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LOCAL GOVERNMENT CONSOLIDATION:

POTENTIAL SAVINGS DUE TO ECONOMIES OF SCALE & EFFICIENCY GAINS

ANALYSIS OF PUBLIC SCHOOL DISTRICTS

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» EXECUTIVE SUMMARY

This study estimates the potential savings from consolidating school districts in New Jersey. Savings from economies of scale occur from spreading fixed costs across more taxpayers. Savings from G-inefficiency are realized by reducing other types of inefficiencies related to large numbers of governmental units engaged in similar activities in a small region. We estimate potential savings using two sets of statistical (regression) models and data on per pupil spending in New Jersey school districts. Our economies of scale model analyzes how average school district expenditures vary with enrollment. The G-inefficiency model examines how average expenditures in a school district vary with the number of school districts in a county. We use estimates from these models to calculate the annual savings that could be achieved from reducing the number of school districts in New Jersey.

Using data on New Jersey school districts, the economies of scale models show the potential savings from scale economies are small. Though there is strong evidence they exist, we find that scale economies occur only in districts with enrollment levels of fewer than 2,000 students. Statewide, total costs would decrease by $3.9 million if all districts with less than 2,000 students were merged with other districts so that the minimum district size was 2,000 students. This savings is less than half a percent of aggregate primary and secondary education costs in New Jersey, and so represents very modest savings.

We could not test G-inefficiency on the sample of New Jersey school districts, so we used data from the Census of Governments to test our model of G-inefficiency. Here, we find strong evidence of G-inefficiency for counties with populations below 250,000 when employing elementary and secondary school expenditures as our cost metric in a five state region, which includes New Jersey and the surrounding states. To assess the magnitude of these effects, we estimate the cost savings of reducing the number of school districts in a county by one through consolidation. This would yield a savings of around $3.7 million in the typical county, and $10 million per year in the largest county in this population range (counties with populations below 250,000). Additional savings would result if more than one district is consolidated in a county.

School expenditures are a significant component of local government activity. The size differentials in schools and the proliferation of numerous administrative units within a region lead to considerable extra cost to taxpayers and/or lower levels of public service quality, both of which pose a significant policy concern. Taxpayers in New Jersey would see potential savings (or improved quality) from consolidation of school districts, resulting in fewer, but larger districts.

» INTRODUCTION

The goal of this project is to estimate the potential savings from consolidating school districts in New Jersey. Savings from economies of scale and improved efficiency may be realized from consolidation. We estimate potential savings using two sets of statistical (regression) models and data on per pupil spending in New Jersey school districts. The economies of scale model examines how average school district expenditures vary with enrollment. The efficiency model examines how average expenditures in a school district vary with the number of school districts in a county. Estimates from these models are used to calculate the annual savings that could be achieved from reducing the number of school districts.

Economies of scale arise from the presence of fixed costs. These costs do not vary with the size of a school district and will be higher in smaller districts. Proponents of school district consolidation argue that by consolidating school districts, fixed cost can be spread over a larger geographic area and enrollment, therefore lowering the average cost of providing primary and secondary public education. We examine how observed school district spending varies with the student population. When our statistical analysis suggests that consolidation is likely to lower spending, the magnitude of this potential savings is estimated.

Government efficiency is measured differently from economies of scale. We measure what we term "G-inefficiency," a type of inefficiency resulting from multiple jurisdictions in a small area. When associated with non-school activities, the costs of coordinating services are a clear example. While this example may also hold in schools, a more likely explanation is the presence of internal inefficiencies in the provision of services due to the multiplicity of school districts. The presence of G-inefficiencies is an empirical matter. To test this, we examine how the number of school districts in a county influences spending on primary and secondary education within that county.

PUBLIC SCHOOL SYSTEMS IN NEW JERSEY & SURROUNDING STATES

In Table 1, we show the distribution of public school systems by state for the five states included in the analysis: Connecticut, Delaware, New Jersey, New York and Pennsylvania.

In Table 2, we provide an adjusted measure of the number of school systems, by type, per million state residents. New Jersey has more school districts per million population (71.9) than the surrounding states.

REVIEW OF RELEVANT STUDIES

There is a considerable history of research examining the impact of school size on performance and cost of education. The studies relevant for this analysis are those that examine the relationship between the size and the costs of schooling.

In a meta-analysis of school size and performance studies, Andrews, Duncombe and Yinger (2002) studied school consolidation and attempted to come to a consensus on how school and district size affect costs and student performance. This study reviewed results from fifteen cost function studies and twelve production function studies to answer the following questions: do school size and school district size matter? And, is consolidation generally an effective policy? They conclude that "moderation in district and school size may provide the most efficient combination. Under some conditions, consolidation of very small rural districts may save money, as long as schools are kept moderate size and transportation times remain reasonable" (Andrews, Duncombe and Yinger 2002, 256). Furthermore, their literature review finds that consolidating particularly small districts, fewer than 500 students, could result in additional administrative and instructional costs. They also note that despite scale economies, per student costs continue to decline until the enrollment reaches approximately 6,000 students, at which point economies of scale are exhausted.

A 1992 study (Deller and Rudnicki) tested size and managerial efficiency on data from Maine's public schools. They directly confront the problem of optimal school size by testing a cost function that included school specific data on attendance, salaries, test scores and parental educational achievement. The design of the model was intended to isolate the effect of school and non-school inputs (referred to in the educational literature as socioeconomic status). They report that in their model, there is evidence of managerial inefficiency, not economies of scale (they label this as economies of size). Further, this managerial inefficiency is more pronounced in smaller schools.

