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SCHOOL PERFORMANCE AND RESOURCE USE: THE ROLE OF DISTRICTS IN NEW YORK CITY

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ABSTRACT:

This study examines the role of school sub-city districts in determining the performance/efficiency of their member schools. The study identifies low and high performing schools and sub-city districts using a three-year panel of data on New York City elementary and middle schools. The results suggest that districts 'matter' to school performance, even when they have no revenue raising responsibility. The implication is that accountability systems need to be designed to recognize the role of school districts, and hold them accountable for their performance as well.

I. Introduction

State accountability systems as well as the system written into the reauthorized Elementary and Secondary Education Act rely on measures of performance to judge how well schools are educating their students. While the role of districts in financing schools is well known, relatively little attention has been paid to any other function the district might have in determining school performance. Advocates for school-based budgeting and school-based financing argue that educational policymaking and primary control over budgeting is best left to schools, with more limited responsibilities for districts in areas such as support services for joint purchasing or professional development. At the same time, the movements toward greater state financing and more stringent state accountability systems are strong forces shifting revenue raising and authority over curriculum from the district to the state level. Do districts continue to matter at all in how schools perform? Why and in what ways?

New York City provides an excellent laboratory in which to study these questions. New York City's elementary and middle schools are organized into 32 community school districts that receive resource allocations from the umbrella citywide school district that is dependent on the city government for revenues. State and federal funds, by and large, are channeled through the citywide district to the community school districts. Each district has a superintendent in charge of operations and instruction and in almost every respect, other than raising revenue, the district functions in a manner similar to independent school districts. Thus, the differences in school performance across these districts is not due primarily to differences in taxation and/or tax bases, but to differences in the effectiveness of schools and districts in dealing with their differing populations. This study uses data from New York City's public elementary and middle schools to examine the differences in school performance across school districts and to investigate the role of the districts in shaping school performance.

The chapter is organized as follows. In section II we review the relevant literature on districts and accountability and in section III we develop a model of the production of education. We describe the data used in the analysis in section IV and we present results on sub-city districts in section V and on schools in districts in section VI. In section VII we conclude.

II. Literature

In the past decade two-thirds of the states have developed accountability systems with most focusing more heavily on school rather than district performance. Of the 33 states that have statewide accountability systems, four hold only districts accountable for student performance, 13 hold both districts and schools accountable, and 16 place all of the accountability at the school level (Goertz, Duffy & LeFloch, 2001). The policy and research focus, however, has been on holding schools accountable as illustrated by the 1996 volume on accountability entitled, *Holding Schools Accountable: Performance-Based Reform in Education* (Ladd, 1996a). The focus on schools is clear. Ladd writes in the introduction, "[M]any people believe that schools should be held more accountable for the academic performance of their students (Ladd, 1996b p. vii)." Districts in large part are absent from the volume's papers, either because districts are not part of the school-based programs (e.g., Clotfelter & Ladd, 1996) or because the research focuses on schools. In the case of Mississippi, the state relies on relative performance categories to hold districts accountable through its accreditation process that has low incentives and low sanctions (Elmore, Abelmann & Fuhrman, 1996). It is somewhat surprising that districts are not more fully considered in accountability systems that involve high stakes, such as financial incentives, promotion, or sanctions, given that districts serve at a minimum to coordinate educational services of their schools. Further, this oversight might lead to ineffective policies and/or sanctioning or rewarding of schools. Consider the possibility of two schools that in every respect may be similar, but differ in terms of performance. Is an accountability system fair if it does not include the district, given that the difference in performance between the two schools may be attributable to their districts?

Research on the production and costs of education has shifted from district-level analyses to school-level analyses as school-level data are increasingly available. Furthermore, the school is often the unit of analysis most appropriate for production related studies. As shown by Hanushek, Rivkin and Taylor (1996), production functions may be biased when aggregated data are used and models are mispecified.

With regard to districts, other than their role in school performance, researchers have examined a wide variety of topics including district administrative spending, district consolidation and district size. Using a ten-year panel of data on district spending and performance in New York State, Brewer (1996) finds that educational performance is lower in districts with higher district administrative spending. The difference, however, is not statistically significant. School district consolidation is often proposed for smaller districts as a means by which they can lower their costs, taking advantage of economies of scale of the larger consolidated district. Districts with less than 500 students may benefit, in terms of cost savings, from consolidation (Duncombe, Miner & Ruggiero, 1995). In terms of performance, smaller school districts moderate the negative relationship between socio-economic factors and student performance (Howley, 2000). Using a single cross-section of data on public high schools in New Jersey, Fowler and Walberg (1991) find strong relationships between district socio-economic status and high school performance. In her study of Ohio's public schools, Schwartz (1999) examines the role of districts in allocating funds across schools and contrasts district-based allocation de facto formulas to a simulated statewide funding system. She finds that districts do differ in their distribution of spending across schools, and that a statewide system for allocating resources would differ substantially from the current system by narrowing disparities in school spending policies across districts.

III. Model of Production of Education[1]

The factors determining the output of schools and districts can be investigated using a production function to measure the maximum amount of output that can be produced from a given quantity of inputs. In its general form, the production function can be represented as:

$$Q = f\,(X_1, X_2, \ldots X_n) \qquad (1)$$

where Q represents the quantity of output, X_1, X_2, ... X_n are the *n* inputs to production, and *f* (.) is the transformation linking them. Historically, district-level analyses have dominated the research literature, largely because school-level data were seldom available across or within districts. Conceptually, school-level data are preferable for estimating production functions because they more closely represent the actual operation of schools within districts. But the choice between school-level and district-level analyses is not so clear-cut in efforts to use production function estimates to measure effectiveness. In this case we are interested in both, as schools operate within districts.[2] As we noted above, districts may well perform important functions that go beyond revenue raising, such as establishing and coordinating educational programs for students and teachers in the district's schools.

