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School Budgeting and School Performance: The Impact of New York City's Performance Driven Budgeting Initiative

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Abstract

Performance Driven Budgeting (PDB) is a school-based budgeting initiative that was instituted in a select group of New York City schools beginning in the 1997-1998 school year. This paper analyzes the impact of the initiative on student test scores in the fourth and fifth grades and on spending patterns. Using school-level data provided by the New York City Board of Education, we construct a panel dataset of 609 elementary and middle schools over a span of four years, 1995-96 through 1998-99. To analyze the impact of the initiative we estimate school production function models that incorporate school fixed effects and an indicator for participation in PDB. After controlling for these and other student-body characteristics, we find that PDB had a positive effect on some student test scores and led to a change in the mix of spending, but not its level.

Introduction

Many reforms aimed at improving public schools involve transferring control over resources from central authorities to school-level decision-makers while at the same time holding school decision-makers accountable for student achievement. The underlying logic is that decision-makers who are "closer to the ground" will

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be better able to allocate resources to students with different backgrounds, learning styles and needs in general. According to this logic, increasing school control over budgets should lead to increased interest in school-based fiscal and strategic planning. This interest should change the allocation of resources in a way that leads to improvements in academic performance because resource allocation should be better aligned with academic needs. As appealing as this logic is, relatively little research is available about the effects on performance of implementing school-based budgeting reforms in the U.S. Few U.S. districts have tried to decentralize, and of those that have, fewer yet have explicitly linked the decentralization effort to performance improvement.

In contrast, in 1996, Rudy Crew, New York City's chancellor of Schools, initiated an effort termed Performance Driven Budgeting (PDB) to move budgeting decisions toward school-level decision makers for New York City's over 1,000 public schools and to tie the new budgeting practice to school performance. This paper reports the results of an evaluation of the impact of this initiative on student academic performance and explores the extent to which implementing PDB led to changes in resource allocation.

The choice of schools that implemented PDB was not random. The first schools allowed to implement school-based budgeting were recommended by their district superintendents as in good shape fiscally and interested in trying the new initiative. As a result, our research is based upon a 'naturalistic' design providing insight into the potential impacts of PDB on schools choosing to adopt it in the context of a school district initiative.

Our research design focuses on the estimation of the impact of PDB on student academic achievement at the school level. We have assembled a rich panel dataset that includes information on test scores, resources and socio-economic and demographic information provided by the New York City Board of Education. The data span four years beginning with the 1995-96 school year, the year that Chancellor Crew announced the PDB initiative, and 1998-99, by which time PDB was fully implemented in 39 elementary schools in four New York City community school districts (CSDs) and was in the planning stage in 81 elementary schools in five CSDs. We have focused our attention on elementary schools, due in part to the availability of consistent test scores for the fourth and fifth grade during the study period.

The research clearly provides neither the last nor the definitive word on the impact of school-based budgeting reforms. Instead, it provides insight into New York City's experience with a particular initiative. The next section reviews the existing literature

on school-based budgeting. A more detailed history and description of the PDB initiative is included in section III. The methodology is outlined in section IV and the data are described in section V. Results are presented in section VI, followed by conclusions in section VII.

Literature Review

The existing research on Site-Based Management (SBM) and Site-Based Budgeting (SBB) focuses mostly on evaluations of the process of their implementation. According to this literature, two prerequisites are needed in order for school-level personnel to properly allocate resources. First, personnel need accurate and timely information about the current state of resource allocation at their school. Second, they must be somewhat adept at understanding the budget-making process.[1] Researchers have come to the conclusion that without control over resources, the ability of site-based management strategies to improve student performance will be limited.[2] Furthermore, authority over the budget needs to be held in conjunction with "empowering schools with control over information, professional development and compensation systems."[3]

A study of 44 schools in 13 school districts in the U.S., Canada and Australia by the Center on Educational Governance found that schools that implemented SBM and focused on actively restructuring curriculum and instruction were able to improve student performance.[4] For implementation to be successful, however, Wohlstetter found that these schools also had to have meaningful authority over budget, personnel and curriculum. In schools where SBM failed, it was found that SBM was viewed as an end in itself rather than a way to focus on improving teaching and learning. The decision-making councils were too concerned with delineating authority, which distracted them from the reason for instituting SBM to begin with improving student performance. In other cases the principal would not share decision-making power and thus alienated teachers and staff, or the participants were unprepared for the

1. Lawrence Picus, "Fiscal Decision Making at the School Site: A Nuts and Bolts Approach" (paper presented at the American Education Finance Association annual meeting, Jacksonville, Florida, March 1997).

2. Lynn Olson, "Shaking Things Up," *Education Week*, 10 September 1997, 17-21.

3. Priscillar Wohlstetter & Susan A. Mohrman, "School-Based Management: Strategies for Success," *CPRE Finance Briefs*, January 1993.

4. Priscilla Wohlstetter, Getting School-Based Management Right: What Works and What Doesn't. *Phi Delta Kappan* 77, no. 1 (1995): 22-26.

commitment that successful implementation required.

Site-based management is an innovation that has its roots in the private sector. The theory suggests that encouraging self-management and empowering employees leads to improved morale which in turn results in higher productivity.[5] In transferring SBM theory from the corporate world to the realm of public education, the reforms often involved giving schools authority over budget, personnel and curriculum, but little thought was given to granting schools authority over professional development or compensation systems. Also, when researchers took a close look at the implementation of SBM programs, more often than not, they found that the extent of the decision-making authority given to teachers and administrators on site was limited.

In a study of the implementation of a site-based budgeting program in Fort Worth, Texas, Peternick and Sherman found that the level of true site-based decision-making varied widely from school to school.[6] In some cases the school successfully engaged stakeholders from various groups, most notably parents and teachers, in the decision-making process. In other schools, however, the main decision-making power rested with the principal. Perhaps this was why administrators reported being more satisfied with the reforms than teachers or parents.