Stiefel et al. (2000) utilized budget and academic performance data to compare small and large high schools in New York City on measures of academic achievement and cost effectiveness. Data on 121 New York City high schools for the 1995-1996

TABLE 1 » NUMBER OF PUBLIC SCHOOL SYSTEMS T IN THE STUDY REGION

	CONNECTICUT	DELAWARE	NEW JERSEY	NEW YORK	PENNSYLVANIA
Public School Systems	166	19	625	716	515
School Districts	17	19	546	680	515
Dependent Public School Systems	149	—	76	36	—
State Population (2007)	3,502,309	864,764	8,685,920	19,297,729	12,432,792
Land Area (State, sq.miles, exclud. water)	4,844.80	1,953.56	7,417.34	47,213.79	44.816.61

SOURCE: 2007 Census of Governments for local government units, 2007 Census Annual Estimates for state population, and 2000 U.S. Census Bureau QuickFacts for land area.

TABLE 2 » NUMBER OF PUBLIC SCHOOL SYSTEMS PER MILLION RESIDENTS

	CONNECTICUT	DELAWARE	NEW JERSEY	NEW YORK	PENNSYLVANIA
Public School Systems	47.3973	21.9713	71.9555	37.1028	41.4227
School Districts	4.8539	21.9713	62.2057	35.2373	41.4227
Dependent Public School Systems	42.5434	—	8.7498	1.8655	—

SOURCE: 2007 Census of Governments for local government units, 2007 Census Annual Estimates for state population, and 2000 U.S. Census Bureau QuickFacts for land area.

school year was used to model budgeted costs per student and graduates. They found both budget and performance measures for small and large high schools in New York City are similar. In fact, the authors point out that both small and large schools are equally cost-effective due to the high school choice policy implemented in New York City, which allows students to choose their school on the basis of its size (Stiefel et al. 2000).

In a study of school consolidation in West Virginia, Hicks and Rusalkina (2004) test a production function model of all middle and high schools in the state. They find no evidence that consolidation of schools did or would affect school performance.

Gordon and Knight (2008) directly examine school district consolidation on school performance and cost. Examining school consolidation in Iowa in the 1990s, the authors modeled not only the cost and performance issues, but also statewide fiscal effects. They focused on this issue since small school districts were incentivized by the state to consolidate. Their study examined both complete and limited consolidation of some functions. They did not find effects of consolidation on pupil-teacher ratios, enrollments or dropout rates, or reductions in local tax rates for schools. However, they did find schools that consolidated received considerable state assistance. The authors conclude that benefits of consolidation at the local level did not emerge, though costs to the state were significant.

More recently, Zimmer, DeBoer and Hirth (2009) simulated the effects of a proposed school district consolidation in Indiana using a scale economies estimate of the state's school district. The authors employed a traditional cost function, treating the potential endogeneity in cost factors (e.g., teacher salary) using socioeconomic instrumental variables. This study found an optimal school district enrollment (in terms of cost) of 1,300 to 2,900 students, suggesting the presence of economies of scale in this disaggregated school system at those ranges, with diseconomies at larger levels.

In our book (Faulk and Hicks 2011), we estimated scale economies in Indiana's schools, finding the presence of scale economies in districts with an enrollment of 2,000 or fewer students. We also estimated that within schools of this range, the addition of 100 extra students to a school district would reduce costs by $580 per student, or almost 6% of the annual per-student costs.

Existing research points to a range of scale economies in districts and schools ranging from a few hundred, to a few thousand students. However, as scale increases beyond a few thousand students, there is evidence of diseconomies of scale

in districts (cost per pupil increases as the number of students in a district or school increases). This makes the choice of optimal school size a difficult public policy matter. While there are potential cost savings through consolidation, these dissipate quickly at the school level. However, the full weight of analysis has not been conducted for the question of consolidation of school districts. Here, the role of G-inefficiency and scale economies in districts requires more analysis in support of policy decisions.

MODELING PROCEDURE

As with our earlier estimates of scale economies and G-inefficiency, we use a straightforward model to estimate both phenomenons within the context of K-12 education in New Jersey. For our estimate of scale economies, we employ a normalized quadratic cost function, where the cost is a function of fixed and variable costs with normalized input prices. We use the population adjusted expenditures as a cost measure, variables measuring size of the activity as a quantity measure of services,[1] and include a stochastic component that permits random or unexplained variation in the data to exist. This is a common approach, and when adapted to our available data for empirical testing, the equation appears in general form as:

$$C_{i,t} = f(\alpha_i, \Psi_{i,t}, \Psi^2_{i,t}, \varepsilon_{i,t})$$

where cost, C, (costs per unit of service delivered, such as per student or per capita spending), in county i, in year t, are a function of a county constant term (α), population as the quantity measure (Ψ) in county *i*, year *t*, its square and a random error term which captures unexplained variation.

Our estimates of G-inefficiency are based upon the presence of coordination costs, corruption, padding of budgets and overlapping responsibilities, which takes the same form as the normalized quadratic cost function with information flows replacing output from the cost function. This form also permits us to derive some simple conclusions about the role coordination costs potentially play in government activity. The first order conditions of this expression suggest that information costs should be a positive, but decreasing cost of the number of units (G) with which a government must coordinate. This is but one of several potential mechanisms, all of which have similar predictions about government efficiency. More colloquially the model takes the form:

$$C_i = f(Z_i, G_i, G^2_i, \varepsilon_i)$$

where the cost C per pupil in county i, is a function of control variables Z for each county, and the number of local school districts G, and its squared value. We also include a white noise error term.[2] A more formal treatment of both of these models is provided in Faulk and Hicks (2011). We next turn our attention to empirical tests of scale economies and G-inefficiency.

