NEW STAKES AND STANDARDS, SAME OL' SPENDING? EVIDENCE FROM NEW YORK CITY HIGH SCHOOLS

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ABSTRACT

In 1996, the New York State Education Department began requiring all graduating high school students (starting with the Class of 1999) to pass rigorous end-of-course (Regents) exams in five subjects. This study explores whether the New York City Department of Education and New York City high schools have responded to these new standards by re-allocating resources, and whether the reallocation patterns systematically differ among high and low graduation rate schools. The analyses draw on a six-year balanced panel of school-level data (1997-2002), constructed from a variety of New York City data sources. We model school-level resources as a function of school and student characteristics, including school graduation rates and school fixed effects. Regression analyses reveal large increases in direct services spending over this time period (1997 to 2002), while the percentage of more experienced and educated teachers fell. We find little evidence, though, of differential patterns across high and low graduation rate schools, with the exception of teacher experience and licensure, which show some evidence of significantly larger increases in schools with lower graduation rates. Non-personnel expenditures also show some evidence of differential spending patterns. The findings suggest that schools may have limited ability to redeploy non-teacher resources in the short-term. While other funds may be re-allocated, these represent a small share of total school resources.

New Stakes and Standards, Same Ol' Spending? Evidence from New York City High Schools

In 1996, New York State embarked on an ambitious reform to raise academic standards for all students. As part of that reform, the New York State Education Department revised state policy to require all graduating high school students (starting with the Class of 1999)[1] to pass rigorous end-of-course (Regents) exams in English, math, world history, American history, and one science subject.[2] Prior to this reform, only a fraction of New York State high school students took the Regents exams, with the majority opting to earn local, rather than Regents, diplomas.[3] While the reforms could be expected to have an important impact on student preparation and motivation in high school, little is known about the institutional effects of these reforms on high schools themselves, and more particularly about resource allocation patterns before and after the announcement of the high stakes exit exam requirements. Yet these patterns are important. If we accept that money spent wisely can affect student performance, then resource re-allocation could be an important tool for responding to increased standards. Even if we assume that schools currently have "slack" resources – that is, resources that are not being used efficiently – changing allocation patterns to improve efficiency might be a natural response to mandated student performance standards.

Given that the largest share of school spending is devoted to teachers and other personnel, and that the deployment of such personnel may be largely constrained by district allocation practices and collective bargaining agreements, the question remains as to whether

[1] New York State uses the beginning calendar year to refer to the academic year. For example, 1999 refers to the 1999-2000 academic year. For the purposes of this paper and in accordance with New York City practices, we will use the ending calendar year (2000) to refer to the academic year.

[2] The requirements are being phased-in over a five year period. Initial dual-scoring standards specify lower cut-offs for passing scores. Recent controversy over the mathematics exam has led the Regents to extend the phase-in period.

[3] Prior to the new reform school districts had the option of awarding local diplomas to students who had passed a series of competency exams.

schools themselves have substantial flexibility to re-allocate resources. Schools may, though, have discretion to allocate fairly substantial pools of non-teacher resources (for example, funds from reimbursable or categorical programs). And while schools themselves may not have the power to dramatically alter the distribution and deployment of teachers and other staff, the district could facilitate re-allocation to benefit lower-performing schools. Historically, New York City high schools have had some control over their resources (Siegel and Fruchter 2002). The study presented here explores whether the New York City Department of Education and New York City high schools have, in fact, responded by re-allocating resources, and whether the reallocation patterns systematically differ among schools closer to and farther from the performance standards.

BACKGROUND AND LITERATURE

A growing body of research has examined the effects of stricter testing and course-taking requirements on student outcomes, including test scores, graduation rates and dropout rates (see, for example, Bishop, Moriarty and Mane 2000, Bishop and Mane, 2001, Jacob 2001, Carnoy and Loeb 2002, Schiller and Muller 2003). While changes in student outcomes are clearly the "bottom line" in judging the effectiveness of such reforms, effects on students will often be influenced by school responses to external accountability pressures. Relatively little of the research on the effects of high school graduation requirements, though, has examined whether high schools systematically alter their internal practices, including resource allocation, following such a change. If schools are to be held accountable for the performance of their students, and if they are expected to improve the performance of their students over time (measured in various ways), then understanding the ways in which schools alter their patterns of resource use is an important component of school improvement efforts.

Most research on resource allocation practices in education has focused on school districts, sometimes examining changes in spending by function or program over time (see, for example, Lankford and Wyckoff 1995, Rothstein and Miles 1995). Spurred by better data availability, an increasing number of studies have moved beyond district-level aggregates to examine spending at the school-site. These school-level studies have often been cross-sectional and largely descriptive, rarely examining changes in school spending practices in response to external pressures (see, for example, Rubenstein 1999, Rubenstein and Iatarola, 2001, Iatarola and Stiefel, 2003). Stiefel et al. (2003), however, use a panel data set of elementary schools in New York City to evaluate the effects of the city's Performance Driven Budgeting initiative, finding small positive gains in performance and decreases in reimbursable (categorical) funding per pupil, after controlling for student characteristics and school fixed effects.

While several studies have attempted to trace educational resource use in response to new accountability systems, they have relied largely on district rather than school-level data. For example, Alexander (2003) examines changes in curricular offerings in New York State districts between 1975 and 1995, and finds substantial disparities in curricular offerings between districts, though the disparities generally declined after the new requirements were put in place. In other work, Alexander (2002) examines course-taking patterns in New York State high schools in 1980 and 1990 and finds that significantly higher proportions of class time were devoted to core courses and advanced courses in 1990 (after enactment of the earlier increase in graduation standards).

