369)	(0.369)	(0.368)	(0.369)
overall winning percent	**-1.544**	--	--	--	-0.504
	(0.211)	--	--	--	(0.510)
Pbnum	--	**-0.037**	--	--	**-0.047**
	--	(0.005)	--	--	(0.017)
Coach's Record	--	--	**-1.699**	--	-0.522
	--	--	(0.237)	--	(0.513)
Rank	--	--	--	**0.006**	*-0.005*
	--	--	--	(0.001)	(0.003)
Constant	0.170	**3.280**	-0.005	-1.422	**5.409**
	(1.262)	(1.332)	(1.259)	(1.294)	(2.443)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table B.4.b Probability Coach Leaves Sample after 2000-01 School Year

N	994	994	994	994	994
Log Likelihood	-391.06	-393.40	-395.41	-395.87	-389.80
LR Chi2	91.82	87.13	93.11	82.18	94.33
Pseudo R2	0.11	0.10	0.10	0.09	0.11
district size	-0.004	-0.014	-0.006	-0.012	-0.008
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
age	**-0.149**	**-0.149**	**-0.137**	**-0.151**	**-0.145**
	(0.054)	(0.054)	(0.054)	(0.054)	(0.055)
age squared (100s)	**0.192**	**0.194**	**0.181**	**0.197**	**0.188**
	(0.059)	(0.059)	(0.059)	(0.058)	(0.059)
White	-0.070	0.035	-0.064	0.025	-0.032
	(0.148)	(0.150)	(0.148)	(0.149)	(0.152)
Advanced Degree	-0.059	-0.079	-0.062	-0.081	-0.064
	(0.119)	(0.119)	(0.119)	(0.119)	(0.120)
Teach	**-0.426**	*-0.377*	**-0.412**	*-0.382*	**-0.415**
	(0.211)	(0.210)	(0.210)	(0.210)	(0.211)
Academic	**0.273**	*0.245*	**0.284**	*0.244*	**0.268**
	(0.133)	(0.132)	(0.132)	(0.132)	(0.134)
Athletic Director Share	-0.294	-0.294	-0.328	-0.290	-0.297
	(0.190)	(0.191)	(0.190)	(0.191)	(0.191)
Share of time, non-management, non teaching	*-0.710*	*-0.666*	*-0.663*	*-0.619*	*-0.726*
	(0.371)	(0.371)	(0.370)	(0.365)	(0.375)
overall winning percent	**-1.270**	--	--	--	**-0.857**
	(0.211)	--	--	--	(0.426)
Pbnum	--	**-0.026**	--	--	-0.019
	--	(0.005)	--	--	(0.015)
Coach's Record	--	--	**-1.322**	--	-0.148
	--	--	(0.248)	--	(0.436)
Rank	--	--	--	**0.005**	-0.002
	--	--	--	(0.001)	(0.003)
Constant	**2.533**	**4.756**	*2.261*	1.326	**4.691**
	(1.241)	(1.313)	(1.239)	(1.243)	(2.260)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table B.4.c Probability Coach Leaves Sample after 2001-02 School Year