DATA AND MODELS

Economies of Scale Model

Data from the New Jersey Department of Education is used for the analysis of economies of scale for school districts. Our scale economies model includes the traditional quadratic form, with the inclusion of control variables for socioeconomic conditions and charter schools within the district. We have complete information for these variables for 623 school districts in New Jersey (Figure 1). These include a variety of types of school districts: charter, vocational and technical. Descriptive statistics for the data used in the economies of scale regression models appear in appendix Table A1. We estimate separate models for total comparative per pupil costs and instructional costs per pupil.[3]

The scale economies model is tested on a single-year cross-section. We use data from 2007-2008 because this is the latest year with complete data for the variables that we include in the analysis. We report five different regression results, one for the entire sample and four for subsets of school districts with fewer than 1,000 and 2,000 enrolled students, 2000 to 5000 enrolled students and more than 5000 enrolled students. The variables for the estimation include, as a dependent variable, the per capita student expenditures. The explanatory variables include the quadratic form of enrollment (enrollment and squared enrollment), a dummy variable indicating whether the district is a charter school or not, the share of students receiving free

[1] *For a recent application to scale economies in government services, see Garrett (2001), who estimates scale economies in rural extension councils and Sjoquist and Walker (1999) who estimated scale economies in local assessor offices.*

[2] *Simple empirical models of this relationship are also available in Hicks (2007)*

[3] *The Comparative Cost per Pupil represents comparisons with districts of similar budget type. The components that comprise the comparative cost per pupil are as follows: classroom instructional costs; support services (attendance and social work, health services, guidance office, child study team, library and other educational media); administrative costs (general administration, school administration, business administration, and improvement of instruction); operations/maintenance of plant; food services; and extracurricular costs. The total of these expenditures is divided by the average daily enrollment for a total comparative cost per pupil.*

TABLE 3 » ECONOMIES OF SCALE MODEL, TOTAL COST PER PUPIL, NEW JERSEY SCHOOL DISTRICTS, 2007-2008

	SCHOOL DISTRICT ENROLLMENT				
	TOTAL	<1,000	<2,000	<5,000	5,000+
Constant	11,005.72***	14,609.93***	14,012.79***	16,591.40***	12,221.10***
Total Enrollment (2007-08)	-0.21***	-12.45***	-6.85***	-2.49	-0.23**
Total Enrollment Sq.	9.24E-06***	0.008***	0.003***	0.0003	7.43E-06***
Charter Dummy	-1,432.04***	-965.39	-1,327.56**	..	..
Percent Free Lunch	15.89*	-13.16	-10.83	44.34**	68.48***
Percent Special Education	105.14***	119.24***	95.41***	-19.59	-10.02
Adjusted R-squared	0.088	0.264	0.197	0.085	0.537
F-statistic	12.99***	22.63***	21.24***	4.29***	20.12***
Durbin-Watson stat	1.53	1.57	1.55	1.27	0.76
Observations	623	303	414	142	67

NOTE: ***0.01 level of significance, **0.05 level of significance, *0.10 level of significance. Total costs are total comparative costs per pupil. We estimate this same equation using the poverty rate in the school district in place of the percentage of students receiving free lunch as the socioeconomic variable. The poverty rate is not available for all school districts, so the sample is smaller. The results using the poverty rate are similar to the ones presented above and are available from the authors upon request.

lunch, and the share of students in special education classes. These are a common representative set of socioeconomic variables which provide a control for the incremental effect of socioeconomic differences on costs. Results appear in Table 3.

These models support the existence of economies of scale, with the common non-linear presence, in the overall sample and in districts with enrollment lower than 1,000 and 2,000. Such results were also found in districts with enrollment greater than 5,000 in total, though the effect of enrollment on cost per pupil approaches zero at this level and is not significant for instructional costs. The effect is much larger in school districts with the smallest enrollment. Across the full sample, the presence of scale economies is small, indicating each additional student enrolled decreases total cost per pupil by $0.21. However, with enrollment numbers of 2,000 and fewer students within a district, costs per pupil decrease by $6.85 for each additional student enrolled and for enrollment of 1000 and fewer, costs per pupil decrease by $12.45 for each additional student enrolled. This holds when we control for the other factors that determine per student cost. These results suggest that potential savings may result from the consolidation of smaller school districts.

We find that per-pupil costs are significantly lower in charter schools relative to non charter schools. In charter schools, total cost per pupil is $1,327 lower in school districts with enrollment lower than 2,000 students and $965 lower in districts with fewer than 1,000 students. Instructional costs per pupil are $1,178 lower and $948 lower in charter school districts relative to other school districts for districts with enrollment of 2,000 and 1,000 students, respectively. Each of the 56 New Jersey charter schools in this dataset (2007-2008) is its own school district. Each of the New Jersey charter schools in this dataset have enrollment lower than 2000 students, so the charter school dummy is not included in the models examining enrollment larger than 2000 students.

In larger school districts, the share of students receiving free lunch in a school district is associated with higher costs per pupil. A one percentage point increase in students receiving free lunch is associated with a $44 per-pupil increase in the total cost of educating students in districts with enrollment between 2,000 and 5,000. This grows to a $68 per pupil increase in total cost in districts with enrollment larger than 5,000. Per-pupil instructional costs increase with the proportion of students receiving free lunch in schools with more than 2,000 students but decrease with the proportion of students receiving free lunch in schools with less than 2,000 students. This likely reflects the provision of additional services in larger schools.

The share of students in special education classes increases the per-pupil cost in schools with enrollments lower than 2,000. For these school districts, a one percentage point increase in students qualifying for special education is associated with a $95 increase in total costs per pupil and a $59 increase in instructional costs per pupil in districts with enrollment lower than 2,000 students. For districts with enrollment lower than 1,000 students, a one percent increase in special education students results in a $119 increase in total costs per pupil and a $72 increase in instructional costs per pupil.

