# School District Spending and State Aid: Why Disparities Persist

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Most decisions about the level of local public school spending are made by local school districts. The choices they make are conditioned by local resources—which means rich districts typically spend more per pupil than their poorer neighbors—as well as by the availability of external funds. State governments are by far the largest "external" source of funds, providing about half of all public school dollars nationwide. One of the major purposes of this substantial state aid is to further the goal of equal educational opportunity by helping to make spending more equal in rich and poor districts.

State governments encourage equal spending among local districts by designing the formulas that distribute their aid funds in such a way that they provide both money and incentives for poorer districts to spend more than they otherwise would, while providing less of a subsidy for richer districts' school spending. Poor districts also typically tax themselves at higher rates to support schools. Nevertheless, in most states and certainly in the New England states (see Bradbury 1993 for documentation), rich districts still average noticeably higher spending per pupil than poor districts.

This article investigates the link between school spending disparities and school aid. It addresses the question of whether inequality in spending persists because the "incentives" embedded in the aid formulas are ineffective, because localities respond in perverse ways to the incentives, because insufficient funds are channelled into aid, or because of other factors not related to aid.

Part I describes the factors and forces, including school aid, that help to determine local public school districts' spending levels. Part II uses regression analysis to sort out the importance of various factors associated with interdistrict variations in per pupil school spending in two of the New England states—Massachusetts and Rhode Island. These two states represent the two basic approaches to distributing school aid that are used by state governments nationwide. Part II also

indicates what the regression results imply about the degree to which current aid distributions reduce interdistrict spending disparities. Part III then examines recently enacted legislation for school finance reform in Massachusetts, investigating its likely impact on intrastate school spending disparities. Part IV offers conclusions.

## *I. The Determinants of Local School District Spending*

An extensive economics literature has examined the determinants of school spending per pupil. This earlier research suggests that, in deciding how much to spend, decisionmakers in local school districts consider the quality of education they (and the residents they represent) would like to provide, the costs of providing it, and the resources available to finance the spending. In this local decisionmaking context, states' use of aid dollars (to help shape local outcomes) rather than spending mandates (to require certain local outcomes) can be seen as an attempt to honor the differing preferences or desires of district residents, while offsetting or minimizing the influence of resource differences and, in some states, cost differences.

*Preferences and Institutions.* Local voters' preferences regarding desired educational output (quantity and quality of schooling) in their district do not directly determine school spending. Those preferences are filtered through the local political or electoral institutions that approve school budgets.

Parents' support for education varies among school districts, as does the fraction of voters who are past, present, or future public school parents.[1] In some districts, voter approval of school board or school committee budgets is needed; in others, voters elect those school officials, but do not directly review their budget decisions.[2]

*Costs.* Any desired educational output requires different amounts of per-pupil spending when local production costs differ. These costs vary for several reasons, including input price variations (for example, inter-area wage differences), possible economies of scale, and different student characteristics that make it more expensive to educate some students (for example, bilingual pupils or those with special needs) to any specific attainment level.

*Resources.* The local resources that can be tapped for schools vary considerably across school districts in most states. These variations are largely attributable to differences among districts in the amount of taxable property per pupil, since most school systems rely heavily (if not exclusively) on property taxation for locally raised funds.

Locally available school revenues also reflect variation in the bases of non-property taxes, if any, used for schools, and explicit tax or spending limitations. Furthermore, the resources available for schools depend on nonschool public demands on the local tax base as well as private demands on taxpayer resources. For example, two property-tax-dependent communities with identical property values per pupil may not raise the same school revenue per pupil because of heavy commuter demands for police and highway services competing for revenues in one, or higher resident incomes (making it easier for them to pay any given property tax bill) in the other.

*States' use of aid dollars rather than spending mandates can be seen as an attempt to honor the differing preferences of district residents, while offsetting resource differences.*

In addition to local resources, federal and state aid dollars are available to support local schools. Some of these funds are earmarked for specific purposes, such as transportation, school construction, or teachers' pensions, or for specific student populations; others can be pooled with general school revenues. Most states distribute the bulk of school aid funds through "equalization" formulas that provide general-purpose money to school districts in inverse relation to local wealth or revenue-raising ability and in proportion to the student population. The measure of student population is sometimes "weighted" to incorporate cost or need factors.

Although school aid funds must be spent on schools, districts can implicitly divert some of the revenue to other public or private purposes by choos-

[1] Note also that parents' desires are often constrained by their own and their neighbors' ability to pay, as discussed below, but a distinction is being made here between their "tastes" and what their resources allow their "effective demand" to be.

[2] Tax or spending limitation measures may further influence such votes or budgeting; these, however, represent another form of resource constraint and will be discussed below.

ing to raise less money for schools from local sources than they would in the absence of the aid. Poorer districts, for example, may use some of the aid to reduce their "excess" tax burdens; as noted earlier, their tax rates are typically higher than those in richer districts.