N	993	993	993	993	993
Log Likelihood	-397.50	-403.96	-396.80	-406.18	-393.54
LR Chi2	88.46	75.54	89.85	71.09	96.38
Pseudo R2	0.10	0.09	0.10	0.08	0.11
district size	0.0003	-0.010	-0.002	-0.010	-0.0001
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
age	-0.085	-0.095	-0.078	-0.088	-0.082
	(0.061)	(0.060)	(0.061)	(0.060)	(0.061)
age squared (100s)	*0.120*	**0.131**	*0.115*	*0.124*	*0.118*
	(0.066)	(0.065)	(0.066)	(0.065)	(0.067)
White	-0.190	-0.118	-0.186	-0.121	-0.185
	(0.144)	(0.145)	(0.144)	(0.144)	(0.147)
Advanced Degree	0.027	0.030	0.023	0.037	0.024
	(0.117)	(0.117)	(0.118)	(0.117)	(0.118)
Teach	0.152	0.210	0.182	0.201	0.164
	(0.201)	(0.199)	(0.201)	(0.199)	(0.202)
Academic	0.046	0.000	0.042	-0.005	0.050
	(0.131)	(0.130)	(0.131)	(0.130)	(0.132)
Athletic Director Share	**0.372**	**0.408**	**0.457**	**0.380**	**0.435**
	(0.182)	(0.180)	(0.183)	(0.180)	(0.185)
Share of time, non-management, non teaching	-0.555	-0.505	-0.549	-0.528	-0.556
	(0.435)	(0.421)	(0.440)	(0.421)	(0.441)
overall winning percent	**-1.449**	--	--	--	**-0.832**
	(0.206)	--	--	--	(0.404)
Pbnum	--	**-0.031**	--	--	-0.012
	--	(0.005)	--	--	(0.015)
Coach's Record	--	--	**-1.832**	--	**-1.070**
	--	--	(0.256)	--	(0.416)
Rank	--	--	--	**0.005**	-0.002
	--	--	--	(0.001)	(0.003)
Constant	0.697	**3.666**	0.666	-0.582	2.397
	(1.390)	(1.469)	(1.390)	(1.378)	(2.496)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table B.5.a Probability Coach Leaves School after 1999-00 School Year

N	975	975	975	975	975
Log Likelihood	-518.46	-520.08	-521.06	-521.22	-518.00
LR Chi2	39.98	36.76	34.78	34.47	40.91
Pseudo R2	0.04	0.03	0.03	-0.03	0.04
district size	-0.019	-0.021	-0.019	-0.021	-0.020
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
age	-0.049	-0.049	-0.048	-0.051	-0.048
	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)
age squared (100s)	0.060	0.061	0.060	0.063	0.060
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)
White	-0.142	-0.046	-0.148	-0.058	-0.107
	(0.135)	(0.138)	(0.135)	(0.138)	(0.142)
Advanced Degree	0.012	0.005	0.009	0.004	0.011
	(0.105)	(0.105)	(0.105)	(0.105)	(0.105)
Teach	0.144	0.168	0.154	0.172	0.149
	(0.182)	(0.182)	(0.182)	(0.182)	(0.183)
Academic	0.145	0.100	0.140	0.119	0.127
	(0.118)	(0.118)	(0.118)	(0.118)	(0.120)
Athletic Director Share	0.112	0.117	0.121	0.115	0.113
	(0.163)	(0.162)	(0.162)	(0.162)	(0.163)
Share of time, non-management, non teaching	-0.033	-0.027	-0.036	-0.022	-0.031
	(0.293)	(0.291)	(0.292)	(0.291)	(0.293)
overall winning percent	**-0.880**	--	--	--	*-0.757*
	(0.183)	--	--	--	(0.457)
Pbnum	--	**-0.019**	--	--	-0.011
	--	(0.004)	--	--	(0.014)
Coach's Record	--	--	**-0.875**	--	0.133
	--	--	(0.205)	--	(0.464)
Rank	--	--	--	**0.003**	-0.001
	--	--	--	(0.001)	(0.002)
Constant	0.597	*2.243*	0.544	-0.262	1.750
	(1.165)	(1.212)	(1.163)	(1.191)	(2.107)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table B.5.b Probability Coach Leaves School after 2000-01 School Year