Using a three-year school-level panel of data on schools and districts that includes measures of school performance as well as average characteristics of students and resources, we first estimate the following model of production:

$$TS_{sdt} = \alpha_0 + \alpha_1 TS_{sdt-1} + \alpha_2 ST_{sdt} + \alpha_3 SC_{sdt} + \alpha_4 T + \alpha_5 D + \varepsilon_{sdt} \quad (2)$$

Where s indexes schools, d indexes districts and t indexes time and TS_{sdt} is output measured as average student achievement on tests. TS_{sdt-1} is output one period ago, ST_{sdt} is a vector of school and student characteristics, SC_{sdt} is a vector of school inputs (purchased or donated) and characteristics, T is a vector of time dummies, D is a vector of district dummies, and ε_{sdt} is an error term (or several error terms) with the usual statistical characteristics. The coefficients on the district dummies, D, are known as district fixed effects. These district effects (α_5) measure the residual variation in school output unaccounted for by variation in inputs across schools, student characteristics, etc. that is systematically related to a given district. Thus, these can be viewed as measures of technical efficiency – more specifically, the relative efficiency of the districts in the sample - *controlling for* differences in student and school characteristics.[3]

The district fixed effects capture the impacts of unobservable or unmeasured factors, but our data also include some observable information about the districts that might be important determinants of school performance. These observable factors include district size, measured both by the number of students and the number of schools; average student performance in the district as indicated by test scores; average level of resources; and measures of resource use, such as percentages devoted to various functions. Estimating the impact of these characteristics on school performance can be accomplished in two ways. A two-stage method would first estimate the district-effects (α_5) in a model like (2) and then estimate a second regression explaining the variation in the district effects with the district characteristic variables described above. A second, and statistically more attractive method, includes the district-level variables in the first stage model, and estimates the impacts directly.[4] The estimated coefficients on these district-level variables, then, offer insight into what it is about districts that matters in relation to school production. Thus, equation 2 is modified as follows:

$$TS_{sdt} = \alpha_0 + \alpha_1 TS_{sdt-1} + \alpha_2 ST_{sdt} + \alpha_3 SC_{sdt} + \alpha_4 T + \alpha_5 DS_{dt} + \alpha_6 DS_{dt} + \alpha_7 DC_{dt} + \varepsilon_{sdt} \quad (3)$$

where DS_{dt} is the average output of the district, measured as test scores, DT_{dt} is a vector of district characteristics, and DC_{dt} is a vector of average school inputs.

To estimate equations 2 and 3, we use school-level data that provide the commonly-used measures of student and school characteristics and use robust standard errors to correct for clustering of schools within districts. In terms of outputs, there are multiple measures available from which to choose. The New York City Board of Education (BOE) tests students in grades three through eight, using citywide or statewide reading and mathematics exams. The two most commonly reported measures of outputs are the percent of students meeting a required level, often the nationally normed 50th percentile, and the average normal curve equivalent (NCE) score. The former is much easier to interpret, but the NCE score is preferable because it provides more information about the school's (or district's) overall performance rather than simply the proportion of students meeting a specific cutoff. Because tests and their standard deviations change across time, we standardize the scores in each tested grade to the citywide average by calculating a Z score,[5] which represents the distance between the score for a particular grade or particular school and the citywide average, relative to the standard deviation. We then average all the grade-specific Z scores to obtain a school-level average Z score.[6]

IV. Data

Sources

This study uses a three-year (1996-97 through 1998-99) panel of data obtained from two main sources, of the New York City Board of Education (BOE). The *School Based Expenditure Reports* (SBER) provide rich and detailed data on school-level spending and a count of the number of full-time equivalent teachers in a school. For example, spending can be broken down by student type with spending on students who are in special education classroom settings on a full-time basis separated from spending on students in general education classrooms and their related resource room services. Additionally, the data contain a wealth of information on the functional purpose of the expenditures. The broadest categorization of spending breaks down expenditures into those that directly provide services to schools, those that provide for district administration and those that cover systemwide costs, such as debt service. Within each of these categories, there is information on the purpose of the expenditures. For example, direct services spending is broken down into more detailed categories such as classroom instruction, instructional support and leadership. Even finer detail on the functional purpose of spending is available within these categories. The *Annual School Reports* (ASR) provide school-level data on student and teacher characteristics and student performance. In addition to these two sources, the study uses data obtained directly from the BOE to augment measures of school-level student performance on citywide reading and mathematics exams, specifically data on individual NCE scores that are aggregated to the school level. District-level data are created from these school-level sources and are described below.

Sample Size

There are over 1,100 public schools operating in New York City. Nearly 900 of these are elementary and middle schools organized in 32 community school districts while the rest are high schools or citywide special education schools.[7] The number of schools changes from year to year for a variety of reasons, reflecting the opening of new schools or the closing or reorganization of existing schools. We analyze school performance by school, we include only schools with reading and mathematics test results in each of the three years. Of these 892 schools, we exclude 44 schools with missing data on test scores or missing data on a majority of the other analysis variables and two schools in a special district. Thus, a three-year (1997 through 1999) balanced panel data set includes 846 schools.

V. Sub-City School Districts in New York City

Other large urban districts, such as Chicago and Los Angeles, have some form of governance structure within that of the larger citywide district.[8] New York City's unique governance structure, however, is the most deeply rooted and longest lasting of the decentralization models and provides an appropriate model from which to glean insight into the role of districts in determining performance. The 32 community school districts that govern New York City's elementary and middle schools in effect operate as districts might in a single statewide public finance system.