The manner in which resources affect spending decisions is conditioned, in some cases, by the way the funds are made available, in particular, the "price" the district's residents "pay" to receive them. For example, some states distribute their basic equalizing aid through matching formulas that provide a certain number of cents for each dollar the district raises locally, with the number of cents—the matching rate—being higher for poor districts than rich districts. In the presence of such aid, districts, especially those with high matching rates, may decide to spend more because state aid covers part of each additional dollar of spending. Similarly, if the fraction of a district's property taxes "exported" outside the district is high because of the presence of commercial or industrial property or seasonal residents, local residents are likely to vote for higher spending, other things equal, because they believe they pay a smaller fraction of each additional dollar.

## *II. Explaining Disparities in School Spending in Two New England States*

The previous section outlined the factors that help to determine the amount each school district decides to spend per pupil. A district's choice reflects the interplay of local preferences, costs of producing educational services in the local market, and the internal and external resources available to finance school spending, including school aid. The next subsection attempts to quantify the importance of each of these factors in determining school spending outcomes in Massachusetts communities. The following subsection focuses on school aid, analyzing and interpreting its role in the local school spending decision. The exercise is then repeated for Rhode Island, where the basic school aid formula matches local spending rather than being invariant to spending, as in Massachusetts.

### *Estimated Equations: Massachusetts*

Table 1 reports the estimated effects of a wide variety of factors on school district operating spending per pupil, based upon data for school districts in Massachusetts for the school year 1990–91, the latest year for which complete data are available. In Massachusetts, the basic unit of all local government, including schools, is the municipality; the entire area of the state is divided among 351 cities and towns. For purposes of this analysis, therefore, the individual observations are cities and towns, and communities that are members of regional school districts have their proportional share of that district's enrollment, spending, and aid figures attributed back to them.[3]

Column (1) of Table 1 reports results when total operating spending per pupil is the dependent variable; these are discussed immediately below. Column (2) replaces total operating with instructional spending per pupil; differences between the operating and instructional results are summarized later. Overall, the explanatory power of the equations is high for a cross-sectional analysis. Most of the variables included in the equations have the expected effects on school spending.

*Resources.* The results indicate that available resources are a very important determinant of school spending. The size of the property tax base, amount of resident income per capita, and the amount of state aid for schools (other than school construction aid) and for municipal purposes all contribute to greater per pupil spending. These variables obtain estimated coefficients that are positive and significantly different from zero with greater than 99 percent confidence.[4] By contrast, the estimates indicate no significant effect on school operating spending of federal school aid or of state aid for school construction.[5]

Communities with greater ability to export property taxes to nonresidents (as measured by the frac-

[3] Sixteen communities were dropped from the analysis because of townwide enrollments below 100 and 13 were dropped on account of missing or imperfect data, bringing the total included in the analysis to 322. A majority (173) of the 322 communities operate their own dependent school district. Eighty-four of the 322 communities have banded together to form regional high school districts, while providing elementary education locally; 65 other towns are members of regional K–12 districts. Communities participating in regional school districts are assumed to spend (per pupil) what the regional district of which they are a member spends, and similarly are assumed to receive their pro-rated share of the regional district's school aid. Their "share" depends on their fraction of the regional district's enrollment, which also determines their contribution to the regional district's budget. All nonschool variables are measured for each community individually.

[4] Theory suggests resident income has two kinds of effect on school spending: its strong coefficient probably reflects an element of preferences as well as available resources.

[5] The school construction aid finding is not surprising since construction aid represents reimbursements from the state for prior years' construction expenditures, which are not part of operating spending, even contemporaneously.

Table 1
## *Per-Pupil School Spending Regressions: Massachusetts*
Table entries are estimated coefficients and standard errors; the latter are in parentheses.