There is some evidence that the implementation of site-based budgeting programs led to, at the very least, increased awareness of the budget-making process on the part of teachers and parents. In a study of two groups of schools in Rochester, New York, Moser found that the schools that were implementing school-based budgeting programs experienced increased parental involvement.[7] For the most part, however, both teachers and parents felt that the principal had more influence over the way resources were allocated than they did. Still, stakeholders in schools that were implementing the program felt that they had more autonomy in planning their budgets than stakeholders that were in non-SBB schools.

One of the important characteristics of SBB programs including PDB is that decision-making is shared. In some cases, however, even when parents and teachers believe that it is important that they have some influence over how resources are allocated at

5. Priscillar Wohlstetter & Susan A. Mohrman, (1993).

6. Lauri Peternick & Joel Sherman, "Site-based Budgeting in Fort Worth, Texas," *Journal of Education Finance* 23, no. 4 (1998): 532-556.

7. Michele Moser, "School-based Budgeting: Increasing Influence and Information at the School Level in Rochester, New York," *Journal of Education Finance* 23, no. 4(1998): 507-531.

their school, they find it easier to defer to the principal.[8] In order for stakeholders to have meaningful roles in helping to prepare their school's budget, they must have some knowledge about the budget-making process. This requires that the districts invest in educating teachers and parents, and that teachers and parents take time to participate. For some districts such an investment is too costly in monetary terms and for some teachers and parents, the investment is too costly in terms of time.

As with any school-based budgeting or management program, there are a number of ways in which the PDB initiative may affect schools, including empowering administrators, teachers and parents, increasing parental involvement, improving student performance, and influencing patterns and amounts of school spending. Thus far, the existing literature suggests that SBM and SBB programs may help stakeholders feel more empowered in the decision-making process and that fully and effectively implementing such programs requires long-term commitments on the part of school districts as well as principals, teachers and parents. Few studies have focused on effects of budgeting changes on spending patterns or performance in the schools, but this study does move beyond evaluating the process of implementing SBM/SBB to evaluate the impact of PDB on student performance and spending.

A Brief History of Performance-Driven Budgeting

PDB represents another step in a process that began decades ago of transferring decision-making power from central boards of education to the school level. In New York City the process began in 1969 with a school governance law that led to the eventual creation of 32 community school districts (CSDs).[9] Each CSD had a publicly elected community school board, which hired a superintendent based on criteria set by the chancellor's office, and appointed principals often based on superintendent recommendations. The CSDs were responsible for the governance of elementary and middle schools only. High schools remained under the

8. Patrice Iatarola & Leanna Stiefel, "School-based Budgeting in New York City: Perceptions of School Communities," *Journal of Education Finance* 23, no. 4 (1998): 557-76.

9. In June 2002, New York City underwent yet another historic change in governance. The New York State legislature and governor approved legislation giving the mayor of New York City control of the school board, thereby giving him the power to appoint the chancellor. The chancellor appoints other managers and, therefore, the mayor has managerial control of the school system. The 32 community school districts remain for one year. This change occurred well after the evaluation described in this paper.

authority of the central office.[10] Since that time, however, New York City, like many school districts that have made attempts to decentralize, has struggled to increase decision-making power in a meaningful way at the school level and to have that translate into improved student performance.

The city's schools number approximately 1,100 and serve more than one million students. In the fall of 1995, the responsibility for running the nation's largest school system was bestowed upon Rudy Crew when he was installed as chancellor of New York City schools. Shortly thereafter, in September of 1996, he introduced a school-based budgeting initiative. Chancellor Crew chose to entitle the New York City initiative "Performance-Driven Budgeting" in order to stress that the cornerstone of the plan was to have every expenditure made with the intention of improving a school's performance. The main goal of the reform was to give the schools more control over how resources are spent so that they could be used more effectively and efficiently to improve student performance.

Prior to the announcement of the PDB initiative, the chancellor began to assemble the components necessary for successful implementation. In order to observe school-based budgeting in action, ten members of the New York City educational community attended a conference in Edmonton, Alberta in May of 1996.[11] There, they saw an example of a decentralized school system that had been successfully utilizing school-based budgeting practices for more than 17 years. Some of these ten people became the core of a planning team that participated in the design and implementation of PDB. A 32-member PDB selection committee was formed to select districts and schools to participate in the pilot program, called Phase I[12]

While the selection process was underway, in December 1996, the New York State Legislature, under pressure from Mayor Rudolph Giuliani and Chancellor Crew, introduced changes in the governance of the New York City school system. Among the provisions to the 1996 governance law was a timetable for PDB implementation that called for all schools in New York City to do school-

10. Patrice Iatarola & Leanna Stiefel, (1998).

11. Dorothy Siegel, E. Zurer & N. Fruchter, *Second Annual Report: Evaluation of the Performance Driven Budgeting Initiative of the NYC Board of Education.* (New York: Institute for Education & Social Policy, May 2000).

12. The full selection committee included administrators from the Board of Education, districts and schools, teachers, education researchers and reform advocates.

based budgeting by the 1999-2000 school year.[13]

By February1997, the Phase I schools, all in community school Districts 2, 13, 19 and 22 were selected. By the 1997-98 school year, Phase I schools were implementing the reform, some schools from each of Districts 13, 19 and 22 and all schools in District 2.[14] During the 1998-99 school year, the remaining schools in Districts 13, 19 and 22, as well as all schools in Districts 9 and 20, were brought into the initiative as they planned for the new budgeting system. [15]

Methodology

We evaluate the PDB initiative by estimating first its impact on the academic performance of students as measured by standardized tests and second its impact on the allocation of resources at the school level. The centerpiece of our first analysis is a production function that links student performance to school inputs such as teacher resources and expenditures. This approach identifies the impact of the PDB reform as the difference in school performance before and after the PDB intervention, relative to the schools that did not implement PDB. It is similar to the approach employed by Schwartz, Stiefel and Kim to evaluate a whole school reform using pupil-level data,[16] and it improves upon the interrupted time series approach used by Bloom to evaluate the Accelerated Schools re-

13. The law changed more important aspects of school governance in New York City, including effectively weakening the power of the 32 community school districts by transferring power up to the chancellor's office and down to the schools themselves. For the first time in more than twenty-five years, district superintendents were accountable to the chancellor's office. In addition, the CSDs, which previously had the power to choose the district superintendents were reduced to an advisory role and the chancellor had the final say over superintendency appointments. The schools were granted increased autonomy in hiring and budgeting decisions, and principals were to be held accountable for their schools performance.