TABLE 4 » ECONOMIES OF SCALE MODEL, INSTRUCTIONAL COST PER PUPIL, NEW JERSEY SCHOOL DISTRICTS, 2007-2008

	SCHOOL DISTRICT ENROLLMENT				
	TOTAL	<1,000	<2,000	<5,000	5,000+
Constant	6,533.02***	8,817.91***	8,350.39***	8,993.11***	7134.56***
Total Enrollment (2007-08)	-0.11***	-7.74***	-3.96***	-0.97	-0.09
Total Enrollment Sq.	4.87E-06***	0.005***	0.002***	0.0001	3.08E-06**
Charter Dummy	-1,156.24***	-947.53**	-1,177.62***	..	..
Percent Free Lunch	3.12	-14.05**	-12.12**	21.59*	30.00***
Percent Special Education	64.74***	71.96***	59.32***	-18.81	2.86
Adjusted R-squared	0.114	0.329	0.258	0.051	0.425
F-statistic	17.03***	30.61***	29.70***	2.89**	13.2***
Durbin-Watson stat	1.54	1.62	1.51	1.04	0.49
Observations	623	303	414	142	67

NOTE: ***0.01 level of significance, **0.05 level of significance, *0.10 level of significance. Total costs are total comparative costs per pupil. We estimate this same equation using the poverty rate in the school district in place of the percentage of students receiving free lunch as the socioeconomic variable. The poverty rate is not available for all school districts, so the sample is smaller. The results using the poverty rate are similar to the ones presented above and are available from the authors upon request.

Potential Savings from Economies of Scale

We estimate the potential savings from consolidating school districts in New Jersey. For those districts with enrollment lower than 1,000, we simulate the savings from economies of scale due to merging districts so total enrollment in all school districts is at least 1,000. We follow a similar procedure for those districts with enrollment lower than 2,000, so all school districts[4] in the state have at least 2,000 students. Table 3 reports the results of these simulations. Consolidating districts with enrollment lower than 1,000 with other districts so that each district has 1,000 students will result in a $2.2 million decrease in total cost. This includes a $1.4 million decrease in instructional cost. The potential savings from consolidating districts with fewer than 2,000 students so that each district in the state has at least 2,000 students is $3.89 million in total costs, including $2.25 million in instructional costs. Each of these estimates is less than a half percent of aggregate total costs or instructional costs in New Jersey.

Efficiency Model

Elementary and Secondary Education Expenditures

Using data from the Census of Governments, supplemented with other Census data, we estimate our G-inefficiency model. Descriptive statistics are shown in Appendix Table B1. In this model, we examine how the number of school districts within a county affects per capita expenditures on elementary and secondary education in a five state region, i.e. New Jersey and the surrounding states. We examine four population groups: counties with populations lower than 1 million, lower than 500,000, lower than 250,000, and lower than 150,000. The results were significant only for counties with populations below 250,000 and we report those results in Table 6. Variables used in the model include the GINI coefficient, which measures income inequality, and the socioeconomic status variables of adults with high school diploma, share of adults with a bachelor's degree or higher, percentage of families with children and the share of the population aged 65 or older. We also include population density and per capita income to control for transportation related costs and wealth as well as state

TABLE 5 » POTENTIAL SAVINGS IN NEW JERSEY DUE TO ECONOMIES OF SCALE

	Enrollment	COEFFICIENT	POTENTIAL SAVINGS*
Total Cost	<1,000	-12.45	-2,240,620
	<2,000	-6.85	-3,891,338
Instructional Cost	<1,000	-7.74	-1,392,963
	<2,000	-3.96	-2,249,590

NOTE: *savings by increasing district size to 1,000 or 2,000 students.
SOURCE: Author's calculations

[4] *In the data set of 624 school districts used in this analysis, 304 have enrollment of less than 1,000 students and 416 have enrollment of less that 2,000 students. See Appendix Table A.1 for descriptive statistics.*

TABLE 6 » **EFFICIENCY MODEL, PER CAPITA EXPENDITURES ON ELEMENTARY & SECONDARY EDUCATION** Five-State Region, County Population <250,000

	EXPENDITURES PER CAPITA
Constant	-737.51
Number of School Districts	42.73**
Number of School Districts Squared	-1.59*
Number of Dependent School Systems	-132.65
Number of Dependent School Systems Squared	2.96
GINI Coefficient	13.09
High School Graduate (%)	36.25**
Bachelors Degree (%)	-29.02
Per Capita Income	0.02
Population Density	-0.91***
Percent of Households with members age 65+	-6.84
Percent of Households with children under age 18.	0.28
CT Dummy	494.05
DE Dummy	-752.71**
NY Dummy	-342.31
PA Dummy	-1,231.24***
Adjusted R-squared	0.653
F-statistic	14.79***
Durbin-Watson stat	2.80
Observations	111

NOTE: ***0.01 level of significance, **0.05 level of significance, *0.10 level of significance.

dummy variables.

For counties with populations below 250,000, per capita expenditures on public education increase by almost $43 for each additional school district in a county.

Compared to New Jersey, per capita expenditures on education is $753 lower in Delaware and $1,231 lower in Pennsylvania. There is no significant difference in per capita education expenditures between New Jersey and Connecticut or New Jersey and New York for counties in this population range.