Several researchers have also begun to examine the effects of New York State's high stakes high school tests on student outcomes. Iatarola (2003) finds that graduation rates increased after implementation of the new standards, and that dropout rates increased only in the first year

of the new policy. She suggests, though, that higher discharge rates in schools with more dropouts may conceal part of the reform's effect on dropout rates. Monk, Sipple and Killeen (2001) examine Regents test participation rates and "pass" rates (scores over 65 percent) and find that test participation across New York State increased between 1992 and 2000, but that the percentage of test-takers scoring over 65 on various exams fell over the period. They also find little relationship between district-level per-pupil expenditures and test participation rates.

Killeen and Sipple (2002) report on the results of a survey of New York State superintendents and high school principals regarding changes in school district practices in response to New York State's increased graduation requirements. Over two-thirds of administrators who were surveyed reported increasing teaching staff and 40 percent said they had increased the number of teacher aides. About one-third of districts, primarily in urban areas, reported class size reductions in response to the new standards. Almost 90 percent of superintendents and 80 percent of principals stated that their teachers were engaged in more professional development activities, and most high need and urban districts reported that these activities were "fundamentally different" than in previous years, including greater emphasis on the new standards and curriculum frameworks.

Monk, Hussain and Miles (2000) examine changes in resource allocation patterns in New York State districts (apart from the five largest city districts[4]) in relation to changes in Regents examination participation rates between 1992 and 1996.[5] They find a negative relationship between changes in participation rates and changes in pass rates, particularly for districts with lower starting rates. While average spending increased overall in the districts over the period,

[4] The State's "Big Five" largest districts are New York City, Buffalo, Yonkers, Rochester and Syracuse. Unlike most districts in New York State, each is a fiscally dependent city school district.

[5] While this period does precede the start of the Regents diploma requirement for all high school students, the study results provide early indicators of potential responses to the new policy.

they find no relationship between spending levels and changes in participation rates. Examining staffing patterns rather than spending, they find that districts with larger increases in participation rates had significantly larger increases in professional staff per 1000 students and in share of staff devoted to the academic portion of the curriculum. The data also suggest that staff in those districts have been shifting away from remedial courses and toward regular academic courses.

The results of Monk, Hussain and Miles's work suggest that even larger effects may be evident in the data used in our study for several reasons. First, we employ more disaggregated data than the previous study (school-level rather than district-level), allowing us to distinguish between already high performing schools and lower-performing schools. Second, the changes in graduation requirements and high-stakes were actually phased in during our period of study. While it is possible that larger effects would be found in earlier years, following announcement of the change but before implementation, it is likely that school responses would continue, if not accelerate as the requirements were being implemented.

We expect, *a priori*, that schools in which graduation rates were relatively high prior to the change in graduation standards would have smaller changes in their resource allocation patterns as they "stay the course." Conversely, we would expect schools with lower graduation rates to have larger resource allocation changes as they seek ways to meet the new standards.

MODELS

To examine whether the new graduation requirements had an effect on resource allocation patterns, we model school-level resources as a function of school and student characteristics, including school graduation rates. We exploit the panel nature of the data set by including a series of time variables representing the year of the resource data and school fixed effects to capture unobserved time invariant characteristics of the school that could affect

resource allocation patterns. To examine the impact of the increased graduation standards, we include a series of interaction terms between graduation rate and the post-implementation years in the sample. These interactions allow us to explore whether the relationship between a school's graduation rate and its resource allocation patterns changed after the new graduation standards were implemented. Specifically, our model is specified as:

$$R_{it} = \alpha_0 + \alpha_1 ST_{it-1} + \alpha_2 \ln SZ_{it-1} + \alpha_3 EX_{it-1} + \alpha_4 GAP_{it} + \alpha_5 T + \alpha_6 2000GAP + \alpha_7 2001GAP + \alpha_8 2002GAP + s_i + \varepsilon_{it}$$

where R_{it} is the measure of resources in school *i* at time *t.* We control for a number of structural characteristics that may be related to changes in the level and use of resources, by including a vector of student characteristics (ST), such as the percent of students eligible for free lunch, and the log of the school size (SZ) as measured by the number of registered students.[6] We enter these structural characteristics in lagged (*t-1*) form. We control for the base level of spending (EX) using the previous year's spending (*t-1*). The model also includes, ε_{it} , an error term with the usual properties. By using lagged values, we are estimating a model of level and use of resources that reflects the likelihood that such changes in the level and use of resources are sequentially based, taking into account what the school looked like in the previous year

Included in the model is a measure of the gap between the new policy's goal of having a 100% graduation rate and the schools' actual graduation rate (GAP). The graduation rate gap represents how far schools are from achieving the goal of having 100% of all students graduating

[6] Because we examine expenditures on behalf of general education students, including their resource room needs, we use general education students to control for the size of the school.

with the new standards.[7] To control for changes that are affecting all schools over time we include a vector of time dummy variables (T). In order to examine the impact of the higher graduation standards we interact the post-implementation years (2000, 2001 and 2002) with the gap measure. The coefficients on these interaction terms indicate whether or not there is a differential effect of the gap on resources in the implementation years as compared to the years preceding the new higher standards. Of particular interest are the estimates of α_4, α_6, α_7 and α_8, which provide evidence on the graduation policy's effects on school resource levels and uses.