14. Sixty-two schools implemented PDB in 1997-98, but not all are included in our analyses because some did not have fourth and fifth grades.

15. Our analysis extends through June 1999. Since then, the schools in Districts 2, 13, 19 and 22 were provided with the new budgeting systems and software, called Galaxy, which all along was meant to be an integral part of the PDB reform. However, technical difficulties prevented the pilot schools from utilizing Galaxy fully until the spring of 2000. As a result of the technical problems, District 22 opted out of the Galaxy portion of PDB, however PDB remains a central component of that district's planning. Two other districts (9 and 20) began planning for PDB in the 98-99 school year and implemented Galaxy during 99-00.

16. Amy E. Schwartz, Leanna Stiefel & Dae Y. Kim, "The impact of School Reform on Student Performance: Evidence from the New York Networks for School Renewal Project," (paper presented at the annual meeting of the Association for Public Policy Analysis and Management, Washington D.C., November 2001).

form with school-level data.[17] Our method yields an unbiased estimate of the impact unless there were other changes, for example in school policies or environment, that were contemporaneous to the PDB reform and that affected the performance of PDB schools but did not affect non-PDB schools. Since PDB schools are located in several different districts, the likelihood that such policies or other reforms affecting school performance occurred seems small.

We begin by estimating a base line model of the effect of PDB on school performance as follows:

(1) $TEST_{s,t} = \alpha + \beta \ln E_{s,t} + \delta X_{s,t} + \gamma S_{s,t} + \phi IMP78_s + \upsilon_s + \omega_t + \varepsilon_{s,t}$

where $TEST_{s,t}$ refers to the average performance of students in school "s" on a standardized reading or math test in year "t". $E_{s,t}$ is expenditure per student; $X_{s,t}$ refers to teacher characteristics such as the percent fully licensed and permanently assigned and the percent with more than five years of experience; $S_{s,t}$ refers to the characteristics of the student community such as the logarithm of total enrollment, ethnic composition (e.g. percent Asian, black and Hispanic students), and percent free lunch eligible. $IMP78_s$ is a program dummy variable that takes a value of one if school s implemented PDB in 1997-98. The terms υ_s and ω_t are school and year fixed effects and $\varepsilon_{s,t}$ is an error term with the usual properties. In this model, the coefficient of the implementation dummy variable, ϕ, provides an estimate of the impact of implementing PDB on the performance of schools.

One year before actually implementing PDB, schools began planning for the new budget system, therefore, we also estimate an alternative specification of model (1) that introduces two PDB plan dummies, PDBPLN67 and PDBPLN89, that take a value of one if the school planned PDB in 1996-97 and 1998-99, respectively. This alternative model is a fuller specification that may enable us to estimate the net impact of implementing PDB on the performance of schools after controlling for the effect of planning for PDB.

(2) $TEST_{s,t} = \alpha + \beta E_{s,t} + \delta X_{s,t} + \gamma S_{s,t} + \phi_1 PLAN67_s + \phi_2 IMP78_s + \phi_3 PLAN89_s + \upsilon_s + \omega_t + \varepsilon_{s,t}$

In this model, the coefficients on the two plan dummies, ϕ_1 and ϕ_3, capture the effect of PDB planning on the average academic performance of schools. The coefficient of the implementation dummy variable, ϕ_2, provides an estimate of the net impact of implementing PDB.

As the PDB initiative delegates decision making power to schools, it may consequently affect resource allocations at the school

17. Howard S. Bloom, "Measuring the Impact of Whole-School Reforms: Methodological Lessons from Evaluation of Accelerated Schools," (MDRC working papers on research methodology, New York, NY, October 2001).

level. We start our analysis on these changes by investigating whether PDB has affected the amount of per-pupil expenditures. This analysis will enable us to see if the total amount of resources allocated to schools changes after implementing PDB. Second, PDB may also affect the composition of revenue sources. The New York City schools are financed by revenues from "tax levy and state operating aid funds" and "reimbursable funds." We examined the effect of PDB planning and implementation on the total amount of reimbursable funds received by schools as well as on the share of reimbursable funds of the total revenues. Finally, one may expect that schools have incentives to allocate more resources to instruction-related services under PDB. We examined this hypothesis by estimating the effect of PDB on the share of classroom expenditures as a percentage of the total tax levy and operating aid revenues.

The following model estimates the effect of PDB planning and implementation on expenditures or expenditure shares:

$$(3)\ EXP_{s,t} = \alpha + \gamma S_{s,t} + \phi_1 PLAN67_s + \phi_2 IMP78_s + \phi_3 PLAN89_s + \upsilon_s + \omega_t + \varepsilon_{s,t}$$

where $EXP_{s,t}$ represents four alternatives: the log of total expenditure per pupil; the log of reimbursable expenditures per pupil; the share of reimbursable expenditure as a percentage of total expenditure; or the share of classroom teacher expenditure as a percentage of total tax levy and operating aid. In this model, ϕ_1 and ϕ_3 are the estimates of the effects of planning PDB in 1996-97 and 1998-99, respectively, and ϕ_2 captures the effect of implementing PDB in 1997-98 on the dependent variables specified above.