Potential Savings from Efficiency Improvements

Estimates of potential savings from reducing the number of school districts by one are shown in Table 7. For the average county in this five-state region (population around 87,000) merging one school district with another (so that there is one fewer school district in the county) could result in savings of $3.7 million per year. For the largest county (population around 233,000), consolidating one school district could

TABLE 7 » **POTENTIAL SAVINGS DUE TO G-INEFFICIENCY**

Elementary and Secondary Education, County Population <250,000

	EXPENDITURES
Coefficient	42.73
Mean County Population	86,996
Mean Potential Savings	$3,717,339
Max Potential Savings	$9,958,996

SOURCE: Author's calculations

results in almost $10 million in annual savings. Among the six New Jersey counties with populations below 250,000 (in 2002), potential annual savings from merging one school district with another to reduce the total number of districts by one would range from $2.65 million in Salem County to $6.08 million in Sussex County.[5] More extensive consolidation so that more than one school district is consolidated within a county would result in higher savings.

Total Local Government Expenditures

We also investigated the relationship between the number of local governments and total local government expenditures per capita in a county for the five-state region. Variables used in the model include the number of cities, the number of townships, the number of special districts, the number of school districts and dependent school systems, the GINI coefficient, the share of the county population that are high school graduates, the share of the population with a bachelor's degree or higher, per capita income, population density and state dummy variables. Here, we are particularly interested in how the number of school districts affects total expenditures. Descriptive statistics for the total sample and each state are shown in appendix table B2. Table 8 shows the results of this efficiency model. One additional school district increases total local government expenditures by almost $80 per person in counties with populations lower than 500,000. In smaller counties the effect is larger. An additional school district increases per capita expenditures by almost $109 in counties with populations below 150,000.

The potential savings from consolidating two school districts (reducing the number of school districts in a county by one) are shown in Table 9. For counties with populations below 500,000, reducing the number of school districts by one would save about $10.56 million in the typical county. Consolidating

[5] *The six New Jersey counties with population below 250,000 in 2002 are Cape May, Cumberland, Hunterdon, Salem, Sussex and Warren.*

TABLE 8 » EFFICIENCY MODEL, TOTAL LOCAL GOVERNMENT EXPENDITURES PER CAPITA, FIVE STATE REGION

	COUNTY POPULATION			
	<1 million	<500,000	<250,000	<150,000
C	-3,597.76	-3,539.67	-2,595.14	-2,265.78
Number of Cities	-13.48	-9.44	-48.12	-29.06
Number of Cities Sq	0.35	0.09	1.30	0.09
Number of Townships	-41.52*	-38.05	-28.07	-54.18
Number of Townships Sq	0.77*	0.73*	0.67	1.34
Number of Special Districts	2.24	2.25	-2.67	-21.81
Number of Special Districts Sq	-0.04	-0.04	-0.039	0.49
Number of School Districts and Dependent Schools	51.98***	79.93***	105.93**	108.94**
Number of School Districts and Dependent Schools Sq	-0.69**	-1.68***	-3.04*	-3.32*
GINI Coefficient	103.73***	100.20**	81.29	86.66*
High School Graduate (%)	39.69	43.65	52.46*	48.31
Bachelors Degree (%)	-52.63***	-53.19***	-48.86**	-48.62**
Per Capita Income	0.06***	0.05*	0.032	0.04
Population Density	-0.07**	-0.20	-0.79	-1.37
CT Dummy	-750.74**	-1,090.67***	-1,729.35***	-1,817.39***
DE Dummy	-862.09*	-968.28	-789.76	-2892.95
NY Dummy	1,232.01***	882.71**	330.56	312.11
PA Dummy	-719.29**	-1,036.79**	-1,646.39***	-1,731.91***
Adjusted R-squared	0.72	0.72	0.77	0.78
F-statistic	24.24***	21.73***	22.21***	21.46***
Durbin-Watson stat	2.02	2.23	2.49	2.49
Observations	152	134	111	97

NOTE: ***0.01 level of significance, **0.05 level of significance, *0.10 level of significance.

TABLE 9 » ESTIMATES OF POTENTIAL SAVINGS FROM EFFICIENCY IMPROVEMENTS

			MEAN		MEDIAN		MINIMUM		MAXIMUM	
Government Function	County Population	COEFFICIENT	County Population	Potential Savings	County Population	Potential Savings	County Population	Potential Savings	County Population	Potential Savings
Total—School Districts*	<500,000	79.93	132,057	10,555,316	93,087	7,440,444	4,995	399,250	493,537	39,448,412
Total—School Districts	<250,000	105.93	86,996	9,215,486	69,489	7,360,970	4,995	529,120	233,068	24,688,893
Total—School Districts	<150,000	108.94	71,878	7,830,389	62,335	6,790,775	4,995	544,155	149,833	16,322,807

NOTE: *Coefficient is additional expenditure per capita. All government functions are from special districts unless otherwise indicated.

more than one school district in a county would result in additional savings. The potential savings from efficiency gains are substantially larger than those associated with economies of scale.

DISCUSSION AND IMPLICATIONS

In this report we evaluated the presence of scale economies and G-inefficiency in schools districts in New Jersey. Our examination of school spending included both New Jersey schools and school districts in counties in New Jersey and the surrounding states, respectively.

Using data on New Jersey school districts, the economies of scale models show the effects of scale economies as relatively small. These results are very robust. However, we find that scale economies are exhausted at district enrollment levels of more than 2,000 students. Total costs would decrease by $3.9 million if all districts with less than 2,000 students in New Jersey were merged with other districts so that the minimum district size was 2,000 students. This savings is less than half a percent of aggregate primary and secondary education costs in New Jersey.

We could not test G-inefficiency on the sample of New Jersey school districts, so we used data from the Census of Governments to test our model of G-inefficiency. Here, we find strong evidence of G-inefficiency for counties with populations below 250,000 when employing elementary and secondary school expenditures as our cost metric in a five state region, which includes New Jersey and the surrounding states. To assess the magnitude of these effects, we estimate the cost savings of reducing the number of school districts in a county by one through consolidation. This would yield a savings of around $3.7 million in the typical (average) county, and $10 million per year in the largest county in this population range (counties with populations below 250,000). Additional savings would result if more than one district is consolidated in a county.