The data provide us with an excellent opportunity to examine whether resources have been redeployed as the phase-in of the new graduation requirements begins. Specifically, we examine seven resource variables: 1) expenditures on services directly related to schools (direct services), 2) percentage of direct service spending devoted to classroom instruction, 3) percent of direct service spending on teachers, 4) the percentage of teachers who are licensed, 5) the percentage of teachers who are experienced (five or more years teaching), 6) the percentage of teachers who have at least a master's degree, and 7) the number of teachers per 100 students. The first three resource variables exclude spending on full-time special education students and include only those expenditures made on behalf of general education students and the related resource room services. The others include resources for all students.

DATA

This study draws on rich school-level data available from New York City's Department of Education (DOE) to create a six-year balanced panel of data (1997-2002). In particular, three

[7] The cohort of students includes all students who graduate, dropout and remain enrolled in school. The sum of the rates of all three total 100%. For example, a school may have a graduation rate of 40%, dropout rate of 25% and a still enrolled rate of 35%. The gap for this school would be 60% (100-40).

sources are used: *School-Based Expenditure Reports* (SBER), *Annual School Reports* (ASR), *Four-Year Longitudinal Reports* ("Cohort Reports"). The SBER are detailed reports on actual school-level spending that break down the expenditures made by the school plus those made on behalf of the school by student type, functional use and fund source. The Department of Education initially published the reports in budget format beginning in 1997 for the 1995-96 school year and has produced expenditure versions for each subsequent year. New York City remains one of the few large urban districts to publicly release such detailed information. The ASR include information on school, student and teacher characteristics, for example the number of students enrolled, the percent of students eligible for free lunch and the percent of experienced teachers. The Cohort Reports track each cohort of students as they enter 9th grade and report on their status after four years, providing school-level data on cohort graduation, dropout and still-enrolled rates.

Given that we are using graduation rates as a measure of student performance it is important to discuss the reliability of this measure, especially in light of recent controversies over graduation rates and their manipulation.[8] The DOE tracks students as they enter 9th grade and reports on their status after four years. This is measure is preferable to one that calculates an annual graduation rate based on the number of students who have remained in school and graduated. There are, however, means by which even the cohort data can be manipulated to inflate graduation rates. Students who leave the New York City public school system and go to either a private school or another public school outside the district are considered discharged and are not included in the calculation of the graduation or dropout rates. Some have claimed that schools are misclassifying students as discharged from the system, when they have actually

[8]For example, high schools in Houston have been accused of falsifying dropout figures, drastically undercounting the number of students who dropped out. See Schemo (2003) as an example of the intense media coverage.

dropped out (Public Advocate for the City of New York & Advocates for Children, 2002). In the analyses that follow, we used an adjusted measure of graduation rate that treats all "discharged" students as dropouts, taking the possibility of intentional misclassification into account, and found no substantive differences. Thus we report our findings using the graduation rate as measured by the DOE.

The balanced panel includes 171 high schools that have spending data for all six years. When characteristics of teachers (experience, licensure, master's degree) are used as the resource measure, the balanced panel includes fewer schools due to missing data for these dependent variables.[9]

Table 1 presents descriptive statistics for the data used in the analyses.[10] From 1997 to 2002, average per pupil spending on services directly related to the operations of schools increased by nearly 41% from $6,121 to $8,635.[11] Approximately 57 percent was allocated to classroom instructional expenditures, with 48 percent spent on teachers. While the share of spending in many of the categories remains constant, there are noticeable differences across the two points in time. For example, spending on teachers as a share of direct services spending decreased by an average of two percentage points and the share going towards professional development and instructional support increased by one and two percentage points, respectively. The majority of teachers have more than five years of teaching experience, are licensed and

[9] Over the six-year period, 1997-2002, there are total of 226 high schools that have been in operation for at least one year. Of those schools excluded from this study, 65% have three or fewer years of spending data and 35% have four or five years of spending data. There are a number of reasons why these schools do not have data for all six years, most commonly that the school may have opened or closed during this time period. In general, the schools excluded from the sample are much smaller, have higher spending and greater student needs than those schools included in the sample. The schools that do remain in the sample, however, are more representative of the typical high school during this period. As a check for possible sample selection bias caused by these exclusions, we conducted the same regression analyses for the entire school population, using an unbalanced panel, and the results do not differ substantially.

[10] Only 1997 and 2002 figures are reported for illustrative purposes and include all schools in the sample. Appendix A provides a more detailed description of the variables used in this study.

[11] If inflation is taken into account, the increase in constant dollars is approximately 21%.

permanently assigned to schools, have master's degrees and have taught in the same school for more than two years. From 1997 to 2002, however, the percentages of experienced teachers and teachers with master's degrees dropped precipitously, likely due to a wave of retirements in which older teachers were replaced by younger, less experienced ones. At the same time, there was an increase in the number of teachers per 100 students from 1997 to 2002. Interestingly, despite the drop in average experience, average salaries increased by approximately 15 percent between 1997 and 2002.

The students in New York City's public high schools reflect the diversity and educational challenges facing many other large urban districts: a relatively high proportion of students from poor families (as indicated by eligibility for free lunch programs), with limited English proficiency, recent immigrants, and students in need of resource room services or special education instructional settings. The proportion of such students has remained high but stable over the time period, with the exception of increases in free lunch eligible and limited English proficient students.[12]

Also reported in Table 1, graduation rates have increased on average by two percentage points from 1997 to 2002, while dropout rates have increased by more than one percentage point. It appears that higher proportions of students, rather than remaining enrolled in high school beyond four years, are either graduating or dropping out. If all students who have been discharged from the school system are counted as dropouts, the dropout rate is much larger and the increase across the years is also greater.