Data

Our analysis uses data obtained from the New York City Board of Education on students' test scores, school expenditures and resources, and school demographics. The data set is a balanced panel of school-level data for 609 elementary and middle schools in four consecutive school years—1995-96 through 1998-1999—for a total of 2,436 observations. These 609 schools are all the schools in New York City that serve grades four and five and had test score data for grades four and five for each of the four years that span our analysis.

The PDB Initiative began in the 1996-97 school year when the first group of 39 Phase I schools began to plan for the program implementation. The previous year, 1995-96, therefore, serves as our base year and the descriptive statistics in the following four tables refer to the 1995-96 school year. Table 1 describes the particular attributes of the schools in our dataset. On average, the

schools in our data set have approximately 780 students, the largest being nearly 3.5 times the average and enrolling over 2,500 students, while the smallest enrolls only 96. The average school is approximately 49% female and nearly 80% non-white. Some schools are highly segregated, serving over 90% of one racial/ethnic group. In the typical school nearly 75% of students are eligible for free lunch, with some schools having 100% of its student body eligible. Per-pupil expenditures range from $5,443 to $20,849 with the average being $7,449. The typical school has a stable, experienced teaching staff with nearly 85% licensed and over 75% with master's degrees.

Table 2 reports descriptive statistics for the 39 schools that planned for PDB during the 1996-97 school year. The same 39 schools implemented the program in the 1997-98 school year. On average, these schools are smaller with an average enrollment of 725 and a maximum of 1,155. The average school in this group serves a larger percentage of Asian students but significantly lower percentages of black and Hispanic students.

Table 3 reports data for the 81 schools that planned for PDB during the 1998-1999 school year. Because we do not have data beyond the 1998-1999 school year, an analysis of PDB implementation in these schools was not possible. Finally, Table 4 describes characteristics of all other schools in our data set that neither planned nor implemented the PDB Initiative.

Comparing the four tables, we see that the PDB implementers (Table 2) have lower average expenditures and higher test scores than the other three groups. Implementing schools also have higher percentages of licensed teachers and teachers with master's degrees, and lower teacher absenteeism. The lower percentage of students who receive free lunch in the PDB implementing schools indicates that these schools serve a student population that is not as poor as in the rest of the schools in our sample. The racial/ethnic minority population in implementing schools is significantly smaller than in the rest of the schools, as is the percentage of students who have limited English proficiency (LEP) and students in special education. Interestingly, while the LEP population is smaller, the percentage of immigrants in implementing schools is comparable or greater than the percentage of immigrants in the schools that make up the rest of the sample.

It is apparent from the analysis of descriptive statistics that the group of PDB implementing schools is different from the rest of the schools in our data. The effect of this, however, on our overall analysis is controlled for by incorporating school fixed effects and by using a time series that began before PDB was implemented.

TABLE 1
DESCRIPTIVE STATISTICS — ALL SCHOOLS

Variable	N	Mean	Minimum	Maximum
Test Scores				
Grade 5 reading (z-score)	609	0.019	-1.125	1.549
Grade 4 reading (z-score)	609	0.019	-0.922	1.396
Grade 5 math (z-score)	609	0.023	-1.155	1.407
Grade 4 math (z-score)	609	0.024	-1.281	1.343
Expenditures				
Average total expenditure per pupil	609	7,449.41	5,443.11	20,848.92
Reimbursable total per pupil	609	1,136.20	127.81	4,737.18
% total reimbursable (tax levy & operating aid)	609	15.04	1.77	40.60
Share of classroom teacher expenditures as % of tax levy & operating aid total	609	46.41	20.05	61.84
Teacher Characteristics				
% teachers licensed\permanently assigned	594	84.55	20.00	100.00
% teachers greater than 5 years experience	594	71.70	14.60	100.00
% teachers more than 2 years in current schools	594	81.51	0.00	100.00
% teachers with masters degree	569	75.98	31.00	100.00
Teachers' average days absent per year	505	7.01	0.00	10.70
School Characteristics				
Total enrollment	609	780.87	96.00	2,540.00
% female students	609	48.75	40.90	62.40
% Asian & other students	609	9.88	0.00	93.20
% black students	609	36.15	0.00	98.90
% Hispanic students	609	34.47	0.80	97.60
% average daily attendance	609	89.45	82.60	96.70
% free lunch students	609	74.49	6.70	100.00
% LEP students of total enrollment	603	17.84	0.34	93.39
% resource room students of total enrollment	609	4.03	0.00	18.52
% special education students of total enrollment	609	5.54	0.00	69.60
% students arrived to US within last 3 years	609	8.38	0.00	39.10

Note: The descriptive statistics are based on data from the 1995-96 school year.

This allows us to use within school variation to identify the impact on expenditures and test scores from the 1996-97 to the 1998-99 school years.

RESULTS

Table 5 shows the parameter estimates from the baseline model (1). The estimated R^2s indicate that the model performs well, explaining more than 90% of the variation in test score as is typical of models including school fixed effects. Most importantly, the PDB implementation variable has positive and statistically significant effects on grade four reading and math scores and grade five read-

TABLE 2
DESCRIPTIVE STATISTICS — PDB IMPLEMENTERS

Variable	N	Mean	Minimum	Maximum
Test Scores				
Grade 5 reading (z-score)	39	0.299	-0.626	1.347
Grade 4 reading (z-score)	39	0.364	-0.541	1.265
Grade 5 math (z-score)	39	0.383	-0.743	1.331
Grade 4 math (z-score)	39	0.397	-0.726	1.339
Expenditures				
Average total expenditure per pupil	39	7040.66	5607.99	10301.62
Reimbursable total per pupil	39	1099.33	322.12	2793.00
% total reimbursable (tax levy & operating aid)	39	15.27	4.53	32.29
Share of classroom teacher expenditures as % of tax levy & operating aid total	39	49.07	41.59	55.54
Teacher Characteristics				
% teachers licensed\permanently assigned	36	87.90	69.20	100.00
% teachers greater than 5 years experience	36	66.81	30.80	96.10
% teachers more than 2 years in current schools	36	81.77	8.70	98.00
% teachers with masters degree	34	79.38	48.60	93.80
Teachers' average days absent per year	34	6.33	4.50	10.70
School Characteristics				
Total enrollment	39	725.15	120.00	1155.00
% female students	39	49.22	43.60	59.20
% Asian & other students	39	18.85	0.20	93.20
% black students	39	29.51	0.50	97.90
% Hispanic students	39	20.47	1.60	69.00
% average daily attendance	39	90.87	85.10	96.70
% free lunch students	39	59.63	11.80	100.00
% LEP students of total enrollment	39	14.66	0.70	57.43
% resource room students of total enrollment	39	3.76	0.00	8.58
% special education students of total enrollment	39	3.40	0.00	15.98
% students arrived to US within last 3 years	39	9.78	0.70	31.60