School expenditures are a significant component of local government activity. The size differentials in schools and the proliferation of more numerous administrative units within a region lead to considerable extra cost to taxpayers or lower levels of public service quality, both of which pose a significant policy concern.

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» APPENDIX A

TABLE A.1 » DESCRIPTIVE STATISTICS, ECONOMIES OF SCALE MODEL, NEW JERSEY SCHOOL DISTRICTS

	MEAN	STANDARD DEVIATION	MEDIAN	MINIMUM	MAXIMUM	OBSERVATIONS (N)
Total Sample						
Total Enrollment 2007-08	2,194	3,318	36	1,060	40,507	624
Percentage of students receiving free lunch	17.2	19.8	0	9.0	87.6	624
Percentage of students in special education classes	16.76	5.15	0	16.63	51.43	624
Poverty rate for children age 5 to 17 (%)	7.4	6.0	1.0	5.6	40.0	624
Total Comparative Cost Per Pupil	12,607	2,734	6,804	12,057	32,460	624
Instructional Cost per Pupil	7,408	1,597	3,127	7,158	20,209	624
Charter School Dummy	0.09	0.29	0	0	1	624
Enrollment <1,000						
Total Enrollment 2007-08	459	266	36	416	999	304
Percentage of students receiving free lunch	18.7	21.1	0	9.7	83.6	304
Percentage of students in special education classes	16.51	6.37	0	16.45	51.43	304
Poverty rate for children age 5 to 17	7.2	5.4	1.0	5.7	33.1	304
Total Comparative Cost Per Pupil	12,786	3,080	6,804	12,094	32,460	304
Instructional Cost per Pupil	7,514	1,889	3,127	7,199	20,209	304
Charter School Dummy	0.18	0.39	0	0	1	304
Enrollment <2,000						
Total Enrollment 2007-08	724	514	36	603	1,980	415
Percentage of students receiving free lunch	17.0	19.6	0	9.0	83.6	415
Percentage of students in special education classes	16.70	5.88	0	16.67	51.43	415
Poverty rate for children age 5 to 17	7.0	5.2	1.0	5.7	33.1	415
Total Comparative Cost Per Pupil	12,641	2,895	6,804	12,061	32,460	415
Instructional Cost per Pupil	7,427	1,740	3,127	7,145	20,209	415
Charter School Dummy	0.13	0.34	0	0	1	415
Enrollment <5,000						
Total Enrollment 2007-08	3,125	926	2,004	2,909	4,980	142
Percentage of students receiving free lunch	13.9	16.3	0.3	6.8	74.1	142
Percentage of students in special education classes	16.94	3.35	0	16.89	25.75	142
Poverty rate for children age 5 to 17	6.7	5.5	1.5	4.8	40.0	142
Total Comparative Cost Per Pupil	12,534	2,367	8,476	12,108	27,476	142
Instructional Cost per Pupil	7,330	1,300	4,846	7,125	15,924	142
Charter School Dummy	0.00	0.00	0	0	0	142
Enrollment 5,000+						
Total Enrollment 2007-08	9,327	5,744	5,008	7,521	40,507	67
Percentage of students receiving free lunch	25.6	24.3	0.1	16.0	87.6	67
Percentage of students in special education classes	16.76	2.98	11.20911	16.41	24.32	67
Poverty rate for children age 5 to 17	10.9	9.1	1.1	6.1	31.7	67
Total Comparative Cost Per Pupil	12,553	2,422	9,095	11,705	18,466	67
Instructional Cost per Pupil	7,456	1,184	5,573	7,252	10,759	67
Charter School Dummy	0.00	0.00	0	0	0	67

SOURCE: Calculated from data from the New Jersey Department of Education, Division of Finance.

» APPENDIX B

TABLE B.1 » DESCRIPTIVE STATISTICS OF G-INEFFICIENCY MODEL FOR SCHOOL DISTRICTS

Per capita expenditures on elementary and secondary education within the five-state region; population <250,000

A. Total Sample **Total Observations: 111**	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Population	86,996	55,108	69,489	4,995	233,068
Percentage with high school diploma	81.1	4.1	81.0	68.5	91.5
Percentage with bachelor's degree or higher	17.6	6.6	16.0	8.8	47.5
Per Capita Income, 1999	18,490	3,414	17,630	14,341	36,370
Population Density, 2000	145	119	108	3	711
GINI Coefficien,t 2000	36.5	1.9	36.7	31.6	41.0
NJ Dummy	0.05	0.23	0.00	0	1
NY Dummy	0.42	0.49	0.00	0	1
PA Dummy	0.47	0.50	0.00	0	1
CT Dummy	0.04	0.19	0.00	0	1
DE Dummy	0.02	0.13	0.00	0	1
Number of School Districts	8	5	6	1	29
Number of Dependent Public School Systems	1	3	0	0	17
Percentage of households with children <18 years old	31.0	2.9	30.7	23.2	39.9
Percentage of households with members age 65+	15.2	2.6	15.2	9.1	21.9
Per capita expenditures on elementary & secondary education	1,764	537	1,754	748	3,362

B. New Jersey **Total Observations: 6**	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Population	115,726	29,042	116,508	64,511	147,891
Percentage with high school diploma	82.7	7.6	83.4	68.5	91.5
Percentage with bachelor's degree or higher	23.7	9.7	23.2	11.7	41.8
Per Capita Income, 1999	25,252	5,905	24,950	17,376	36,370
Population Density, 2000	290	61	285	190	401
GINI Coefficien,t 2000	36.2	2.6	35.3	33.1	40.3
NJ Dummy	1	0	1	1	1
NY Dummy	0	0	0	0	0
PA Dummy	0	0	0	0	0
CT Dummy	0	0	0	0	0
DE Dummy	0	0	0	0	0
Number of School Districts	20	6	20	13	29
Number of Dependent Public School Systems	2	1	3	1	3
Percentage of households with children <18 years old	34.1	4.3	34.4	26.1	39.9
Percentage of households with members age 65+	13.3	3.6	13.0	9.1	20.2
Per capita expenditures on elementary & secondary education	2,152	78	2,141	2,055	2,256