| Explanatory Variable | Dependent Variable: Spending Per Pupil | |
|---|---|---|
| | Total Operating (1) | Instructional (2) |
| Constant | 2449*** | 2003*** |
| | (898) | (579) |
| *Measures of Resources:* | | |
| Income per capita, 1989 ($000) | 86.6*** | 41.9*** |
| | (7.8) | (5.0) |
| Equalized property tax base per pupil ($000) | .992*** | .665*** |
| | (.096) | (.062) |
| Nonresidential property tax share | 1354*** | 586*** |
| | (248) | (160) |
| City or town at Prop 2½ levy limit for at least 3 years | −116** | −53.3 |
| | (55) | (35.3) |
| Federal aid per pupil | .110 | −.142 |
| | (.298) | (.192) |
| State school construction aid per pupil | −.0123 | −.135* |
| | (.115) | (.074) |
| State non-construction school aid per pupil | .227*** | .0946** |
| | (.057) | (.0370) |
| State municipal aid per pupil | .415*** | .237*** |
| | (.056) | (.036) |
| *Measures of Preferences and Institutional Factors:* | | |
| Town is member of regional K–12 district | −130 | −93.9 |
| | (102) | (65.5) |
| Town is member of regional high school district | 148** | 58.8 |
| | (73) | (47.2) |
| Percentage of households with school-age children | −12.9* | −2.77 |
| | (7.6) | (4.90) |
| Percentage of resident children attending private schools | .304 | −5.59* |
| | (4.94) | (3.19) |
| Percentage of population age 65 and older | −4.84 | 2.44 |
| | (10.6) | (6.84) |
| *Indicators of Costs:* | | |
| Average annual wage at all establishments ($000) | 5.96 | 10.6*** |
| | (5.81) | (3.8) |
| Log of number of students | −233*** | −130*** |
| | (38) | (24) |
| Enrollment growth, 1986–91 (percent change) | −4.43* | −2.94** |
| | (2.29) | (1.48) |
| Special education students (percent of all students) | 13.6 | 10.5 |
| | (16.6) | (10.7) |
| Bilingual students (percent) | 38.4** | 32.6*** |
| | (15.2) | (9.8) |
| Occupational day students (percent) | 1.75 | −2.83 |
| | (11.6) | (7.49) |
| Residential students (percent) | 201 | 101 |
| | (202) | (130) |
| Low-income students (percent) | −20.2** | −12.0** |
| | (8.3) | (5.37) |
| Pre-kindergarten and kindergarten students (percent) | 25.8* | 8.11 |
| | (14.3) | (9.22) |
| Grades 5–8 students (percent) | 6.15 | −9.93 |
| | (14.8) | (9.54) |
| High school students (percent) | 44.3*** | 28.1*** |
| | (10.3) | (6.7) |
| R-squared | .80 | .79 |
| Adjusted R-squared | .79 | .77 |
| Number of observations | 322 | 322 |
| F-statistic | 50.8 | 45.7 |
| Mean of dependent variable | 4,973 | 3,205 |
| Standard error of regression | 409 | 264 |

*Significantly different from zero with better than 90 percent confidence.
**Significantly different from zero with better than 95 percent confidence.
***Significantly different from zero with better than 99 percent confidence.
Note: Dependent variables are for school year 1990–91; explanatory variables refer to school year 1990–91 or to fiscal year 1991 unless otherwise noted.
See Appendix A for variable definitions and means.

tion of the property tax levy falling on nonresidential property) also appear to spend more on schools, indicating some degree of "price" response. And communities severely constrained by Proposition 2½ (Massachusetts' property tax limitation measure), spend significantly less on schools than less constrained districts.[6]

*Preferences and Institutional Factors*. The estimated coefficients on the variables measuring preferences and institutional factors are more mixed; these variables are generally less important than resources in determining school spending. Communities that are members of a regional high school district appear to spend more per pupil than communities providing

local schools. Whether this difference results from the loosened political control of each individual member community on the group outcome or from cost factors cannot be determined. But regional K–12 districts do not spend significantly more or less per pupil than local K–12 districts.[7]

The percentage of households with school-age children obtains an unexpected negative sign. The political process would be expected to lead to a positive effect, the argument being that if more voters care about the schools, they will be able to muster more political clout to keep public school spending up. But the estimated negative sign suggests the variable is playing the role of a resource measure: if more of a community's households have children, the school resources are spread more thinly. By contrast, the fraction of the population that is elderly has no effect on operating spending, and neither does the fraction of the community's school-age children attending private schools. Voter self-interest would lead one to expect these variables to exert a negative influence on per-pupil public school spending.

*Costs.* The cost factors show most, but not all, of the expected effects on school spending. The measure of wages in the local labor market obtains a positive coefficient, but it is statistically indistinguishable from zero. The student count suggests that economies of scale are operative over the relevant range of district sizes.[8] The estimated coefficient on enrollment growth indicates that districts with growing enrollment spend less per capita than stable districts, while districts with declining enrollment spend more. This result suggests that spending adjustments take time when the number of students changes, that is, total spending (not per student) displays some inertia, perhaps because staff-to-student ratios shift in the short run before hiring or reducing staff can occur.

Another important element of school costs is the mix of students served by the school district, and any special programs or educational approaches they may require (or the state may mandate). Two sets of student mix variables were included in the equation: (1) grade mix and (2) student groups believed to be more costly to educate (as reflected in the Massachusetts school aid formula, which weights these students more heavily in distributing aid). The latter categories include special education students (day and residential), bilingual students, occupational students (taking vocational courses in a regular or vocational high school), and students from low-income families.

The regression estimates indicate that districts with a greater fraction of special education or occupational day students do not spend significantly more per pupil than districts with fewer of these students, other things equal, but communities with more bilingual students typically do spend more. The low-income fraction of students obtains a negative coefficient that is significantly different from zero, probably indicating that this variable is picking up an aspect of resource availability rather than testing the hypothesis that poor children are more costly to educate.