Note: The descriptive statistics are based on data from the 1995-96 school year.

ing scores with coefficients of 0.0557, 0.0599 and 0.0568, respectively.[18]

The log of total expenditure per pupil is largely insignificant and its effect is mixed. For the most part, teacher characteristics also appear insignificant except for the percent of teachers who are in the same school for more than two years and the percent with master's degrees. Unexpectedly, the percent in the same school

18. There is also a small positive effect on grade five math although it is insignificant.

TABLE 3
DESCRIPTIVE STATISTICS — PDB PLANNERS

Variable	N	Mean	Minimum	Maximum
Test Scores				
Grade 5 reading (z-score)	81	-0.018	-0.761	0.812
Grade 4 reading (z-score)	81	-0.043	-0.746	1.178
Grade 5 math (z-score)	81	-0.01	-0.877	1.205
Grade 4 math (z-score)	81	-0.06	-1.061	1.157
Expenditures				
Average total expenditure per pupil	81	7517.47	5655.62	10633.22
Reimbursable total per pupil	81	1272.10	420.11	2938.41
% total reimbursable (tax levy & operating aid)	81	16.74	7.13	32.48
Share of classroom teacher expenditures as % of tax levy & operating aid total	81	46.86	38.70	53.48
Teacher Characteristics				
% teachers licensed\permanently assigned	81	82.43	33.30	100.00
% teachers greater than 5 years experience	81	72.07	40.00	95.00
% teachers more than 2 years in current schools	81	84.30	22.20	96.70
% teachers with masters degree	78	73.95	31.00	100.00
Teachers' average days absent per year	73	7.40	5.30	9.60
School Characteristics				
Total enrollment	81	828.83	148.00	1711.00
% female students	81	48.12	41.30	53.00
% Asian & other students	81	8.09	0.00	56.10
% black students	81	41.38	0.80	96.60
% Hispanic students	81	30.38	1.60	81.10
% average daily attendance	81	88.95	83.30	93.90
% free lunch students	81	81.45	25.50	100.00
% LEP students of total enrollment	80	21.21	2.85	53.93
% resource room students of total enrollment	81	3.47	0.52	7.78
% special education students of total enrollment	81	6.04	0.00	23.93
% students arrived to US within last 3 years	81	9.55	0.40	27.20

Note: The descriptive statistics are based on data from the 1995-96 school year.

shows a significant negative effect on fourth grade reading scores, and a barely significant positive effect on fifth grade math scores. With the percent of teachers with master's degrees, we see a slight positive effect on grade four reading and grade five math scores.

Many of the estimated coefficients on the student body characteristics are statistically significant, which is typical in models that measure variations in student test scores. Increases in the percent of Asian students, for example, suggest increases in grade five reading and math scores but decreases in grade four reading and

TABLE 4
DESCRIPTIVE STATISTICS — ALL OTHER SCHOOLS

Variable	N	Mean	Minimum	Maximum
Test Scores				
Grade 5 reading (z-score)	489	0.003	-1.125	1.549
Grade 4 reading (z-score)	489	0.002	-0.922	1.396
Grade 5 math (z-score)	489	-0.001	-1.155	1.407
Grade 4 math (z-score)	489	0.008	-1.281	1.343
Expenditures				
Average total expenditure per pupil	489	7470.74	5443.11	20848.92
Reimbursable total per pupil	489	1116.62	127.81	4737.18
% total reimbursable (tax levy & operating aid)	489	14.74	1.77	40.59
Share of classroom teacher expenditures as % of tax levy & operating aid total	489	46.13	20.05	61.84
Teacher Characteristics				
% teachers licensed\permanently assigned	477	84.66	20.00	100.00
% teachers greater than 5 years experience	477	72.01	14.60	100.00
% teachers more than 2 years in current schools	477	81.02	0.00	100.00
% teachers with masters degree	457	76.08	33.30	100.00
Teachers' average days absent per year	398	7.00	0.00	10.50
School Characteristics				
Total enrollment	489	777.37	96.00	2540.00
% female students	489	48.82	40.90	62.40
% Asian & other students	489	9.46	0.00	55.90
% black students	489	35.81	0.00	98.90
% Hispanic students	489	36.26	0.80	97.60
% average daily attendance	489	89.42	82.60	95.40
% free lunch students	489	74.52	6.70	100.00
% LEP students of total enrollment	484	17.55	0.34	93.39
% resource room students of total enrollment	489	4.14	0.00	18.52
% special education students of total enrollment	489	5.63	0.00	69.60
% students arrived to US within last 3 years	489	8.08	0.00	39.10

Note: The descriptive statistics are based on data from the 1995-96 school year.

math test scores. Schools educating larger percentages of black and Hispanic students have lower reading and math test scores for both grades four and five; estimated coefficients are, for the most part, statistically significant. Average student attendance is positively associated with reading and math test scores. The estimated coefficient of this variable is statistically significant in grade four reading and math as well as grade five math regressions.