New York City came to its decentralized governance structure in 1969 when the state legislature authorized a radical transformation of the city's centralized control. Thirty-two community school districts were created to govern the elementary and middle schools. Each district would have its own locally elected community school board and a superintendent in charge of instruction and operations. The central office retained control over high schools, systemwide budgetary functions, collective bargaining negotiations, pupil transportation, food services, school safety, fringe benefits, legal services, school maintenance and construction and renovation of schools. Under this decentralized governance structure, the central office allocates resources to community school districts through a series of formulae that take into account the number of students by grade and regulated or mandated class sizes. The locally elected district school board and superintendent are then responsible for developing the district's budget and allocating resources to schools. In 1996, new legislation shifted budgetary and administrative power away from the locally elected district school board and to the individual district superintendents and the system's chancellor of schools.[9] District superintendents are now solely responsible for the district budget and resource allocation decisions.

Perhaps the most prevailing impression of New York City's public school system is the sheer size: over one million students, 1,100 schools and $13 billion in total spending. As is true for most large urban school systems, New York City's public schools enroll very high percentages of students who are racial or ethnic minorities and who are eligible for federal free lunch programs, limited English proficient (LEP) and/or recent immigrants to the United States. Just as there is diversity across districts within a state, there is diversity across New York City's districts. The diversity is not simply in terms of student demographics, but also in terms of the structural organization of the districts themselves, as reflected in the number of students, number of schools and the size of those schools. Furthermore, even though each district receives operating funds through the central formulas, total spending does vary across districts, as does the manner in which districts and schools spend their resources.

As seen in Table 1, there are nearly 700,000 students enrolled in 846 elementary and middle schools in the 32 community school districts. The average district enrolls 21,815 students and has 26 schools, 20 of which are elementary schools and 6 middle schools. Of the 645 elementary schools, 6% (37) enroll 0-300 students, 24% (156) enroll 301-600 students and

70% (452) enroll over 600 students. Proportionally, there are far more middle schools in the smallest category, 20%, and far fewer in the middle category, 9%. What these averages and sums mask, however, is the difference across districts as hinted to by the minimum and maximum values reported in the same table.

Insert Table 1 here

Consider the two extreme cases in terms of district size: District 1, a geographically small district on Manhattan's lower east side that has seen its school-aged population decrease for decades; and District 31 that covers Staten Island, a populous borough known for its stable middle-class environment. District 1 enrolls 8,536 students compared to District 31's 38,107. Interestingly, fewer schools are not synonymous with lower enrollment, testifying to the organizational independence of the community school districts. While District 31 has more schools (48) than any other district, District 1 does not have the fewest; District 16, located in central Brooklyn, has only 14 schools, one of which is a middle school, and just under 10,000 students. District 4, located in the East Harlem neighborhood of upper Manhattan, is known across the country for its success in creating small learning communities. With just over 12,000 students it has 38 schools, only 10 fewer than the largest district in New York City.

The implication is that, while the size of schools depends in part on available space, districts in large measure do have control over school size. Those districts interested in creating smaller learning communities often are able to find suitable locations or break-up existing large schools into smaller ones.[10] Clearly, districts are distinctly different from one another in the size of their schools. As seen in Table 1, there is at least one district without any small schools (minimum value equal to zero) and there are 12 districts without any small elementary or middle schools. Conversely, Districts 1 and 4 have nine such schools each. Large schools, on the other hand, are abundant and each district has at least one elementary school with over 600 students enrolled. Districts may vary widely with respect to school size, for example two of the Queens districts are quite distinct; District 27, located in southeastern Queens, has 29 elementary schools of which 24 enroll more than 600 students; District 26, also in Queens, alternatively has neither small nor large schools as most of its elementary schools enroll between 301-600 students.

The middle panel in Table 1 reports statistics describing the characteristics of the average student in the average district and reports the standard deviation rather than the sum of the observations reported in the first panel. Nearly 77% of the elementary and middle school students in the average district are eligible for free lunch and approximately 11% are Asian, 38% are black, 38% are Hispanic and 14% are white. Educational needs are, on average, high, as 15% of the students are LEP, 6% receive resource room services (part-time special education services) and another 6% are in special education classroom settings on a full-time basis. Again, these district averages mask the diversity across districts and the different challenges each district faces addressing the educational needs of its students.

Demographically, the districts are quite distinct. Those that are geographically close to one another tend to be demographically similar, although not uniformly. District 26, as noted above as being in northwestern Queens, is on many measures, truly distinct in comparison to any other New York City district, with a low of 22.8% of its students being eligible for federal programs. The district with the second lowest rate of eligibility, Staten Island's District 31, has nearly double the rate of eligibility with 40.2%. Districts 7 and 9 in the south and central Bronx, respectively, have over 93% of their students eligible for free lunch.

While New York City is often considered the most diverse city in the United States, a close examination of the sub-city districts reveals differences in the racial and ethnic makeup of their students. In six of the seven districts in Queens, the percent of Asian students is greater than 17% and reaches a maximum of 41% in District 26. Upper Manhattan's District 6, which includes the densely populated Washington Heights neighborhood that is home Puerto Ricans and a large share of immigrants from the Dominican Republic, and most of the districts in the Bronx, except the northeastern most district, enroll high percentages of Hispanic students (greater than 60%); nearly 90% of District 6's students are Hispanic, for example. In the central Brooklyn districts over 80% of the students are black. These districts encompass neighborhoods, such as Fort Greene (District 13), Bedford-Stuyvesant (District 16), Crown Heights (District 17), East Flatbush (District 18) and Ocean Hill Brownsville (District 23), that are now well-established African-American and immigrant (primarily Caribbean) neighborhoods of New York. Districts with relatively higher rates of Asian students, such as Districts 24, 25, and 26 in Queens, and districts with higher percentages of white students, such as Districts 20, 21, 22 in the southwestern portion of Brooklyn and District 31 in Staten Island, tend to have very low percentages of black and Hispanic students.