It is generally believed that more money is spent per pupil on high school students than on elementary students, and that kindergartners cost less to educate, largely because they receive fewer hours of schooling per day and hence less teacher time. The estimates in Table 1 are consistent with the former hypothesis, but not the latter. Districts with a greater fraction of students in high school do spend more per pupil, and districts with a greater fraction of students in pre-kindergarten and kindergarten also appear to spend more, other things equal.

*Instructional Spending.* Column (2) in Table 1 reports a similar regression with *instructional* spending per pupil, rather than total operating spending per pupil, as the dependent variable. Because instructional spending is a subset of operating spending, the coefficients are generally smaller in magnitude, but otherwise the results are similar to those reported for total operating spending, with a few exceptions.

[6] The equation includes a dummy variable equal to 1 for communities with property tax levies within 0.1 percent of their levy limit in all three fiscal years, 1989–91. The levy limit is the maximum amount the community is allowed to raise under the rules of Proposition 2½, unless the voters pass an override, which raises the levy limit. Since the levy limit rises only 2.5 percent per year plus an allowance for new growth, a community is likely to be cutting or limiting the growth of all "controllable" elements in the budget after three or more years of bumping against the limit.

[7] Regionalization is intended to provide these smaller towns with the economies of scale available to local schools in the Commonwealth's medium-sized and bigger communities; this coefficient estimate may indicate success along that dimension. That is, in the absence of the regional district, these communities might well spend more because they are small.

[8] The logarithm form indicates that the cost savings from adding another child are greater at smaller sizes than in the biggest districts. Note also that just as the regional district dummy variables may be picking up cost elements as well as voting behavior, this size coefficient could also indicate that bigger cities have greater difficulty mustering support for school spending.

Most striking is that average wages in the local community have a significant positive effect on instructional spending per pupil (in contrast with no effect on total operating spending). This probably reflects the greater importance of salaries in the instructional figure.[9] Also related to costs, the fraction of pre-K and kindergarten student enrollment has no significant effect on instructional spending, a result that is more consistent with expectations than the operating spending result.

Some institutional and preference factors also have different impacts on instructional spending. Districts in which a greater fraction of school-age children attend private or parochial schools typically spend less on public school instruction, other things equal, although the result is not strong statistically; this variable has no effect on total operating spending.[10] And regional high schools do not spend significantly more on instruction than their local or regional K–12 counterparts, even though they do spend more in total; the greater expense associated with regional high schools is apparently something other than instruction.

On the resource side, bumping repeatedly against a Proposition 2½ levy limit does not significantly reduce instructional spending. This result might reflect districts' attempts to protect instruction even as they were forced to limit total operating spending.[11]

### *Massachusetts School Aid Results—Further Implications*

For most of the 1980s, Massachusetts did not distribute incremental school aid dollars through the school aid formula. Each fiscal year (until aid was cut in 1990), all cities and towns received the school and municipal aid they had received the year before, and additional state aid to local governments was distributed through the "additional assistance" formula. This formula reflected both local revenue-raising ability and a number of cost factors including the weighted pupil count that also appeared in the school aid formula. The additional assistance formula determined the "bottom line" of new aid funds to each city or town, and then the basic equalizing school aid formula (Chapter 70) was used simply to label some fraction of those additional aid dollars as school aid.

As in most states, a variety of other aid programs also provided state funds for school and municipal purposes, although the bulk of the new dollars each year in the 1980s came through the additional assistance formula. Statewide, general purpose (nonconstruction) school aid and municipal aid together averaged about $2,100 per pupil, and school aid accounted for slightly over half of that sum. School spending statewide was about $5,000 per pupil and local public education represented about two-fifths of all local government spending.

Given the way each year's new aid was calculated and labeled, it is not at all surprising that the coefficients shown in Table 1 imply that municipal aid funds (measured per pupil) make a contribution to school spending just as do school aid funds.[12] Indeed, the coefficient on municipal aid is significantly bigger than the school aid coefficient.

The size of the coefficients suggests that for every additional dollar of state aid per pupil, school operating spending rises by 23 to 42 cents.[13] (Instructional spending rises 9 to 24 cents.) The remaining 58 to 77 cents presumably goes toward nonschool local spending (as is the intention of municipal aid) or to local property tax reductions.

A simple calculation quantifies the role of school aid funds in reducing school spending disparities between rich and poor communities in Massachusetts

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[9] Plant maintenance, transportation, and food are examples of spending categories included in the total operating figure but not in instructional spending that might have a large non-personnel component.

[10] Also, the weak (and wrong-signed) effect of households with school-age children on operating spending is indistinguishable from zero for instructional spending.

[11] Stories abound of districts cutting supplies, maintenance, and auxiliary programs to maintain, or at least minimize deterioration in, teacher-pupil ratios.