Schools with larger enrollment have significantly lower read-

TABLE 5

THE IMPACT OF PDB PARTICIPATION ON THE PERFORMANCE OF SCHOOLS ON STANDARDIZED TESTS; INCLUDING IMPLEMENTATION DUMMY ONLY

	Grade 4		Grade 5	
Dependent Variables:	Reading	Math	Reading	Math
Participation Variable				
Implemented PDB in 1997-98	0.0557**	0.0599**	0.0568**	0.0187
	(0.0254)	(0.0269)	(0.0247)	(0.0263)
Expenditure				
Log of total expenditure per pupil	-0.002	-0.1234	0.1201*	0.1125
	(0.0720)	(0.0765)	(0.0701)	(0.0746)
School Size				
Log of total enrollment	-0.1502***	-0.1665***	-0.1226**	-0.1023*
	(0.0523)	(0.0555)	(0.0509)	(0.0541)
Teacher Characteristics				
% teachers licensed\permanently assigned	0.0001	0.0009	0.0007	0.0009
	(0.0007)	(0.0008)	(0.0007)	(0.0008)
% teachers greater than 5 years experience	-0.0007	-0.0011	-0.0008	-0.0002
	(0.0007)	(0.0008)	(0.0007)	(0.0008)
% teachers more than 2 years in current schools	-0.0014***	-0.0002	0.0007	0.0010*
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
% teachers with masters degree	0.0012*	0.0009	0.0007	0.0013*
	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Teachers' average days absent per year	0.0034	0.00003	-0.0006	-0.0020
	(0.0026)	(0.0027)	(0.0025)	(0.0026)
School Characteristics				
% female students	0.0022	-0.0035	0.0040	-0.0005
	(0.0027)	(0.0029)	(0.0026)	(0.0028)
% Asian & other students	-0.0063**	-0.0057*	0.0094***	0.0089***
	(0.0029)	(0.003)	(0.0028)	(0.0030)
% black students	-0.0091***	-0.0114***	-0.0018	-0.0039
	(0.0024)	(0.0025)	(0.0023)	(0.0025)
% Hispanic students	-0.0124***	-0.0111***	-0.0050**	-0.0065**
	(0.0026)	(0.0028)	(0.0025)	(0.0027)
% average daily attendance	0.0158***	0.0184***	0.0085	0.0129**
	(0.0054)	(0.0057)	(0.0052)	(0.0056)

TABLE 5 (CONTINUED)

	Grade 4		Grade 5	
Dependent Variables:	Reading	Math	Reading	Math
% free lunch students	0.0021**	0.0012	-0.0013	0.0006
	(0.0009)	(0.0010)	(0.0009)	(0.0010)
% LEP students of total enrollment	-0.0033**	-0.0063***	-0.0016	-0.0047***
	(0.0014)	(0.0015)	(0.0014)	(0.0015)
% resource room students of total enrollment	-0.0059*	-0.0091**	-0.0062*	-0.0021
	(0.0034)	(0.0037)	(0.0034)	(0.0036)
% special education students of total enrollment	0.0003	-0.0025	-0.0010	0.0022
	(0.0024)	(0.0025)	(0.0023)	(0.0025)
% students arrived to US within last 3 years	-0.0004	-0.0069**	-0.0087***	-0.0063**
	(0.0026)	(0.0027)	(0.0025)	(0.0027)
Constant	0.3316	1.6980	-0.9112	-1.2716
	(1.0014)	(1.0629)	(0.9749)	(1.0371)
Number of Observations	2436	2436	2436	2436
R-squared	0.9234	0.9290	0.9252	0.9304

Notes:

i) All regressions are weighted by enrollment share.

ii) All dependent variables are measured in z-scores. Test scores in all years are from the CTB (reading) or CAT (math) normal curve equivalents (NCEs), except for 1998-99 4th grade reading and math scores. Fourth grade students were given new state reading and math tests in 1998-99, and the BOE reports their scaled test scores.

iii) Regression equations include school and year fixed effects and a group of missing value

iv) * p<.10. ** p<.05. *** p< .01.

v) Standard errors are reported in parentheses.

ing and math test scores for both grade four and five, a result that is not unexpected given that other research suggests that larger schools may contribute to worse student outcomes.[19] Our model, however, includes school fixed effects and since school size does not vary widely over time the fact that it is still highly significant is telling.

The estimated coefficients of percent free lunch eligible students show mixed signs and are mostly insignificant. The percent

19. William J. Fowler & Herbert J. Walberg, "School Size, Characteristics and Outcomes," *Educational Evaluation and Policy Analysis* 13, no. 2 (1991): 189-202; Leanna Stiefel, Robert Berne, Patrice Iatarola, and Norman Fruchter, "High School Size: Effects on Budgets and Performance in New York City," *Educational Evaluation and Policy Analysis* 22 (2000): 27-39.

TABLE 6

THE IMPACT OF PDB PARTICIPATION ON THE PERFORMANCE OF SCHOOLS ON STANDARDIZED TESTS; INCLUDING BOTH PLAN AND IMPLEMENTATION DUMMIES