District 20 in southwestern Brooklyn and District 30 in Jackson Heights, Queens have the highest rate of students who are recent immigrants; approximately 14% of their students have been in American schools for three years or less. These two districts also have the lowest proportion of female students (around 47.5%). Central Brooklyn's districts 16, 18, 23 and 32, with high percentages of black students, also have the highest percentage of female students (approximately 50%). Do these figures suggest that immigration rates are higher for school-aged males, reflecting the fact that districts with high proportions of recent immigrants have the lowest proportion of female students? Answering this question is beyond the scope of this paper, but the question does raise an interesting point for further research.

In terms of educational needs, the districts with larger percentages of black students tend to have fewer LEP students. In turn, in the largely Hispanic district of Washington Heights in upper Manhattan, roughly forty percent of its students are LEP. While the districts with the greatest percentage of recent immigrant students, Districts 20 and 30, have LEP rates above 20%, the representations of recent immigrant and LEP are not synonymous. The need for and use of resource room services and full-time special education classroom settings is also not consistent across districts. For example, Districts 1 and 31 have over 9% of their students identified as needing resource room services, while District 17 in the Crown Heights neighborhood of Brooklyn identifies only 3.6% of its students in such need. In terms of full-time special education students, District 2 in Manhattan has the lowest percentage, with only 3.2% of its students in full-time special education programs. Conversely, District 7 in the south Bronx has 10.3% of its students in full-time special education. One of the difficulties in describing the differences across districts in the percentages of students receiving resource room and special education services is identifying factors to which to attribute the difference. Are there simply more students in need of such services in a district in the South Bronx compared to one in mid-Manhattan? Or, do the districts have different approaches to identifying and integrating students in need of special services? Is the location of appropriate facilities the driving force? Most likely it is a combination of these factors.

The third panel in Table 1 reports spending per pupil and the manner in which funds are spent. Spending ranges from a low of $7,688 per pupil to a high of $11,191 per pupil. Over 88.5% of the spending provides for the direct services of schools; an average of 2.9% of total spending covers central New York City district costs. The breakdown of spending by function may provide some insight as to how districts are investing resources. Clearly, not all districts spend their resources in the same manner. While the average district spends 3.0% on educational paraprofessionals, there is at least one district that spends 1.3% and one that spends 4.8%. A similar range is evident in professional development spending.

Rather than detail the high and low districts in each of the spending categories, we highlight two districts, District 4 in Manhattan and District 19 in Brooklyn. District 4, which spends $9,475 per pupil, spends near the minimum proportion on teachers (41.8%) and instructional support (11.8%) and the highest on leadership (8.5%). In contrast, District 19, which spends $9,035 per pupil, spends near the higher end on teachers (47.4%) and is the highest in terms of educational paraprofessionals (4.8%), but lowest in terms of instructional support (8.5%). Demographically, the two districts both have high rates of free lunch eligibility, as well as similar percentages of minority, LEP and recent immigrant students. Clearly they have made different choices in how to use resources.

VI. Results: Schools in Districts

Descriptive Statistics

While the discussion above focused on describing students in the 32 community school districts, this section focuses on schools (See Table 2). The distinction between average student (Table 1) and average school (Table 2) is straightforward. In the former, an average for each district is calculated from school-level data that is weighted by the number of students in each school, reflecting the characteristics of and spending on the average student in the district. In the latter, an average for each district is calculated from school-level data that is not weighted by the number of students in each school, reflecting the perspective of the average school. In both cases, we then calculate an average for all districts. The average school in the average district has 43.8% of its test takers passing the reading exam and 46.6% passing mathematics. Over 800 students are enrolled in the average school and the daily attendance rate is 90%, with 92% of the students in the same school in June as in the previous October. As seen by the range in the minimum and maximum values, the average school differs noticeably across districts.

Insert Table 2 here

The districts with the highest performing schools in reading, District 2 in Manhattan and Districts 25 and 26 in Queens, are also the highest in mathematics. This holds true as well at the opposite end of the spectrum, with schools in District 5 in Central Harlem and Districts 9 and 12 in Central Bronx having the lowest passing rates in reading and mathematics. District 26's schools stand out as high performing in terms of passing rates, attendance rates, and percent of students who are in the same school in October and June. Districts 23 and 32's schools, both in Central Brooklyn, have the lowest average daily attendance rate and percent of students who are in the same school in October and June, respectively. Per pupil spending for the average school, including spending on students in special education on a full-time basis, is $9,013 and, excluding such students, is $8,061. In terms of special education, per pupil spending is nearly 3 times that of the general education average and the range from lowest to highest special education spending is nearly $10,000. Giving a proper context to spending on full-time special education students is difficult because of the widely different needs of such students. Interestingly, the highest per pupil spending on full-time special education students is in District 26's schools, where the rate of special education is quite low. Conversely, the lowest spending is in District 23's schools where the special education rate is quite high. Does this association reflect economies of scale or some other phenomenon? The answer to this question is beyond the scope of this paper, but important nevertheless.