[12] As is the case in most districts, free lunch eligibility is lower in high schools than either elementary or middle schools. This is often attributed to the difficulty of getting parents of high school students to fill out the eligibility forms.

RESULTS

In order to provide an in-depth analysis of resources (level and use) and graduation rates and gaps, we first explore the data descriptively, focusing on the beginning and end-points of our panel – 1997 and 2002. We group schools into quintiles based on the initial graduation rate in 1997 and, then, on the change in graduation rates from 1997 to 2002 and explore the same set of resources, structural characteristics and graduation rates. We then discuss our regression estimates of the model described above.

We hypothesize that schools in which a majority of students were meeting state graduation requirements prior to the new state Regents standards – those with a smaller graduation gap - would have more consistent spending patterns than would schools in which relatively few students met the standards – those with a larger gap. As a first step to explore this hypothesis, we divide the schools into quintiles – first, based on their graduation rate gaps in 1997 and second, on the change in the graduation rate gap between 1997 and 2002. Note that the quintile comparisons for (1) 1997 and (2) the change between 1997 and 2002 do not compare identical groups of schools. For example, schools in the top quintile for 1997 have high graduation rates, but these schools may have small changes in graduation rates from 1997 to 2002 and not be in the top quintile when grouped by change in rates.

Table 2 presents average (1997, 2002 and change from 1997 to 2002) resource allocation patterns, structural characteristics and student performance for the lowest and highest quintiles based on 1997 gap.[13] As reported in Table 1, the average gap for all high schools in the sample is 47%. In the lowest quintile the average gap is 73% (average graduation rate of 27%). In contrast, the average gap in the highest quintile is 20% (average graduation rate of 80%). There

[13] We only report the lowest and highest quintiles to examine whether there appears to be convergence between the two groups. Note that the lowest quintile includes those schools with the highest gap rate (lowest graduation rate), while the highest quintile includes those schools with the lowest gap rate (highest graduation rate).

are clear differences across the groups not only in graduation rates but, unsurprisingly, in student needs, with the lower performing schools having much higher percentages of students eligible for free lunch, with limited English proficiency, and receiving resource room services.

While spending on direct services increased overall over the period, there were sharp differences across the quintiles, with the lowest quintile showing the largest spending increases. While spending increased by almost $2,100 per pupil in the highest performing quintile, this was only 83 percent of the average increase for all high schools. As noted above, approximately 57 percent of direct service dollars were spent on classroom instruction in both years, suggesting that, as spending levels increased, spending patterns changed little as schools continued to devote a stable share of resources to direct instruction. Across quintiles, though, some differences emerge, as the top quintile devoted a larger share of resources to classroom instruction than did schools in the lowest quintile. Similarly, while the higher performing schools (top quintile) slightly increased the share devoted to classroom instruction, the lowest quintile schools slightly decreased their share. A similar pattern appears across quintiles in the share of direct services dollars devoted to classroom teachers, with the upper quintile allocating a higher percentage as compared to schools with lower graduation rates. The decrease of more than two percentage points between the years is almost uniform across the groups of schools.

Teachers are, arguably, the most important resources available to schools. Previous research on school-level resource allocation in New York City and elsewhere has found differences in the deployment of teachers across schools, which often appear as “trade-offs” between teacher-pupil ratios and teacher qualifications (see for example, Rubenstein, 1998; Stiefel, Rubenstein and Berne, 1998; Iatarola and Stiefel, 2003). Table 2 also displays average teacher characteristics by lowest and highest quintile for the two years and reveals several

differences across the quintiles and across the years. For both quintiles there was a large decline in the percentage of teachers with at least five years experience, and in the percentage with a master's degree or higher. The decreases may be a function of a number of factors, such as the retirement of an aging pool of teachers and the loss of teachers to nearby suburban districts.[14]

While the patterns are not entirely consistent, schools with higher graduation rates tend to have a more stable teaching force, with teachers who are more likely to have a master's degree, a full license and, not surprisingly, higher average salaries in both years. The number of teachers per 100 students increased over the period and lower quintile schools consistently employed more teachers per student. While previous intra-district research has typically focused on the relationship between teacher characteristics and student poverty or needs, often finding that schools with higher proportions of low income students tend to have more teachers, but with less education, experience and lower salaries, the results here suggest that similar patterns may also arise in relation to student performance. Since graduation rates are so closely linked to student needs, however, it not possible to disentangle the complex relationships in these quintile analyses. These patterns also do not explain the direction of the causality, and are not intended to imply that these resource allocation patterns cause the differences in performance.

While Table 2 displays differences in spending patterns before and after the change in Regents graduation standards for high and low graduation rate schools (as measured by graduation rates in 1997), it does not shed light on spending patterns in schools that had the biggest *changes* in graduation rates between the two years (or, conversely, the biggest changes in the gap). Table 3 displays the same resource variables for schools grouped into quintiles by the

[14] The percentage of experienced teachers decreased by nearly 6 percentage points from 1997 to 1998, never fully rebounding and further dropping from 2001 to 2002. The percentage of teachers with master's degree or higher declined by 11 percentage points from 1997 to 1998, also rebounding and precipitously dropping from 2001 to 2002. The latter decrease appears to be related to a large wave of teacher retirements with over 4,000 teachers, approximately 5 percent of the entire teaching force and nearly 50 percent of those eligible, doing so.

change in their graduation rate gap. The schools in the lowest quintile actually had a decrease in graduation rates over the period, while those in the highest quintile had increases of over twenty percentage points. Average graduation rates in 1997 were over 10 percentage points higher in the first quintile of schools. By 2002, though, the differences are quite pronounced, with an average graduation rate difference of over 25 percentage points between the highest and lowest quintiles. Thus, there appear to be large "value added" outcome differences across the groups of schools. At the same time, the differences in student needs across the quintiles are relatively small and inconsistent, especially when compared to the previous analysis based on graduation rate levels. Therefore, it is unlikely that differences in graduation rate changes across the groups are due solely to differences in the characteristics of the students they serve.