	Grade 4		Grade 5	
Dependent Variables:	Reading	Math	Reading	Math
Participation Variables				
Planned PDB in 1996-97	0.0138	-0.0092	0.0675**	0.0316
	(0.0353)	(0.0375)	(0.0343)	(0.0365)
Implemented PDB in 1997-98	0.0473	0.0636*	0.0211	0.0009
	(0.0309)	(0.0328)	(0.0300)	(0.0320)
Planned PDB in 1998-99	-0.0240	-0.0129	-0.0327*	-0.0323
	(0.0194)	(0.0206)	(0.0189)	(0.0201)
Expenditure				
Log of total expenditure per pupil	0.0001	-0.1235	0.1263*	0.1162
	(0.0721)	(0.0765)	(0.0701)	(0.0746)
School Size				
Log of total enrollment	-0.1498***	-0.1675***	-0.1185**	-0.1008*
	(0.0523)	(0.0556)	(0.0509)	(0.0542)
Teacher Characteristics				
% teachers licensed\permanently assigned	0.0001	0.0009	0.0007	0.0009
	(0.0007)	(0.0008)	(0.0007)	(0.0008)
% teachers greater than 5 years experience	-0.0007	-0.0011	-0.0008	-0.0002
	(0.0007)	(0.0008)	(0.0007)	(0.0008)
% teachers more than 2 years in current schools	-0.0014***	-0.0002	0.0007	0.0009*
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
% teachers with masters degree	0.0012*	0.0009	0.0007	0.0013*
	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Teachers' average days absent per year	0.0034	0.00005	-0.0006	-0.0020
	(0.0026)	(0.0027)	(0.0025)	(0.0026)
School Characteristics				
% female students	0.0022	-0.0035	0.0041	-0.0005
	(0.0027)	(0.0029)	(0.0026)	(0.0028)
% Asian & other students	-0.0061**	-0.0056*	0.0097***	0.0091***
	(0.0029)	(0.003)	(0.0028)	(0.0030)
% black students	-0.0092***	-0.0114***	-0.0018	-0.0039
	(0.0024)	(0.0025)	(0.0023)	(0.0025)
% Hispanic students	-0.0125***	-0.0111***	-0.0051**	-0.0066**
	(0.0026)	(0.0028)	(0.0025)	(0.0027)

of LEP students, resource room participants and recent immigrants are, overall, negatively associated with reading and math test scores with varying degrees of statistical significance.

Table 6 shows the regression results when we add PDB planning dummies to the model. Once again, the model explains a large

TABLE 6 (CONTINUED)

	Grade 4		Grade 5	
Dependent Variables:	Reading	Math	Reading	Math
% average daily attendance	0.0158***	0.0183***	0.0089*	0.0130**
	(0.0054)	(0.0057)	(0.0052)	(0.0056)
% free lunch students	0.0021**	0.0012	-0.0013	0.0006
	(0.0009)	(0.0010)	(0.0009)	(0.0010)
% LEP students of total enrollment	-0.0033**	-0.0063***	-0.0017	-0.0047***
	(0.0014)	(0.0015)	(0.0014)	(0.0015)
% resource room students of total enrollment	-0.0063*	-0.0093**	-0.0067**	-0.0026
	(0.0035)	(0.0037)	(0.0034)	(0.0036)
% special education students of total enrollment	0.0003	-0.0025	-0.0009	0.0023
	(0.0024)	(0.0025)	(0.0023)	(0.0025)
% students arrived to US within last 3 years	-0.0004	-0.0069**	-0.0087***	-0.0063**
	(0.0026)	(0.0027)	(0.0025)	(0.0027)
Constant	0.3183	1.7235	-1.0253	-1.3152
	(1.0039)	(1.0660)	(0.9760)	(1.0393)
Number of Observations	2436	2436	2436	2436
R-squared	0.9235	0.9290	0.9255	0.9305

Notes:

i) All regressions are weighted by enrollment share.

ii) All dependent variables are measured in z-scores. Test scores in all years are from the CTB (reading) or CAT (math) normal curve equivalents (NCEs), except for 1998-99 4th grade reading and math scores. Fourth grade students were given new state reading and math tests in 1998-99, and the BOE reports their scaled test scores.

iii) Regression equations include school and year fixed effects and a group of missing value indicators.

iv) * p<.10. ** p<.05. *** p< .01.

v) Standard errors are reported in parentheses.

vi) A joint test of the significance of Planned PDB in 1996-97 and Implemented PDB in 1997-98 rejects that they are jointly zero except for the grade 5 math regression.

amount of the variation in student test scores with all R^2s exceeding .92. With this model, our goal was to separate the effect of actual implementation of PDB from the effect of planning for PDB implementation. As a result of the re-specification there is a reduction in the magnitude of the impact that PDB implementation, *per se*, has on test scores. Although still positive, the effect of implementation is only significant in the grade four math regression. Planning for PDB in 1996-97 has mixed effects on the dependent variables—the grade four coefficients are 0.0138 for reading and -0.0092 for math; the grade five coefficient for reading is signifi-

cant with a value of 0.0675 and for math it is 0.0316 though insignificant. A joint test of significance between planned 1996-97 and implemented shows the coefficients are jointly significant except for math in grade five. Planning in 1998-99, on the other hand, shows negative, but largely insignificant effects. The effects of our other independent variables are similar to those in Table 5.

In Table 7, we show the impact of PDB planning and implementation on expenditures and expenditure shares as described by model (3). The explanatory power of this model is reasonably strong. With per-pupil expenditures on the left-hand side of our equation, the model explains about 90% or more of the variation. When we look at the expenditure shares, the model's explanatory power is more than 80%. After controlling for the student body characteristics, and incorporating school fixed effects, we find that the planned PDB 1996-97 dummy variable is the only one that has a significant impact on any of our expenditure variables. Its effect is negative and significant on the reimbursable per-pupil expenditure (-0.1201) and on the share of reimbursable expenditure as a percent of total expenditures (-1.4453). Its effect is still negative, but insignificant on total per-pupil expenditure and the share of classroom teacher expenditure. The implemented PDB 1997-98 and planned PDB 1998-99 show mixed, statistically insignificant effects with mixed signs on the expenditure variables. A joint test of significance between planned 1996-97 and implemented 1997-98 also shows similar results. They are jointly significant in the reimbursable expenditure and its share regressions, but not in the total expenditure and the share of classroom expenditure regressions.

As before, we controlled for a variety of student body characteristics. Some highlights of the results are that schools with larger enrollments have lower levels of total expenditures per pupil and reimbursable expenditures per pupil, which is consistent with other research that suggests that larger schools enjoy economies of scale. Total enrollment is also negatively associated with the expenditure shares. The estimated coefficient of the log of total enrollment is -3.3027 for the share of reimbursable expenditures, and -3.3522 for the share of classroom teacher expenditures.