Teachers, both in their number and the characteristics that are often touted as proxies for quality, exhibit similarly wide variations across districts. The average school in the average district has 6.8 teachers per 100 students, of which 81.8% are licensed, 61.4% have five or more years of experience and 62.8% have taught in the same school for two or more years. An average of $5,036 is spent on students, excluding expenditures on teachers. Schools in districts with lower percentages of free lunch eligible, LEP, black and Hispanic students, such as Districts 25 and 26 in Queens and District 31 in Staten Island, have the highest percentages of licensed, experienced and stable teachers. Conversely, those districts that on average have schools with higher proportions of these types of students have the lowest percentages of experienced, licensed and stable teachers. For example, 64.8% of the teachers in the central Bronx District 12's schools are licensed, 53.6% are experienced and 53.4% are stable. These rates are at least 25 percentage points below those for District 25's schools.

The distribution of school test scores and resources within districts is an issue that researchers often address from an equity perspective. The coefficient of variation is a measure of dispersion that is often used to assess whether or not the distribution of objects is equitable.[11] Standards established by previous research suggest that a coefficient of variation greater than 0.10 indicates high disparity (Odden & Picus, 2000). How disparate is the distribution of resources within districts? Is there variation in the within-district distributions across districts? Table 2 reports the average coefficient of variation for New York City's districts.[12]

The coefficients on the percent of students passing reading and mathematics are high relative to the 0.10 standard, with the coefficient on mathematics slightly higher than the one on reading. Enrollment also varies within districts, with an average coefficient of 0.391.

Attendance rates and the percentage of students in the same school in October and June are the most evenly distributed factors across schools within districts and across districts.

Per pupil spending is, on average, somewhat disparate, with coefficients of variation exceeding 0.10 in each case. Teachers, with the exception of those who are licensed, also have high dispersion as seen in the average coefficients of variation. In terms of spending and teachers, however, not all districts are alike. Some have much higher coefficients of variation than others. For example, the coefficient of variation on spending per pupil (All Students) is 0.448 in District 4 and 0.090 in District 29. The only observable pattern is that 4 of the 5 districts with the greatest variation in per pupil spending are in Manhattan (Districts 1, 2, 3, and 4). Notably, Districts 6 and 12 have the highest coefficients of variation on the distribution of licensed teachers, as well being among the districts with the lowest percentages of such teachers. Conversely, Districts 26 and 31 have the most even distribution of licensed teachers, as well as the greatest percentage of such teachers.

School-level Regressions

Table 3 shows the results of two regressions, one with average school reading Z scores as the dependent variable and the other with average school mathematics Z scores as the dependent variable. The regressions include district effects.[13] Because the models include district effects, the R^2 explains over 90% of the variation in reading and mathematics test scores.[14] In both the reading and mathematics regressions the district effects are jointly significant at the 1% level. Thus, districts do matter.

Insert Table 3 here

In general, the estimates from reading and mathematics regressions are quite similar. The coefficients on the previous year's scores are positive and statistically significant, meaning that schools with higher test scores in the previous year do better. As is often the case in such estimates, schools with higher percentages of students eligible for free lunch have lower test scores. The same is true for those schools with higher percentages of black or Hispanic students. In contrast schools with more female students have higher test scores. Counter to expectations, the coefficient on LEP is insignificant in the reading regressions, but is significant and negative in the mathematics regressions. While the coefficients on teacher resources are insignificantly different from zero in the reading regressions, schools with more teachers per 100 students have lower mathematics scores, but those with a greater percentage of teachers who are fully licensed have higher scores. Whether this reflects a tradeoff being made between class size and experience is a worthy topic for future research that is outside the scope of this study. As seen by the coefficient on the log of enrollment, larger schools have lower reading and mathematics test scores. Schools with higher attendance rates and more students who are in the school in October and June do better as well. Test scores, in general, tend to be lower in elementary schools compared to middle schools. Over the three years, reading test scores have increased, though not significantly. Mathematics scores are lower in both 1998 and 1999 than in 1997.

District Effects

Our results show that districts do matter; the fixed effects are jointly significant. The district effects from the reading and mathematics regressions described above are summarized in Table 4. The mean of the district effects in both reading and mathematics is close to zero, but there is quite a bit of variation. Are districts that are effective in producing higher test scores in reading the same as those that produce higher test scores in mathematics? The correlation between district effects in reading and mathematics is quite strong. The Pearson correlation is 0.82 as shown in Table 4. Their ordinal rank, from highest performer to lowest performer, is highly correlated as well. The Spearman rank correlation is 0.83. As shown in Figure 1, where the districts are arrayed in order of the effect size (low to high), the five districts at the bottom of the range have distinguishably lower fixed effects than the next group of districts, but they are much closer to one another than the two highest performing districts that far exceed the next highest performing district. If instead we arrange districts by their respective borough as done in Figure 2, we see that even within boroughs there is variation in the district effects.

Insert Table 4 here

Insert Figure 1 here

Insert Figure 2 here

While there are many characteristics of districts that are difficult to measure, such as district leadership style, some variables we can measure, such as the size of districts, number of schools, total resource level and functional purpose of resources. Including these variables in the regressions, rather than district dummies, may provide insight into how (or why) districts matter. Table 5 reports the coefficients on the district-level variables in the school-level regressions that also included school-level variables. Although not shown, in large measure, the signs and significance of the school-level coefficients do not change. The one notable exception is the coefficient on the percent of Asian students. In the previous regression that coefficient is positive and insignificant, but here it becomes negative and significant. The coefficients on the district-level variables indicate that some are related to performance of schools. Schools in districts that have a higher average test score in the previous year do better. The more middle schools a district has, the lower the reading and mathematics scores, significantly for reading and not so for math. Spending matters to reading scores, but not to math scores. The greater proportion of total spending dedicated to educational paraprofessionals, the higher the math scores. Spending on professional development and leadership also matter in terms of math scores. Textbook spending is the only spending that is significantly related to reading scores and it is negatively related.