As previously noted, overall spending on direct services increased substantially, but the table shows that the increase was larger in the schools with the largest increase in graduation rates. This pattern is interesting since the New York City Department of Education did not explicitly allocate additional resources to schools with low graduation rates, and in fact, the schools had very similar graduation rates at the start of the period. Part of the explanation may be found in the comparison of school size. The schools in the highest quintile averaged only 767 students in 1997, less than half the average in each of the other four quintiles. Size does not entirely explain this pattern though. While equal expenditure increases will result in much higher per-pupil increases in smaller schools, most resource are distributed on a per-pupil rather than a per-school basis.

Both quintiles increased the share of direct services spending devoted to classroom instruction at the same time that the level of direct services spending was increasing, with the largest increase in the highest quintile. Interestingly, though, the share of spending devoted to

classroom teachers fell slightly over the period. Schools with the highest gains also had the largest increase in the share of spending devoted to professional development for teachers, which more than doubled. The share remained low, though, reaching only 3.7 percent of direct services spending in 2002.

Few substantial differences in teacher characteristics emerge across the quintiles. All schools decreased the percentage of teachers with master's degrees and with more than five years of teaching experience, but surprisingly, the declines tended to be largest in the schools with the largest graduation rate gains (Q5). At the same time, average teacher salaries increased, a surprising result given that education and experience largely determine teacher salaries. All schools slightly increased the number of teachers per 100 students, though no clear pattern emerges across the quintiles.

One stark difference emerges across the quintiles: the percentage of teachers who have been in the school for more than two years fell slightly in the lowest quintile but increased by over 11 percentage points in the highest quintile. The highest-gaining schools had much lower rates in 1997, but had almost reached the average of the other quintiles by 2002. While at first glance this might suggest that teacher stability has a strong relationship with student performance gains, the story is likely more complex. Recall that the largest gainers also tend to be much smaller than the other schools, suggesting that many of these schools may be part of the "small schools" initiative of the early 1990s in New York City (Stiefel, Berne, Iatarola & Fruchter, 2000). Thus, the increase in stability of the teaching force may largely be an artifact the schools' relative newness. At the same time, this explanation does not entirely negate the potential effect that increasing stability in the teaching force could have on student outcomes.

The quintile comparisons illustrate some of the differences in resource use across schools with high and low graduation rates, and with large changes in graduation rates. But, as noted, they do not allow us to disentangle the impact of other related factors, such as school size and student characteristics. To begin to do so, we turn to a series of multiple regression analyses examining the relationship between graduation rate and resource allocation patterns, controlling for other school and student factors.

Tables 4 and 5 present results from a series of regression analyses, with the dependent variables (resources) listed along the top row and the independent variables listed down the left hand column. We include dummy variables representing each year of the data set (excluding the first year, 1997) to assess changes affecting all schools over time. The coefficients on these dichotomous variables represent average differences in resource allocation patterns across all schools between 1997 and the year represented by the variable. We include a set of lagged variables representing school and student characteristics to control for resource use patterns related to the demographics of the school.[15] Our variables of interest are two measures of the graduation rate "gap" which we specify as (100 – graduation rate). Since the stated target is a 100 percent graduation rate, we hypothesize that schools farther from the goal will require more pronounced changes in resource allocation patterns as compared to schools closer to meeting the standard.[16]

The first column in Table 4 displays the results examining direct services spending. The large coefficients on the categorical variables representing the year indicate – as in the previous

[15] The school and student characteristics are lagged one year. Thus, for example, if direct services spending in 1999 is the dependent variable, the percentage of students eligible for free and reduced price lunch in 1998 is an independent variable.

[16] Each of these equations also includes a series of dummy variables representing observations with missing data for each of the student characteristics. These variables are included to test whether observations with missing data are significantly different from other observations. Though the results are not reported here, the coefficients are significant in a number of cases, suggesting that further investigation of these missing observations is warranted.

analyses – that direct services spending (in nominal dollars) increased over the period, but the increases level off a bit after 1999. Many of the student demographic variables, with the exception of Resource Room students, are not significant. The school fixed effects that are included in the estimation may absorb the effects of time invariant demographic variables. For the gap variable and gap interacted with post-implementation years there is no significant relationship with the level of direct services spending. The explanatory power of all the estimated models ranges between 78 and 89%, with the high rate in part attributable to the inclusion of the school fixed effects.

The next two sets of columns examine the percentage of expenditures spent on instruction and on teachers, respectively. The coefficients on the year variables show that the proportion of spending on classroom instruction was not significantly different from the proportion spent in 1997. The proportion of spending on classroom teachers, however increased in 1998 and 1999 as compared to 1997, but was not significantly different from 1997 in the subsequent years. Schools with higher levels of per-pupil direct services expenditures spent slightly higher percentages (0.001) on both classroom instruction and teachers, suggesting both a level and share effect on per-pupil spending. The variables measuring student characteristics generally have no significant relationship with resource deployment, with the exception of the percent of students with resource room services. Schools with higher percentages of such students spent a lower proportion of funding on classroom instruction and teachers.

For both variables the coefficient on the gap variable is negative and significant; that is schools with larger gaps spend a smaller share on classroom instruction and teachers.[17] The interactions of gap and post-implementation years, however, are not significant.