Although the estimated coefficient of percent free lunch eligible students is consistently negative in all four expenditure regressions, it is significant only in the share of classroom teacher expenditure regression. Schools with a greater percentage of LEP participants have a significantly higher level of reimbursable expenditures per pupil and a higher share of reimbursable expenditures as a percent of total expenditures. The amount of reimbursable expenditures is higher among schools with a larger percent-

TABLE 7

IMPACT OF PDB ON EXPENDITURES; INCLUDING BOTH PLAN AND IMPLEMENTATION DUMMIES

Dependent Variables:	Log Total Expenditure Per Pupil	Log Reimbursable Per Pupil	Share of Reimbursable Exp as a % of Total Exp	Share of Classroom Teacher Exp as a % of Op. and Tax Levy Total
Participation Variables				
Planned PDB in 1996-97	-0.0151	-0.1201***	-1.4453***	-0.3997
	(0.0116)	(0.0430)	(0.5412)	(0.5353)
Implemented PDB in 1997-98	0.0046	0.0363	0.2670	-0.3949
	(0.0102)	(0.0376)	(0.4732)	(0.4680)
Planned PDB in 1998-99	0.0045	0.0027	-0.1373	0.4354
	(0.0064)	(0.0236)	(0.2971)	(0.2939)
School Size				
Log of total enrollment	-0.1973***	-0.3746***	-3.3027***	-3.3522***
	(0.0162)	(0.0599)	(0.7537)	(0.7455)
School Characteristics				
% female students	-0.0018**	-0.0032	-0.0233	0.0239
	(0.0009)	(0.0033)	(0.0413)	(0.0409)
% Asian & other students	-0.0021**	0.0176***	0.2131***	-0.0211
	(0.0009)	(0.0034)	(0.0434)	(0.0430)
% black students	-0.0006	0.0126***	0.1738***	0.0578
	(0.0008)	(0.0029)	(0.0362)	(0.0358)
% Hispanic students	0.00003	0.0098***	0.1024***	0.0248
	(0.0009)	(0.0032)	(0.0398)	(0.0394)
% average daily attendance	0.0034*	-0.0105	-0.0638	0.0828
	(0.0018)	(0.0066)	(0.0826)	(0.0817)
% free lunch students	-0.00004	-0.0011	-0.0148	0.0562***
	(0.0003)	(0.0011)	(0.0138)	(0.0137)
% LEP students of total enrollment	-0.0005	0.0059***	0.0650***	0.0145
	(0.0005)	(0.0017)	(0.0217)	(0.0214)
% resource room students of total enrollment	0.0012	0.0075*	-0.0294	-0.0965*
	(0.0011)	(0.0042)	(0.0528)	(0.0522)
% special education students of total enrollment	0.0063***	-0.0047*	-0.1635***	-0.3066***
	(0.0008)	(0.0028)	(0.0356)	(0.0352)
% students arrived to US within last 3 years	0.0002	0.0027	0.0457	-0.1404***
	(0.0009)	(0.0031)	(0.0396)	(0.0392)
Constant	10.0009***	9.461***	32.5879***	56.3681***
	(0.2186)	(0.8069)	(10.1583)	(10.0478)
Number of Observations	2436	2436	2436	2436
R-square	0.9450	0.8950	0.8857	0.8032

Notes:
i) All regressions are weighted by enrollment share.
ii) Regression equations include school and year fixed effects and a group of missing value indicators.
iii) * p<.10. ** p<.05. *** p< .01.
iv) Standard errors are reported in parentheses.
v) A joint test of the significance of Planned PDB in 1996-97 and Implemented PDB in 1997-98 rejects that they are jointly zero in the reimbursable expenditure and its share regressions but does not reject the hypothesis in the total expenditure and the share of classroom expenditure regressions.

age of resource room students, while the share of classroom expenditures is lower. The estimated coefficient on percent full-time special education students is statistically significant in all four expenditure regressions. It is positive for the log of total expenditure per pupil and negative for the reimbursable per pupil expenditure and the two expenditure shares. The estimated coefficient of percent of recent immigrants is negative and statistically significant in the share of classroom teacher expenditure, but insignificant in the other three regressions.

Conclusions

PDB had some positive impact on test scores. This finding is most strongly supported by our first set of regressions where schools that implemented PDB in 1997-98 showed standardized test scores higher by approximately .06 than non-implementing schools. In a finer delineation of PDB planners versus implementers, we also found small positive impacts when the effect of both planning and implementing for the PDB schools was tested jointly. This finding, although small in impact, is robust given our research design. The difference-in-difference specification that includes data on both PDB and non-PDB comparison schools before and after the PDB intervention is believed to provide a conservative estimate of the program's impact. We also employed a school fixed effects model to control for unobservable and time-invariant conditions at different schools.

Our efforts to trace the effect of PDB to resource allocation show that there was not a large effect. At most, the schools that planned PDB first (in 1996-97) spent less from reimbursable funds and lowered the reimbursables as a percent of total expenditures. This result could indicate that the schools were given some freedom over allocations between types of funds and used that freedom to reallocate away from funds with restricted use. Since, however, this result is not replicated for the implementation year, we are not confident of it. PDB had a positive effect on achievement, but it is unlikely that the effect was caused by massive resource reallocations.

The results of our study are encouraging for school districts considering implementing or currently experimenting with this type of budget reform. The analysis suggests that a reform such as PDB may lead to improvements in test scores. Additionally, there may be other positive effects of PDB that are beyond the scope of this paper such as the effect of empowering school administrators and teachers in actively participating in the budget-making process, which are worthy of further research.

Finally, the paper demonstrates the efficacy of using school-level panel datasets, which allow researchers to control for time-invariant but unobserved school variables using fixed effects, to estimate the impact of school budget reforms. This is useful in a non-classical experimental framework, which is the one most likely to be used to evaluate most US school budget reforms.