Some of these findings may be counterintuitive; the greater percentage spent on textbooks, the lower the test scores, for example. But on average a district spends less than 1% of its resources on textbooks. Perhaps the choice in textbooks matters more than the resources spent on textbooks. It is interesting that schools in districts that spend more on educational paraprofessionals have higher math scores. Perhaps educational paraprofessionals are more effective in assisting in mathematics instruction than in reading instruction. There are, as always, multiple potential explanations for these observed relationships. Disentangling them is beyond the scope of this paper but certainly worthy of further study in the future. Striking an effective balance between resource investment and student achievement is one of basic challenges districts face.

VII. Conclusions

Although New York City's community school districts are not responsible for taxation, still their diversity and distinct identities offer an opportunity to examine whether or not districts affect school performance. Our results indicate that districts do indeed matter. Our estimated district fixed effects suggest an important role for the districts. Whether that effect is due to unobservable, time invariant district characteristics or differences in the measurable characteristics of the districts is examined and our results indicate that it is the number of middle schools, the level of per pupil spending and the ways that resources are spent that matter.

Districts do have a role, though often difficult to measure, in the production of education at the school level.

Accountability systems, whether at the state or federal level, may fail to capture the importance of districts in the production of school performance, if districts are not explicitly included in performance estimates. Excluding districts from statewide accountability systems does call into question the role of districts, not only in accountability systems but also in finance systems that lean toward increasing state sources as a share of revenues. Given the wide variation across districts in New York City in terms of their resource use and distribution of across the district's schools, districts will have an important role even in a public finance system that draws a much greater share of its revenues from state sources. The evidence from New York City's public elementary and middle schools is that districts do matter and they should be part of performance accountability systems. If districts play an important role in determining the academic performance of their member schools, then implementing accountability systems that focus sanctions and rewards on its schools will be less effective than a system that holds both accountable. In New York City the chancellor of the public schools system holds the community school district superintendents accountable for the performance of their schools and students. The chancellor produces *District Performance Profiles* that are used in the evaluation process and in dialogues on district and school improvement (Board of Education of the City of New York, 2002). This is but one component of an accountability system in New York City that does focus on both schools and districts.

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Endnotes

[1] Much of the material on production functions is drawn from other publications by Schwartz and Stiefel, notably, "Measuring School Efficiency: Lessons from Economics, Implications for Practice," 2000 in *Improving Educational Productivity*, editors, David H. Monk, Herbert J. Walberg, and Margaret Wong, Greenwich, CT, Information Age Publishing Inc.

[2] In fact, there are many levels of nesting: kids in classrooms in schools in districts in states. The policies and practices at all of these levels arguably affect student performance, but given the availability of data and the sophistication of statistical techniques, it would be prohibitive to conduct an analysis that considers all of these levels. For now we think it is crucial to bring the district into the picture.

[3] Note that not all the residual variation is attributed to district effectiveness, rather the error term picks up the random variation.

[4] The estimation procedure must, then account for the difference in the 'level' at which the district and school variables are measured. As described below, we use robust standard errors to control for clustering of observations within districts. See Raudenbusch and Bryk (1986) for more on this.

[5] $Z = \frac{X_{it} - \overline{X_t}}{\sqrt{S_t^2}}$

[6] We weight each grade's Z score by the respective number of students tested in each grade. This helps to account for possible differences in the number of students tested by grades.

[7] High schools are not part of the community school districts, but are run centrally from the New York City Board of Education.

[8] Chicago's public schools are divided into six geographic regions. A regional director oversees a staff that serves as a liaison to the central offices, provides support to local schools, coordinates desegregation efforts and enforces rules and contracts. In June of 2000, the Los Angeles Unified School District reorganized the district into 11 local school districts, with over 50,000 students in each district in kindergarten through 12^{th} grades. Unlike the Chicago regional directors, Los Angeles's superintendents do have budgetary and instructional authority.

[9] Locally elected school boards had the authority to hire a superintendent and principals for the district's schools. The new legislation stripped them of this power.

[10] The chancellor previous to the current one issued regulations concerning the size of schools and the financial support and designation of smaller learning communities as schools.

[11] The Coefficient of Variation is calculated by dividing the square root of the variance (standard deviation) by the mean value.

[12] The coefficient of variation on the mean Z scores in reading and mathematics are numerically excessive because of the values of the Z scores. It is difficult to interpret these numbers, thus, only the coefficients on the percent passing measure are discussed.

[13] The regressions include dummies for missing values for %LEP, %Resource Room, %Special Education, % of Teachers Licensed, Experienced, In This School for 2 Plus Years, and % of Students in this school (October & June). The coefficients on these variables are not reported in Table 3.

[14] The regressions reported in Table 3 are not weighted by student counts. Weighted regressions were run and produced similar results and, thus, are not reported here.

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Table 1. Characteristics of Community School Districts[*] in New York City, 1999.