The first three sets of columns in Table 5 examine teacher characteristics, specifically the percentage of teachers with more than five years of experience, the percentage who are fully licensed and the percentage with a master's degrees or higher. The results show large decreases in teacher experience and education relative to 1997. Although, the same pattern is true for teacher licensure, the differences relative to 1997 are not significant. As might be expected, larger schools tend to have a lower percentage of teachers with master's degree or higher though they also show larger percentages of licensed teachers.

The variables of interest – gap and gap interacted with post-implementation years - show little relationship with teacher characteristics as the variables are only significant in relation to the percentage of experienced teachers. Schools with larger gaps have fewer such teachers, but do increase the percent of experienced teachers in the second of the three post-implementation years. This result provides limited evidence that lower performing schools may have taken steps to add additional experienced teachers in the post-reform years.

The final dependent variable in Table 5 is the number of teachers per 100 pupils.[18] The year-to-year swings suggest a pattern of increases relative to 1997. Again, the size of the school appears to matter in that larger schools have fewer teachers per 100 pupils. Differences across schools, however, are unrelated to the gap and interaction variables.

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[17] Schools with larger gaps also spend a smaller share on educational paraprofessionals. The interaction of gap with the first post-implementation year (2000) is significant; schools with larger gaps significantly increased their spending on paraprofessionals. These results are not reported in the tables as the share of resources spent on educational paraprofessionals is slightly more than one percent, a negligible amount relative to the broader category of classroom instruction that includes spending on paraprofessionals.

[18] Note that 1997 data on teachers per pupil are not available, thus 1998 is the base year.

CONCLUSIONS

This study finds some evidence of differences in how high and low graduation rate New York City high schools allocated resources, and limited evidence that schools with lower graduation rates redeployed resources following the implementation of new state graduation requirements. For example, all schools experienced large declines in teacher experience and education over the period, changes which do not bode well for raising student performance. Schools with larger gaps (lower graduation rates) slightly increased their proportion of licensed, permanently assigned teachers, while schools with the highest graduation rates experienced a much smaller increase. Many of the differences across the quintiles though, appear to be related to other observable differences in the schools' student body composition, such as poverty, language needs and special education eligibility. Comparing changes in resource use in the schools with the largest increases in graduation rates to those in schools with the largest decreases, we find that overall spending levels and share of spending devoted to classroom instruction increased the most in the schools with the largest increases in graduation rates, though the differences were small. This does not necessarily suggest causality but may simply reflect lower instructional needs in the higher performing schools. Schools with declining graduation rates had larger increases in the number of teachers per student and average teacher salaries over the period, but just as the earlier differences appeared to be largely related to differences in student characteristics, these differences may be largely related to school size, as the schools with the largest graduation rate increases were substantially smaller on average than schools with declining graduation rates.

While the quintile analyses reveal a number of interesting patterns, the regression analyses demonstrate the difficulty in disentangling the causes of these patterns by highlighting the influence of structural characteristics, in particular, the size of schools and student characteristics. Overall, the regression analyses with school fixed effects reveal large increases in direct services spending over this time period (1997 to 2002), at the same time that the percentage of teachers with over five years of experience and with a master's degree was falling. These changes largely affected all schools, however, not simply those with larger graduation gaps to overcome. While schools with larger gaps tended to have somewhat lower spending on classroom instruction and teachers, and to have lower proportions of experienced teachers, we found little evidence that these patterns changed differentially for schools with larger gaps in the years after the new Regents graduation standards were implemented. The lone exceptions are teacher experience and licensure, which do show some evidence of significantly larger increases in schools with larger gaps (lower graduation rates) in the years after the new standards were put in place.

Why might there have been limited redeployment of resources in the wake of these new standards? There may be several reasons. Particularly in the case of teacher resources, schools may be constrained by contractual obligations that limit school flexibility to redeploy teachers (Lankford, Loeb and Wyckoff, 2002). At the same time, schools may have been preoccupied by the challenges of a changing teaching force with experienced teachers leaving the system, leaving them unsure or unable to more effectively deploy resources. If schools are succeeding under the new requirements by getting those students who have been on the cusp of graduating to graduate, then perhaps it is not yet necessary to redeploy resources. Some preliminary findings regarding spending by category though, for example the large relative increase in spending on

professional development in schools with the largest gains, suggest that schools may have more flexibility and greater differences might emerge in the use of non-teacher resources.

As schools face the challenges of higher educational standards, it is important that we gain insight into their institutional responses. There has been vociferous debate about resources in relation to the requirements of *No Child Left Behind*. Clearly, the debate must go beyond the argument that more resources are needed and examine more closely the ways in which schools and school systems can and have responded in terms of both the level and use of resources. That further research is needed on institutional responses is clear. This study is a first step in exploring the institutional responses of schools in a large urban district, where institutional challenges are often the most difficult.

Table 1. Mean of analytic variables.