TABLE B.1 » CONTINUED

C. Connecticut **Total Observations: 4**	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Population	149,372	27,114	150,521	110,896	185,552
Percentage with high school diploma	85.9	3.8	87.3	79.6	89.2
Percentage with bachelor's degree or higher	28.3	5.9	30.2	19.0	33.8
Per Capita Income, 1999	25,644	3,222	26,863	20,443	28,408
Population Density, 2000	291	91	273	198	420
GINI Coefficien,t 2000	34.3	1.3	34.6	32.4	35.7
NJ Dummy	0	0	0	0	0
NY Dummy	0	0	0	0	0
PA Dummy	0	0	0	0	0
CT Dummy	1	0	1	1	1
DE Dummy	0	0	0	0	0
Number of School Districts	3	1	3	1	5
Number of Dependent Public School Systems	14	2	14	11	17
Percentage of households with children <18 years old	32.3	1.3	32.7	30.3	33.5
Percentage of households with members age 65+	12.6	1.5	13.0	10.2	14.2
Per capita expenditures on elementary & secondary education	1,589	36	1,591	1,542	1,633

D. Delaware **Total Observations: 2**	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Population	147,501	16,227	147,501	131,274	163,727
Percentage with high school diploma	78.0	1.4	78.0	76.5	79.4
Percentage with bachelor's degree or higher	17.6	1.0	17.6	16.6	18.6
Per Capita Income, 1999	19,495	833	19,495	18,662	20,328
Population Density, 2000	191	24	191	167	215
GINI Coefficien,t 2000	37.5	1.2	37.5	36.2	38.7
NJ Dummy	0	0	0	0	0
NY Dummy	0	0	0	0	0
PA Dummy	0	0	0	0	0
CT Dummy	0	0	0	0	0
DE Dummy	1	0	1	1	1
Number of School Districts	7	2	7	5	8
Number of Dependent Public School Systems	0	0	0	0	0
Percentage of households with children <18 years old	31.3	4.2	31.3	27.1	35.5
Percentage of households with members age 65+	15.1	3.4	15.1	11.7	18.5
Per capita expenditures on elementary & secondary education	1,705	118	1,705	1,587	1,824

TABLE B.1 » CONTINUED

E. New York **Total Observations: 47**	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Population	83,921	53,613	63,976	5,253	233,068
Percentage with high school diploma	81.5	3.8	81.7	69.7	91.4
Percentage with bachelor's degree or higher	19.0	6.2	17.4	11.5	47.5
Per Capita Income, 1999	18,410	2,582	18,003	14,971	30,127
Population Density, 2000	129	123	99	3	711
GINI Coefficien,t 2000	36.8	1.8	37.1	32.7	40.3
NJ Dummy	0	0	0	0	0
NY Dummy	1	0	1	1	1
PA Dummy	0	0	0	0	0
CT Dummy	0	0	0	0	0
DE Dummy	0	0	0	0	0
Number of School Districts	9	4	8	2	18
Number of Dependent Public School Systems	0	0	0	0	1
Percentage of households with children <18 years old	31.7	2.7	31.5	23.6	38.9
Percentage of households with members age 65+	14.3	2.2	14.4	9.6	20.0
Per capita expenditures on elementary & secondary education	2,208	399	2,145	1,393	3,362

E. Pennsylvania **Total Observations: 52**	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Population	79,335	55,840	58,097	4,995	217,181
Percentage with high school diploma	80.4	3.4	80.6	73.1	88.2
Percentage with bachelor's degree or higher	14.8	4.8	14.0	8.8	36.3
Per Capita Income, 1999	17,192	1,749	16,806	14,341	23,610
Population Density, 2000	130	103	93	12	465
GINI Coefficien,t 2000	36.4	1.8	36.7	31.6	41.0
NJ Dummy	0	0	0	0	0
NY Dummy	0	0	0	0	0
PA Dummy	1	0	1	1	1
CT Dummy	0	0	0	0	0
DE Dummy	0	0	0	0	0
Number of School Districts	5	4	5	1	16
Number of Dependent Public School Systems	0	0	0	0	0
Percentage of households with children <18 years old	29.9	2.4	30.1	23.2	36.2
Percentage of households with members age 65+	16.5	2.2	16.7	10.4	21.9
Per capita expenditures on elementary & secondary education	1,332	291	1,321	748	2,157

TABLE B.2 » DESCRIPTIVE STATISTICS OF G-INEFFICIENCY MODEL FOR TOTAL LOCAL GOVERNMENT EXPENDITURES

Per capita expenditures within the five-state region; population <1 million

A. Total Sample	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Total Observations: 152 counties					
Population	201,309	224,194	108,770	4,995	941,371
Total Local Government Expenditures Per Capita	3,551	1,116	3,479	1,320	8,111
Percentage with high school diploma	81.7	4.2	81.7	68.5	91.5
Percentage with bachelor's degree or higher	20.5	8.5	18.3	8.8	47.5
Per Capita Income, 1999	20,346	5,051	18,610	14,341	38,350
Population Density, 2000	545	1,319	172	3	12,957
GINI Coefficien,t 2000	37.07	2.37	37.15	31.58	47.82
NJ Dummy	0	0	0	0	1
NY Dummy	0	0	0	0	1
PA Dummy	0	0	0	0	1
CT Dummy	0	0	0	0	1
DE Dummy	0	0	0	0	1
Number of Cities (in county)	12	9	10	0	61
Number of Townships	19	9	17	0	57
Number of Special Districts	24	20	22	2	146
Number of School Districts	11	10	8	1	74
Number of Dependent Public School Systems	2	4	0	0	27