N	994	994	994	994	994
Log Likelihood	-494.86	-495.40	-497.29	-495.60	-494.07
LR Chi2	66.13	65.03	61.25	64.63	67.69
Pseudo R2	0.06	0.06	0.06	0.06	0.06
district size	-0.016	-0.020	-0.016	-0.020	-0.017
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
age	**-0.128**	**-0.128**	**-0.127**	**-0.128**	**-0.132**
	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)
age squared (100s)	**0.164**	**0.165**	**0.164**	**0.165**	**0.168**
	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)
White	-0.083	-0.045	-0.093	-0.047	-0.063
	(0.136)	(0.138)	(0.136)	(0.138)	(0.139)
Advanced Degree	-0.139	-0.146	-0.142	-0.145	-0.143
	(0.107)	(0.107)	(0.107)	(0.107)	(0.107)
Teach	-0.159	-0.134	-0.142	-0.137	-0.150
	(0.188)	(0.187)	(0.187)	(0.187)	(0.188)
Academic	0.182	0.172	0.186	0.172	0.173
	(0.121)	(0.121)	(0.121)	(0.121)	(0.121)
Athletic Director Share	-0.209	-0.208	-0.223	-0.206	-0.201
	(0.168)	(0.169)	(0.168)	(0.169)	(0.169)
Share of time, non-management, non teaching	-0.471	-0.445	-0.434	-0.430	-0.471
	(0.329)	(0.328)	(0.327)	(0.326)	(0.330)
overall winning percent	**-0.517**	--	--	--	-0.600
	(0.186)	--	--	--	(0.379)
Pbnum	--	**-0.011**	--	--	-0.006
	--	(0.004)	--	--	(0.014)
Coach's Record	--	--	*-0.379*	--	0.442
	--	--	(0.223)	--	(0.393)
Rank	--	--	--	**0.002**	0.000
	--	--	--	(0.001)	(0.003)
Constant	1.889	*2.780*	1.805	1.360	2.451
	(1.156)	(1.213)	(1.155)	(1.169)	(2.088)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

Table B.5.c Probability Coach Leaves School after 2001-02 School Year

N	993	993	993	993	993
Log Likelihood	-513.33	-516.16	-513.89	-517.59	-511.60
LR Chi2	48.21	42.56	47.10	39.69	51.68
Pseudo R2	0.04	0.04	0.04	0.04	0.05
district size	-0.003	-0.007	-0.004	-0.007	-0.001
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
age	**-0.117**	**-0.122**	**-0.113**	**-0.119**	**-0.118**
	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)
age squared (100s)	**0.131**	**0.138**	**0.129**	**0.134**	**0.133**
	(0.061)	(0.060)	(0.061)	(0.060)	(0.061)
White	-0.148	-0.117	-0.146	-0.123	-0.160
	(0.133)	(0.134)	(0.133)	(0.134)	(0.135)
Advanced Degree	0.135	0.138	0.133	0.140	0.125
	(0.104)	(0.104)	(0.104)	(0.104)	(0.104)
Teach	0.077	0.105	0.095	0.101	0.083
	(0.178)	(0.177)	(0.178)	(0.177)	(0.179)
Academic	0.061	0.037	0.059	0.036	0.076
	(0.120)	(0.120)	(0.120)	(0.120)	(0.121)
Athletic Director Share	**0.346**	**0.360**	**0.386**	**0.347**	**0.375**
	(0.163)	(0.360)	(0.164)	(0.162)	(0.165)
Share of time, non-management, non teaching	-0.597	-0.578	-0.578	-0.589	-0.577
	(0.364)	(0.360)	(0.362)	(0.360)	(0.364)
overall winning percent	**-0.732**	--	--	--	*-0.628*
	(0.178)	--	--	--	(0.363)
Pbnum	--	**-0.015**	--	--	-0.014
	--	(0.004)	--	--	(0.014)
Coach's Record	--	--	**-0.887**	--	-0.457
	--	--	(0.223)	--	(0.375)
Rank	--	--	--	**0.002**	-0.004
	--	--	--	(0.001)	(0.003)
Constant	1.892	*3.305*	1.862	1.300	*4.054*
	(1.254)	(1.337)	(1.252)	(1.251)	(2.281)

Notes: Bold indicates significance at the 95%; Italicized indicates significance at 90%

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