	Mean	Min	Max	Sum
Enrollment (October Register)	21,815	8,536	38,107	698,069
Number of Schools	26	14	48	846
Elementary Schools	20	11	38	645
Size: 0-300	1	0	9	37
Size: 301-600	5	0	12	156
Size: Over 600	14	3	24	452
Middle Schools	6	1	15	201
Size: 0-300	1	0	15	40
Size: 301-600	1	0	3	18
Size: Over 600	4	0	10	143

	Mean	Min	Max	Standard Deviation
% Free Lunch	76.7	22.8	94.8	16.8
% Asian	10.6	0.8	41.3	11.8
% Black	38.0	4.3	89.3	27.0
% Hispanic	37.9	7.0	89.7	23.6
% White	13.5	0.3	61.6	15.8
% Recent Immigrants	7.1	2.1	14.6	3.7
% Female	48.9	47.4	50.4	0.6
% Limited English Proficient	15.0	2.1	40.6	8.4
% Resource Room	6.4	3.6	9.9	1.5
% Special Education	6.1	3.2	10.3	1.9
Spending Per Pupil	$8769	$7688	$11,190	693.5
Percent of Total Spending[**]				
Direct Services to Schools	88.5	87.4	89.4	0.5
Classroom Instruction	53.2	49.5	56.9	1.9
Teachers	45.1	40.7	49.2	2.2
Educational Paraprofessionals	3.0	1.3	4.8	0.8
Textbooks	0.7	0.5	0.9	0.1
Librarians & Library Books	0.1	0.0	0.4	0.1
Professional Development	1.7	0.6	4.5	0.8
Instructional Support	10.0	7.9	13.0	1.2
Leadership	7.3	6.3	8.5	0.5
District Costs	2.9	2.3	4.2	0.4

[*]There are 32 community school districts.
[**]Percentages within categories will not sum to the category total as all breakdowns are not included.

Table 2. Characteristics of Schools in Community School Districts* in New York City, 1999.

	Mean	Min	Max	Standard Deviation
Test Scores				
Reading:				
Mean Z of NCE	-0.029	-0.491	0.835	0.327
% Pass	43.8	25.1	81.4	13.6
Mathematics:				
Mean Z of NCE	-0.026	-0.509	0.964	0.364
% Pass	46.6	27.0	85.8	15.2
School Characteristics				
Enrollment (October Register)	831	324	1371	223.4
% Average Daily Attendance	90.4	87.2	94.6	1.9
% of Students in This School in Ocotber & June	92.1	88.2	94.8	1.4
School Inputs				
Spending Per Pupil (All Students)	$9,013	$7,877	$11,305	698.7
Spending Per Pupil (Excluding Full-time Special Education)	$8,061	$7,094	$10,067	573.0
Spending Per Pupil (Full-time Special Education Students)	$23,911	$19,822	$29,777	2528.9
Teachers per 100 students	6.8	5.6	7.8	0.6
% of Teachers, Fully Licensed	81.8	64.8	98.1	9.0
% of Teachers, Experienced (5+ years)	61.4	52.3	76.3	5.6
% of Teachers, In This School 2+ years	62.8	49.9	72.2	5.5
Non-teacher Spending Per Pupil	$5,036	$4,354	$6,646	533.3
Coefficient of Variation				
Test Scores				
Reading:				
Mean Z of NCE	2.622	-5.409	57.287	11.108
% Pass	0.316	0.076	0.510	0.107
Mathematics:				
Mean Z of NCE	-0.740	-9.759	6.047	2.954
% Pass	0.338	0.084	0.551	0.102
School Characteristics				
Enrollment (October Register)	0.391	0.220	0.660	0.112
% Average Daily Attendance	0.022	0.008	0.037	0.006
% of Students in This School in Ocotber & June	0.038	0.016	0.091	0.015
School Inputs				
Spending Per Pupil (All Students)	0.191	0.091	0.448	0.066
Spending Per Pupil (Excluding Full-time Special Education)	0.150	0.067	0.487	0.082
Spending Per Pupil (Full-time Special Education Students)	0.279	0.158	0.875	0.130
Teachers per 100 students	0.175	0.100	0.603	0.091
% of Teachers, Fully Licensed	0.106	0.029	0.195	0.037
% of Teachers, Experienced (5+ years)	0.180	0.106	0.306	0.051
% of Teachers, In This School 2+ years	0.177	0.102	0.282	0.047
Non-teacher Spending Per Pupil	0.240	0.111	0.413	0.062

*There are 32 community school districts.

Table 3. Parameter estimates, Reading & Mathematics. School-Level Production Functions with District Fixed Effects. (Robust Standard Errors)

	Reading	Math
Intercept	**-1.263**	**-1.383**
	(0.239)	(0.238)
Lag of Reading	**0.763**	**0.758**
	(0.015)	(0.014)
% Free Lunch	**-0.001**	**-0.001**
	(0.000)	(0.000)
% Asian	0.000	0.000
	(0.000)	(0.000)
% Black	**-0.001**	**-0.002**
	(0.000)	(0.000)
% Hispanic	**-0.001**	**-0.001**
	(0.000)	(0.000)
% Recent Immigrants	0.000	0.000
	(0.001)	(0.001)
% Female	**0.003**	**0.002**
	(0.001)	(0.001)
% Limited English Proficient	-0.001	**-0.001**
	(0.000)	(0.000)
% Resource Room	**-0.007**	**-0.008**
	(0.001)	(0.001)
% Special Education	0.000	0.000
	(0.001)	(0.001)
Log Teachers per 100 students	-0.022	**-0.029**
	(0.017)	(0.014)
% of Teachers, Fully Licensed	0.001	**0.001**
	(0.000)	(0.000)
% of Teachers, Experienced (5+ years)	0.000	0.000
	(0.000)	(0.000)
% of Teachers, In this school 2+ years	0.000	0.000
	(0.000)	(0.000)
Log Non-teacher Spending Per pupil	0.004	0.007
	(0.021)	(0.021)
Log Enrollment (October Register)	**-0.021**	**-0.026**
	(0.008)	(0.008)
% Average Daily Attendance	**0.014**	**0.016**
	(0.002)	(0.002)
% of Students in this school in Ocotber & June	**0.002**	**0.002**
	(0.001)	(0.001)
Elementary Schools	**-0.014**	**-0.028**
	(0.008)	(0.008)
1998	0.001	**-0.021**
	(0.007)	(0.007)
1999	0.004	**-0.017**
	(0.009)	(0.008)
R-Squared	0.9313	0.9441
N	2538	2538
F statistic	513.12	635.29

Note 1: F-test for joint significance of district effects significant at 1% level
Note 2: Bold indicates significance at the 10% level or better
Note 3: Regressions include dummies for missing for %LEP, %Resource Room, %Special Education, % of Teachers Licensed, Experienced, In This School for 2 Plus Years, and % of Students in this school (October & June).