[12] The Commonwealth's additional assistance/school aid calculation was the same for communities that were members of regional school districts (and where, therefore, the school district was not a dependent part of the city or town government) as for communities operating their own schools. The school aid going to the regional school was subtracted proportionally from each member town's additional assistance funds. However, because regional districts are governmentally independent of municipal governments, the school aid to regions might be more likely to "stick" as school spending, rather than leaking out as other municipal spending or tax reductions. This hypothesis is supported by estimates (not shown) indicating a significantly bigger coefficient on school aid for communities that are members of regional school districts than for communities with dependent schools. The coefficients on municipal aid do not differ significantly between the two groups of communities.

[13] Note that 40 cents corresponds to the schools' 40 percent share of local spending. That is, an estimated coefficient of 0.4 on all aid would be consistent with expenditure by each city or town of aid funds in proportion to the school–nonschool shares of the budget. In fact, in an equation (not shown) in which the (nonconstruction) school aid and municipal aid are combined, the coefficient on combined per pupil aid is 0.324. Not surprisingly, this combined coefficient lies between the school and municipal aid coefficients shown in Table 1.

in fiscal year 1991 (FY1991). The existing pattern of school spending in Massachusetts was not grossly unequal between rich and poor communities, but it was more unequal than in the other New England states (see Bradbury 1993). On average, the richest one-fifth of communities in Massachusetts spent about $1,800 (or 42 percent) more per pupil on schools than the poorest fifth,[14] and this disparity would have been even greater if state aid funds were not allocated in a redistributive (pro-poor) pattern.

The poorest one-fifth of communities received almost $1,600 more school and municipal (combined) aid dollars per pupil than the richest one-fifth, on average. The estimated regression coefficient implies that the combined aid dollars raised per-pupil spending in the poorest quintile by more than $500 relative to the richest quintile.[15] Put another way, if school aid were distributed equally to all districts per pupil, according to these estimates the richest quintile of towns would average per-pupil spending almost 60 percent (instead of 42 percent) higher than their poorest neighbors. This disparity is almost entirely due to the direct effect of resource disparities on communities' ability to spend on schools.

*The fundamental difference between state aid to schools in Rhode Island and in Massachusetts is that most of the aid dollars are "matching" in Rhode Island.*

Because only about one-third of school and municipal aid combined shows up as school spending, an attempt to use aid alone to substantially raise spending among the poorest communities would be quite expensive. For example, the poorest one-half of the communities had roughly a $225 million shortfall in FY1991 school spending compared with what they would have spent at the statewide per-pupil average. Thus, if the state wanted to induce them to spend at the average, the regression implies that it would take a total of about $700 million in additional aid.[16]

### *Estimated Equation: Rhode Island*

Table 2 reports the estimated effects of a similar list of factors on school district spending in a pooled sample of Rhode Island and Massachusetts cities and towns during school year 1991. Because Rhode Island consists of only 39 cities and towns, it is impossible to estimate equations similar to those in Table 1 using Rhode Island communities alone.[17] Instead, the observations were pooled, with Rhode Island coefficients estimated separately for those variables which a priori reasoning suggested would operate differently, specifically state aid to schools and municipalities, plus two variables found empirically to have different coefficients in the two states. Thus, coefficients on all the variables other than the constant, those related to state aid, property tax base, and federal aid were constrained to be the same in Rhode Island and Massachusetts.[18]

The fundamental difference between state aid to schools in Rhode Island and in Massachusetts is that most of the aid dollars are "matching" in Rhode Island. That is, just as in Massachusetts, aid is given

[14] The communities are ranked by equalized property value per pupil and then divided into five equal groups (with 64 or 65 communities in each). Each one-fifth of the distribution is called a quintile.

[15] To simplify the calculations, the coefficient on combined general purpose school and municipal aid (0.324) described in footnote 13 is used in this simulation of the combined aid shift.

[16] This would amount to about a 30 percent increase in the total aid budget to the 322 communities in the sample. Of course, such a program should not be enacted even if the expense were not a problem because it would make aid dependent on existing spending levels, rewarding low-spending communities with more aid and penalizing towns that have made extra effort to fund their schools.

[17] The number of Rhode Island observations is further reduced to 36 by eliminating the smallest community (with only 112 students townwide) from the analysis and dropping two other districts with incomplete data. As for Massachusetts, data for regional school districts (two K–12 districts and one regional high school) are attributed back to member cities and towns. With only 36 observations, regressions with 25 variables (like those in Table 1) would be extremely unreliable because the degrees of freedom would be so limited. Indeed, attempts to estimate even pared-down versions of such equations resulted in very good measured "fit" but highly unstable coefficient estimates. Appendix C reports a bare-bones regression (using only the Rhode Island observations) which confirms the general importance and magnitude of the coefficient estimates for a few key variables.

[18] All the variables were tested, in groups (resources, preferences, costs), to ascertain whether the Rhode Island coefficients were significantly different from the pooled coefficients. The estimated Rhode Island differentials were significantly different from zero only for the tax base and federal aid variables. Furthermore, data for Rhode Island school districts were not available for some of the variables used in the Massachusetts equation, so the variable list for the pooled equation is somewhat shorter.