	1997	2002
Resources		
Direct Services Expenditures per Pupil	$6,121	$8,635
Pct. Classroom Instruction	57.17	57.98
Pct. Teachers	48.41	46.62
Pct. Educational Paras	1.20	1.15
Pct. Professional Development	2.14	3.45
Pct. Instructional Support	8.34	10.39
Pct. Leadership, Supervision & Administration	13.40	14.49
Pct. Ancillary	7.19	6.20
Pct. Building Services	13.90	10.57
Pct. Teachers, w/5+ years teaching experience	61.75	55.84
Pct. Teachers, licensed and permanently assigned	76.16	79.51
Pct. Teachers, w/Masters degree or higher	88.91	71.22
Pct. Teachers, in this school more than 2 years	65.29	64.34
Average Number of Days Teacher Absent	6.12	8.87
All Teachers per 100 students	5.38	6.30
Average salary per teacher (FTE)	$42,075	$48,249
Structural Characteristics		
Pct. Eligible for free lunch, t-1	47.40	55.39
Pct. Limited English proficient, t-1	12.19	15.19
Pct. Recent Immigrants (arrive<3yrs), t-1	9.73	8.11
Pct. Resource room, t-1	5.20	5.69
Pct. Full-time special education, t-1	5.19	5.82
General education student count, t-1	1,574	1,480
Student Performance		
Gap (100-graduation rate), t-1	46.64	44.71
Graduation rate, t-1	53.36	55.29
Dropout rate, t-1	11.75	13.00
Still Enrolled rate, t-1	33.96	31.71
Dropout rate (includes discharged students), t-1	26.35	28.30

Italics: Variables not included in regression analysis.

Table 2. Mean of analytic variables by quintiles based on 1997 gap (100-graduation rate).

	1997		2002		Change 1997 to 2002	
	Q1	**Q5**	**Q1**	**Q5**	**Q1**	**Q5**
Resources						
Direct Services Expenditures per Pupil	$6,437	$5,574	$9,747	$7,673	$3,310	$2,099
Pct. Classroom Instruction	56.68	61.79	55.92	62.16	-0.76	0.38
Pct. Teachers	46.81	53.02	44.77	50.40	-2.04	-2.62
Pct. Educational Paras	2.56	0.39	2.30	0.77	-0.25	0.38
Pct. Professional Development	2.22	1.55	2.86	3.49	0.64	1.95
Pct. Instructional Support	10.50	7.18	12.68	8.60	2.18	1.41
Pct. Leadership, Supervision & Administration	14.56	12.21	14.86	13.22	0.30	1.01
Pct. Ancillary	5.91	7.81	5.18	6.98	-0.72	-0.83
Pct. Building Services	12.35	11.01	11.00	8.70	-1.35	-2.31
Pct. Teachers, w/5+ years teaching experience	63.24	69.70	58.20	61.90	-3.86	-7.80
Pct. Teachers, licensed and permanently assigned	74.29	83.53	79.05	85.49	6.57	1.95
Pct. Teachers, w/Masters degree or higher	87.60	90.61	69.80	77.74	-18.01	-12.87
Pct. Teachers, in this school more than 2 years	72.43	71.95	65.71	68.32	-5.09	-3.63
Average Number of Days Teacher Absent	6.17	6.14	8.73	8.40	2.57	2.25
All Teachers per 100 students	5.68	4.96	6.64	5.80	0.96	0.84
Average salary per teacher (FTE)	$41,014	$45,824	$49,195	$50,858	$8,181	$5,034
Structural Characteristics						
Pct. Eligible for free lunch	63.65	29.92	75.07	28.34	11.38	-1.52
Pct. Limited English proficient	13.99	4.91	16.01	5.37	1.59	0.08
Pct. Recent Immigrants (arrive<3yrs)	8.81	4.09	8.60	3.98	-0.19	-0.11
Pct. Resource room	4.14	2.70	7.90	3.78	3.69	1.37
Pct. Full-time special education	5.44	3.16	6.07	3.48	0.63	0.32
General education student count	1,250	2,106	1,003	2,111	-247	4
Student Performance						
Gap (100-graduation rate)	73.45	19.96	66.44	16.73	-7.01	-3.23
Graduation rate	26.55	80.04	33.56	83.27	7.01	3.23
Dropout rate	17.52	3.97	21.03	4.55	3.51	0.58
Still Enrolled rate	55.93	15.99	45.43	12.19	-10.51	-3.80
Dropout rate (includes discharged students)	31.12	15.99	38.16	16.55	7.04	0.56

Italics: Variables not included in regression analysis.

Table 3. Mean of analytic variables by quintiles based on change in gap (100-graduation rate) from 1997 to 2002.

	1997		2002		Change 1997 to 2002	
	Q1	**Q5**	**Q1**	**Q5**	**Q1**	**Q5**
Resources						
Direct Services Expenditures per Pupil	$6,110	$6,445	$8,531	$9,381	$2,421	$2,935
Pct. Classroom Instruction	57.48	53.72	58.91	55.29	1.43	1.57
Pct. Teachers	47.96	45.30	47.46	43.31	-0.50	-1.98
Pct. Educational Paras	1.21	1.03	1.31	1.07	0.09	0.05
Pct. Professional Development	2.67	1.82	3.62	3.70	0.95	1.88
Pct. Instructional Support	9.60	7.29	10.80	9.39	1.20	2.10
Pct. Leadership, Supervision & Administration	13.87	13.76	13.84	15.13	-0.03	1.37
Pct. Ancillary	7.52	6.60	5.86	6.04	-1.65	-0.57
Pct. Building Services	11.53	18.63	10.24	13.83	-1.29	-4.80
Pct. Teachers, w/5+ years teaching experience	60.94	55.32	56.51	48.69	-4.26	-5.72
Pct. Teachers, licensed and permanently assigned	76.01	72.66	78.39	74.79	2.59	3.18
Pct. Teachers, w/Masters degree or higher	87.64	88.81	71.04	68.66	-16.76	-20.15
Pct. Teachers, in this school more than 2 years	67.91	49.50	64.07	60.76	-3.26	11.83
Average Number of Days Teacher Absent	5.84	5.60	8.51	8.65	2.71	3.34
All Teachers per 100 students	5.24	5.49	6.43	6.49	1.19	1.01
Average salary per teacher (FTE)	$41,664	$40,068	$48,360	$45,736	$6,696	$5,668
Structural Characteristics						
Pct. Eligible for free lunch	50.17	53.39	61.21	59.36	10.24	3.95
Pct. Limited English proficient	14.61	6.37	13.67	5.25	1.72	-1.13
Pct. Recent Immigrants (arrive<3yrs)	13.06	3.13	12.69	2.77	-0.37	-0.54
Pct. Resource room	4.05	4.03	7.53	6.99	3.35	3.06
Pct. Full-time special education	5.61	3.77	7.27	3.93	1.67	0.16
Size	1,788	767	1,595	728	-193	-39
Student Performance						
Gap (100-graduation rate)	45.91	53.88	56.23	31.13	10.32	-22.75
Graduation rate	54.09	46.12	43.77	68.87	-10.32	22.75
Dropout rate	10.91	9.17	18.66	6.85	7.76	-2.32
Still Enrolled rate	35.01	44.71	37.56	24.28	2.55	-20.42
Dropout rate (includes discharged students)	28.01	20.97	36.06	23.86	8.05	2.89