Table 4. Descriptive Statistics and Correlations, Fixed Effects

	N	Mean	Min	Max	Standard Deviation
Reading	32	0.0000	-0.0434	0.0949	0.0299
Mathematics	32	0.0012	-0.0472	0.0674	0.0280
Pearson Correlation	32	0.8192			
Spearman Correlation	32	0.8325			

Figure 1. Reading, District Effects in Ascending Order.

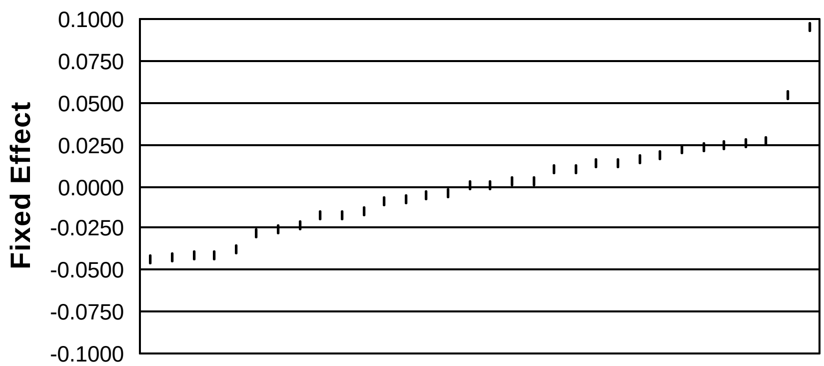

Figure 2. Reading, District Effects by Borough.

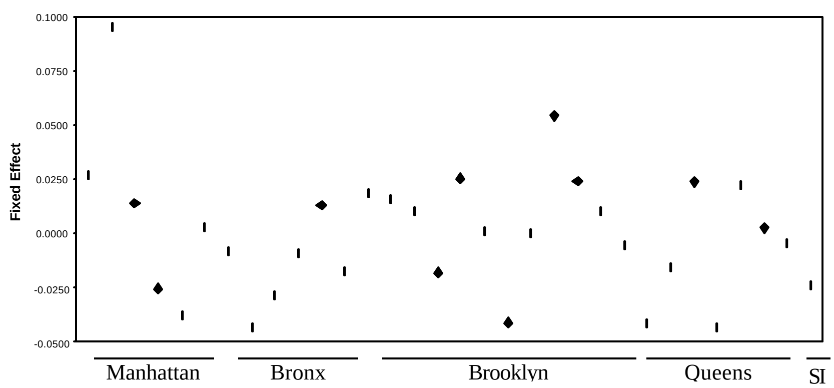

Table 5. Selected Parameter Estimates, Reading & Mathematics. School-Level Production Functions with District-Level Variables (Robust Standard Error).

	Reading	Math
Intercept	1.191	-1.986
	(1.775)	(1.921)
District Enrollment	0.000	0.000
	(0.000)	(0.000)
District Enrollment Squared	**0.000**	**0.000**
	(0.000)	(0.000)
District Average Z Score	**0.123**	**0.088**
	(0.030)	(0.029)
Number of Elementary Schools	0.001	0.000
	(0.002)	(0.002)
Number of Middle Schools	**-0.002**	-0.001
	(0.002)	(0.002)
Total Spending Per Pupil	**0.000**	0.000
	(0.000)	(0.000)
% of Total Spending, Direct Services	-0.030	0.004
	(0.021)	(0.023)
% of Total Spending, Classroom Instruction	0.003	-0.007
	(0.006)	(0.007)
% of Total Spending, Teachers	-0.004	0.008
	(0.007)	(0.008)
% of Total Spending, Educational Paraprofessionals	0.006	**0.016**
	(0.008)	(0.010)
% of Total Spending, Textbooks	**-0.042**	0.015
	(0.017)	(0.017)
% of Total Spending, Librarians & Library Books	0.020	-0.004
	(0.030)	(0.031)
% of Total Spending, Professional Development	0.004	**0.018**
	(0.009)	(0.011)
% of Total Spending, Instructional Support	-0.010	-0.001
	(0.006)	(0.005)
% of Total Spending, Leadership	0.001	**0.014**
	(0.007)	(0.008)
% of Total Spending, District Costs	-0.017	0.014
	(0.027)	(0.031)
R-Squared	0.9306	0.9436
N	2538	2538
F statistic	**3006.88**	**878.72**

Note 1: Bold indicates significance at the 10% level or better
Note 2: The regression includes the school-level variables from the regression reported in Table 3. Only the coefficients on the district-level variables are reported in this table.
Note 3: Regressions include dummies for missing for %LEP, %Resource Room, %Special Education, % of Teachers Licensed, Experienced, In This School for 2 Plus Years, and % of Students in this school (October & June)
Note 4: The difference between significant and insignificant coefficients equal to 0.000 and their standard errors also equal to 0.000 are only seen when the figures are reported to the millionths.