Table 2

## *Per-Pupil School Spending Regressions: Rhode Island and Massachusetts*

Dependent variable is operating school spending per pupil; table entries are estimated coefficients and standard errors; the latter are in parentheses.

| Explanatory Variable | R.I. Matching Aid Variable: Aid Dollars (1) | R.I. Matching Aid Variable: Matching Rate (2) |
|---|---|---|
| Constant | 1864** | 2005** |
| | (861) | (866) |
| Rhode Island dummy | −1010* | −524 |
| | (611) | (595) |
| *Measures of Resources:* | | |
| Income per capita, 1989 ($000) | 93.2*** | 92.5*** |
| | (7.0) | (7.1) |
| Equalized property tax base per pupil ($000) | .972*** | .969*** |
| | (.080) | (.081) |
| R.I. differential − equalized property per pupil ($000) | 1.69*** | 1.43** |
| | (.56) | (.61) |
| Nonresidential property tax share | 1295*** | 1288*** |
| | (231) | (233) |
| City or town at Prop 2½ levy limit for at least 3 years | −123** | −120** |
| | (54) | (54) |
| Federal aid per pupil | −.027 | −.031 |
| | (.269) | (.272) |
| R.I. differential − federal aid per pupil | 1.29** | 1.22** |
| | (.54) | (.54) |
| *Massachusetts State Aid Variables:* | | |
| Non-construction school aid per pupil | .200*** | .196*** |
| | (.051) | (.052) |
| Aid to municipalities per pupil | .410*** | .408*** |
| | (.054) | (.054) |
| *Rhode Island State Aid Variables:* | | |
| Matching school aid (see column head for variable) | .541*** | 12.8** |
| | (.178) | (6.4) |
| Non-matching school aid per pupil | 2.07* | 2.59** |
| | (1.16) | (1.16) |
| Aid to municipalities per pupil | 1.43 | .943 |
| | (2.26) | (2.27) |
| *Measures of Preferences and Institutional Factors:* | | |
| Town is member of regional K–12 district | −151 | −141 |
| | (95) | (96) |
| Town is member of regional high school district | 147** | 154** |
| | (70) | (71) |
| Percentage of households with school-age children | −14.7** | −15.4** |
| | (7.1) | (7.2) |
| Percentage of resident children attending private schools | 1.82 | 2.24 |
| | (4.71) | (4.75) |
| Percentage of population age 65 and older | −12.6 | −13.5 |
| | (9.8) | (9.9) |
| *Indicators of Costs:* | | |
| Average annual wage at all establishments ($000) | 7.82 | 7.70 |
| | (5.62) | (5.66) |
| Log of number of students | −234*** | −234*** |
| | (36) | (36) |
| Special education students (percent of all students) | 9.05 | 7.37 |
| | (15.2) | (15.4) |
| Bilingual students (percent) | 8.77 | 9.23 |
| | (9.47) | (9.54) |
| Pre-kindergarten and kindergarten students (percent) | 30.0** | 28.5** |
| | (14.1) | (14.2) |
| Grades 5–8 students (percent) | 17.8 | 15.7 |
| | (13.9) | (14.0) |
| High school students (percent) | 53.1*** | 52.9*** |
| | (9.7) | (9.8) |
| R-squared | .81 | .81 |
| Adusted R-squared | .80 | .79 |
| Number of observations | 358 | 358 |
| F-statistic | 57.3 | 56.3 |
| Mean of dependent variable | 5,073 | 5,073 |
| Standard error of regression | 409 | 412 |

*Significantly different from zero with better than 90 percent confidence.
**Significantly different from zero with better than 95 percent confidence.
***Significantly different from zero with better than 99 percent confidence.
Note: Dependent variables are for school year 1990–91; explanatory variables refer to school year 1990–91 or to fiscal year 1991 unless otherwise noted.
See Appendices A and B for variable definitions and means.

in direct proportion to the number of students and in inverse proportion to local property wealth, but unlike in Massachusetts, school aid in Rhode Island also depends on the district's actual spending, with a lag. The state's basic "operating aid" in any year reimburses a fraction of districts' operating expenditures two years earlier, and the aid formulas for bilingual ("limited English proficient") education, public hous-

ing, and school construction use the same or a similar matching rate for spending related to those programs. Matching rates in FY1991 ranged from a minimum of 28.5 percent for the richest districts (this legislated floor was reduced to 9 percent by FY1994) to a maximum of 99 percent in the poorest district.[19]

When aid is matching, it is thought to encourage more spending by making it cheaper for any district to raise each incremental dollar for schools (because aid reimburses a fraction of each dollar raised locally), and more so for poorer districts because they enjoy higher matching rates. Rhode Island is the only New England state with a matching school aid formula, so it provides a useful contrast with Massachusetts' approach. In Massachusetts, neither the school aid formula nor the "additional assistance" (municipal aid) formula reflects a community's actual spending or tax rates. Hence these aid dollars arrive independent of local behavior. That is, unlike Rhode Island, state aid programs in Massachusetts offer no price incentive to spend incremental, locally raised dollars on schools.