Italics: Variables not included in regression analysis.

Table 4. Fixed effects model parameter estimates, spending variables as dependent variables (standard errors in parentheses)

	Direct Services	% Classroom Instruction	% Teachers
% Students, eligible for free lunch, t-1	-1.09	**0.04**	**0.03**
	(2.67)	(0.01)	(0.01)
% Students, limited English proficient, t-1	-2.62	0.01	-0.02
	(7.37)	(0.03)	(0.03)
% Students, Recent Immigrants (arrive<3yrs), t-1	0.46	0.00	0.00
	(8.02)	(0.03)	(0.03)
% GE Students w/resource room services, t-1	55.97*	-0.20*	-0.18*
	(19.47)	(0.08)	(0.08)
Log of general education student count, t-1	-37.43	2.10	0.32
	(279.26)	(1.19)	(1.16)
Direct Services Expenditures, t-1	0.23*	0.001*	0.001*
	(0.04)	(0.00)	(0.00)
Gap (100-graduation rate), t-1	6.71	-0.07*	-0.06*
	(3.78)	(0.02)	(0.02)
1998	767.24*	-0.50	1.97*
	(103.46)	(0.44)	(0.43)
1999	997.20*	-0.86	1.42*
	(115.55)	(0.49)	(0.48)
2000	1337.97*	-0.66	-0.19
	(192.14)	(0.82)	(0.80)
2001	1647.84*	1.02	-0.16
	(216.17)	(0.92)	(0.90)
2002	1640.66*	1.60	-0.28
	(218.35)	(0.93)	(0.91)
2000*Gap	-2.93	0.03	0.02
	(3.66)	(0.02)	(0.02)
2001*Gap	6.78	0.00	0.02
	(4.01)	(0.02)	(0.02)
2002*Gap	7.76	0.01	0.02
	(4.05)	(0.02)	(0.02)
R-Square	0.811	0.809	0.797
F	18.71	18.52	17.09
N Observation	1026	1026	1026
N Schools	171	171	171

* Significant at $p<.05$

Table 5. Fixed effects model parameter estimates, teacher characteristics as dependent variables (standard errors in parentheses)

	% Experienced	% Licensed	% Masters	Teachers per 100 Pupils
% Students, eligible for free lunch, t-1	-0.015	-0.041	-0.026	**0.004**
	(0.02)	(0.02)	(0.02)	(0.00)
% Students, limited English proficient, t-1	-0.077	-0.074	0.017	-0.004
	(0.07)	(0.07)	(0.05)	(0.00)
% Students, Recent Immigrants (arrive<3yrs), t-1	-0.303*	-0.269*	-0.105	0.001
	(0.08)	(0.09)	(0.07)	(0.00)
% GE Students w/resource room services, t-1	0.147	0.026	0.067	-0.007
	(0.19)	(0.20)	(0.16)	(0.01)
Log of general education student count, t-1	-6.610	9.861*	-8.776*	-0.275*
	(4.65)	(4.81)	(3.62)	(0.09)
Direct Services Expenditures, t-1	0.000	0.001*	-0.001*	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Gap (100-graduation rate), t-1	-0.084*	0.006	0.037	-0.003
	(0.03)	(0.03)	(0.03)	(0.00)
1998	-6.633*	-0.381*	-10.083*	0.560*
	(0.82)	(0.85)	(0.67)	(0.06)
1999	-5.435*	-2.356	-9.358*	0.562*
	(0.95)	(0.98)	(0.77)	(0.07)
2000	-6.816*	-2.052	-8.833*	0.769*
	(1.58)	(1.63)	(1.27)	(0.11)
2001	-8.745*	-0.595	-8.482*	0.741*
	(1.76)	(1.82)	(1.41)	(0.13)
2002	-9.487*	-4.731*	-15.820*	0.801
	(1.80)	(1.87)	(1.44)	(0.13)
2000*Gap	0.039	0.006	-0.013	0.001
	(0.03)	(0.03)	(0.02)	(0.00)
2001*Gap	0.065*	0.054	-0.005	0.000
	(0.03)	(0.03)	(0.03)	(0.00)
2002*Gap	0.035	0.087*	0.018	0.002
	(0.03)	(0.03)	(0.03)	(0.00)
R-Square	0.8868	0.7988	0.8272	0.7835
F	33.36	16.91	20.40	15.91
N Observation	858	858	864	1026
N Schools	143	143	144	171

* Significant at $p<.05$

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