B. New Jersey	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Total Observations: 21 counties					
Population	407,020	241,761	436,230	64,511	890,457
Total Local Government Expenditures Per Capita	3,885	572	3,783	3,024	5,307
Percentage with high school diploma	82.3	6.4	83.0	68.5	91.5
Percentage with bachelor's degree or higher	28.0	9.1	27.2	11.7	46.5
Per Capita Income, 1999	26,459	5,628	25,728	17,376	37,970
Population Density, 2000	2,124	2,922	975	190	12,957
GINI Coefficien,t 2000	38.26	3.54	38.22	33.05	47.82
NJ Dummy	1	0	1	1	1
NY Dummy	0	0	0	0	0
PA Dummy	0	0	0	0	0
CT Dummy	0	0	0	0	0
DE Dummy	0	0	0	0	0
Number of Cities (in county)	15	13	12	4	61
Number of Townships	12	6	10	2	31
Number of Special Districts	13	10	13	2	37
Number of School Districts	26	16	22	7	74
Number of Dependent Public School Systems	3	2	3	1	10

C. Connecticut

Total Observations: 8 counties

	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Population	431,033	337,086	224,249	110,896	890,913
Total Local Government Expenditures Per Capita	3,024	464	2,906	2,450	3,720
Percentage with high school diploma	84.9	3.0	85.2	79.6	89.2
Percentage with bachelor's degree or higher	29.6	5.8	28.6	19.0	39.9
Per Capita Income, 1999	27,011	4,880	25,761	20,443	38,350
Population Density, 2000	686	494	405	198	1,410
GINI Coefficien,t 2000	37.15	3.73	35.90	32.41	44.88
NJ Dummy	0	0	0	0	0
NY Dummy	0	0	0	0	0
PA Dummy	0	0	0	0	0
CT Dummy	1	0	1	1	1
DE Dummy	0	0	0	0	0
Number of Cities (in county)	4	3	3	0	9
Number of Townships	19	4	19	13	26
Number of Special Districts	48	22	44	25	99
Number of School Districts	2	1	2	1	5
Number of Dependent Public School Systems	19	5	18	11	27

D. Delaware

Total Observations: 3 counties

	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Population	267,925	170,820	163,727	131,274	508,773
Total Local Government Expenditures Per Capita	2,645	193	2,667	2,399	2,870
Percentage with high school diploma	80.5	3.8	79.4	76.5	85.5
Percentage with bachelor's degree or higher	21.6	5.7	18.6	16.6	29.5
Per Capita Income, 1999	21,468	2,871	20,328	18,662	25,413
Population Density, 2000	519	464	215	167	1,174
GINI Coefficien,t 2000	37.37	1.00	37.20	36.23	38.67
NJ Dummy	0	0	0	0	0
NY Dummy	0	0	0	0	0
PA Dummy	0	0	0	0	0
CT Dummy	0	0	0	0	0
DE Dummy	1	0	1	1	1
Number of Cities (in county)	19	5	19	13	25
Number of Townships	0	0	0	0	0
Number of Special Districts	87	46	81	33	146
Number of School Districts	6	1	6	5	8
Number of Dependent Public School Systems	0	0	0	0	0

TABLE B.2 » CONTINUED

E. New York	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Total Observations: 55 counties					
Population	150,026	197,037	80,525	5,253	941,371
Total Local Government Expenditures Per Capita	4,656	741	4,497	3,495	8,111
Percentage with high school diploma	81.9	3.6	82.3	69.7	91.4
Percentage with bachelor's degree or higher	20.7	7.4	18.2	11.5	47.5
Per Capita Income, 1999	19,336	3,795	18,264	14,971	36,726
Population Density, 2000	251	389	106	3	2,133
GINI Coefficien,t 2000	37.14	2.05	37.19	32.67	45.09
NJ Dummy	0	0	0	0	0
NY Dummy	1	0	1	1	1
PA Dummy	0	0	0	0	0
CT Dummy	0	0	0	0	0
DE Dummy	0	0	0	0	0
Number of Cities (in county)	9	6	9	1	29
Number of Townships	17	7	16	5	32
Number of Special Districts	17	12	13	3	53
Number of School Districts	10	6	9	2	39
Number of Dependent Public School Systems	0	1	0	0	2

E. Pennsylvania	MEAN	STD. DEV.	MEDIAN	MINIMUM	MAXIMUM
Total Observations: 65 counties					
Population	146,893	157,843	88,882	4,995	763,205
Total Local Government Expenditures Per Capita	2,615	542	2,608	1,320	4,370
Percentage with high school diploma	81.0	3.7	80.7	73.1	89.3
Percentage with bachelor's degree or higher	16.8	6.9	14.8	8.8	42.5
Per Capita Income, 1999	18,353	3,392	17,224	14,341	31,627
Population Density, 2000	267	430	131	12	2,994
GINI Coefficien,t 2000	36.60	1.77	36.79	31.58	40.97
NJ Dummy	0	0	0	0	0
NY Dummy	0	0	0	0	0
PA Dummy	1	0	1	1	1
CT Dummy	0	0	0	0	0
DE Dummy	0	0	0	0	0
Number of Cities (in county)	14	10	12	1	44
Number of Townships	23	10	22	5	57
Number of Special Districts	27	16	23	2	66
Number of School Districts	7	5	6	1	23
Number of Dependent Public School Systems	0	0	0	0	0