Column (1) in Table 2 reports estimates that ignore the matching aspect of aid in Rhode Island, including measures of aid dollars per pupil for schools and municipalities, just like the variables included (separately) for Massachusetts. Column (2), by contrast, reports estimates from an equation that includes each Rhode Island district's matching rate instead of the number of matching aid dollars.

The aid coefficients in column (1) indicate a greater effect on school spending of each school aid dollar in Rhode Island than in Massachusetts; the coefficient on Rhode Island's matching aid suggests that spending per pupil is about 54 cents higher for each additional dollar of matching aid. However, this estimate in all probability overstates the marginal effect of aid dollars on spending.[20] (The results for non-matching school aid and for municipal aid are discussed in the next subsection on "further implications.")

The estimated coefficient on the school aid matching rate in column (2) is positive and significantly different from zero. The size of the coefficient implies that a community with a 65 percent matching rate, for example, would spend $250 more per pupil than a community with a 45 percent matching rate, other things equal; for changes like this around the average, about 40 percent of each matching aid dollar goes into school spending.[21] Thus, it is more plausible to deduce that roughly two-fifths of school aid in Rhode Island goes into school spending, not 54 percent as the biased results in column (1) suggest.

Aside from the aid variable that differs between the two equations, the coefficients in column (2) are very similar to those in column (1). School spending is not only more closely tied to school aid in Rhode Island than in Massachusetts but apparently also more closely tied to several other measures of resources. The Rhode Island coefficient on property tax base per pupil is significantly higher than the Massachusetts coefficient.[22] And the same is true of the coefficient on federal school aid, which is positive in Rhode Island and zero in Massachusetts.

### *Rhode Island School Aid Results—Further Implications*

Both equations in Table 2 indicate a significant positive effect of non-matching school aid on spending, probably because the non-matching programs provide funding for special education and vocational education, which add to costs. By contrast, general

[19] This 99 percent maximum includes a bonus for regionalization. Aid in Rhode Island in FY1991 also reflected transportation costs, so districts enjoyed a higher matching rate if they had above-average transportation costs per pupil. Note that the matching rate applies to *qualifying* "operating" spending (and other specific matched expenditure categories), not to total operating school spending per pupil. Communities' matching rates were fairly stable from year to year from the mid-1980s on. After FY1991, the nominal matching rates exaggerated the state government's contribution to local schools, since the basic equalizing aid program ("operations aid") and the other school aid programs were not fully funded.

[20] Note that reverse causation (from school spending to school aid) is technically eliminated by the lag built into the aid formula: the aid dollars are proportional to spending two years earlier, not to the spending measured in the dependent variable. Since spending is undoubtedly correlated over time, however, this estimated coefficient is almost certainly biased upward. By contrast, the matching *rate* does not depend on spending, even with a lag; it depends on local revenue-raising potential. Thus the equation that includes the matching rate instead of the matching dollars (column 2) does not suffer from simultaneity bias.

[21] Correcting for the difference between the reported (nominal) matching rate and the percentage of all operating spending that matching aid represents, such a 20 percentage point rise in the nominal matching rate would yield $600-plus in aid to a community with average spending.

[22] This coefficient may also be picking up some measurement differences between the two states. Average per-pupil school spending is higher in Rhode Island than in Massachusetts, at least in part because the measure of school spending is defined somewhat differently in the two states. At the same time, property values are generally lower in Rhode Island. If the spending difference were additive, it would show up in the Rhode Island constant term, but apparently it is not.

purpose municipal aid has no statistically significant effect on school spending in Rhode Island, but a sizable effect, as discussed earlier, in Massachusetts. Rhode Island has a much smaller per-pupil municipal aid pool and has not experienced a blurring of the distinctions between school and municipal aid similar to Massachusetts' experience with "additional assistance" in the last decade.

If Rhode Island's matching school aid were not focused on poorer districts, interdistrict spending disparities would be greater, just as in Massachusetts. In FY1991, the richest seven school districts in Rhode Island averaged spending per pupil almost $800 higher (or 14 percent) than the poorest seven districts.[23] Matching rates for school aid were much higher, on average, in the poorest quintile (80 percent) than in the richest (34 percent). According to the regression estimates, this matching rate differential raised spending per pupil in the poorest seven towns, on average, by almost $600 per pupil relative to the richest seven. Thus, the regression estimates indicate that in the absence of the equalizing influence of pro-poor matching rates, the richest quintile would spend, on average, 25 percent more than the poorest, instead of 14 percent.

### *Comparing Aid Results for Rhode Island and Massachusetts*

State aid comprised a similar fraction of school budgets in Massachusetts and Rhode Island in FY1991, but Rhode Island's aid has a slightly greater equalizing impact. Average per-pupil aid amounted to 40 to 45 percent of average per-pupil school spending in the two states. While spending disparities are considerably larger in Massachusetts than in Rhode Island, as noted earlier, existing aid programs raise spending in the lowest quintile by $500 per pupil in Massachusetts and $600 in Rhode Island relative to the richest quintile.

A comparison of the derived estimate of aid's marginal effect on spending in Rhode Island with the estimated aid coefficient for Massachusetts is consistent with the hypothesis that aid formulas with matching provisions provide more incentive than non-matching aid formulas for districts to spend incremental dollars on schools, although the difference (between approximately 0.3 and 0.4) is not very big. While it is perilous to assume that estimates from one state would hold in another, the similarity of the other coefficient estimates makes this comparison of the aid results interestingly suggestive.

## *III. School Finance Reform Proposals in Massachusetts: Potential Effects on Spending Disparities*

Massachusetts enacted education reform legislation in 1993 that changed responsibilities and standards, added school aid dollars, and altered the distribution formula for the aid. The current fiscal year (1994) represents the first year of a seven-year phase-in period for the additional state funding and associated local spending requirements. The Box summarizes how the new law affects communities' school aid and constrains their school spending.

Table 3 (p. 62) reports the results of several simulations of the impact on school spending disparities of the changes in Massachusetts' new aid program for schools. The first panel reports the actual FY1991 spending and aid distribution. Line (A) uses coefficient estimates from the Massachusetts regressions to simulate the likely effect on FY1991 per-pupil spending of the change in aid that occurred from FY1993 to FY1994.

The additional aid dollars and formula change are redistributive—the simulated spending disparities are smaller than actual FY1991 disparities—but the impact is not large in the first year. With the addition of $140 million statewide, school and municipal aid combined rose an average of $203 per pupil between FY1993 and FY1994. The bottom quintile received $335 more aid per pupil in FY1994, on average, and the top quintile averaged $102 more. The new formula does not result in a significant shift of aid resources toward the poorest districts in the first year because it operates only at the margin: all districts are guaranteed their previous year's school aid plus a minimum per-pupil increment; the remaining new aid funds are then distributed according to a modified foundation plan, with "equity" and "overburden" adjustments (see the Box on pp. 60–61).

This simulation of the impact of aid changes alone ignores other aspects of Massachusetts' educational reform legislation that alter its effect on spending disparities. In addition to adding state aid dollars and changing the formula, the new law imposes specific school spending requirements on local governments. The aim is that all districts will be spend-

[23] These data indicate smaller FY1991 spending disparities in Rhode Island than those shown in Bradbury (1993) because the three districts dropped from the regression sample on account of missing or imperfect data would all have fallen into the richest quintile. The tax base disparities among the quintiles are also smaller in this subsample.

### *Fiscal Aspects of Massachusetts' 1993 Education Reform Legislation*

The basic idea of Massachusetts' new school finance provisions is that all communities must be spending at least their foundation amount after a seven-year phase-in period, and additional aid dollars from the state will help communities attain the foundation once they are making a reasonable effort to fund schooling from their own resources. Maintenance-of-effort provisions insure that the new aid goes into school spending, not tax relief (except for "equity" aid, which explicitly provides tax relief).

*Definitions*

Three key concepts determine how each community's spending and aid are affected by the education reform law in FY1994: foundation spending level, local effort, and municipal revenue growth factor. These concepts are used in calculating each district's aid and spending, as described below.

*Foundation Spending Level.* As in other states with "foundation" school-aid programs, the foundation spending level for each district reflects the state's estimate of the spending required to provide an adequate education in that district. In Massachusetts, the fiscal year 1994 (FY1994) foundation is very close to $5,500 for each pupil in the district, with adjustments for grade mix, local wages, and the fraction of students from families with below-poverty-level incomes. The foundation will change over time to reflect statewide changes in costs.

*Local Effort.* A measure of "effort" indicates how heavily each community is taxing itself to fund its public schools (local or regional). Effort is calculated as local property tax funds for schools divided by the local income-adjusted property tax base.

*Municipal Revenue Growth Factor* (MRGF). The MRGF is a measure of the probable growth rate of total revenues (other than school aid) available to each community. Each community's MRGF for FY1994 reflects the combined percentage increase resulting from increases in four components: the 2.5 percent automatic property tax levy limit increase allowed under Proposition 2½, the contribution of "new growth" to the property tax levy (estimated by averaging the previous three years), general-purpose municipal aid increases from FY1993 to FY1994, and FY1992–93 growth in local receipts (such as the motor vehicle excise) other than specific service fees such as water, sewer, and trash. The MRGF for FY1994 averages about 3 percent statewide.

*Calculations*

For each community, the state calculates a minimum spending level for FY1994, consisting of a minimum local contribution plus FY1994 school aid (except for "equity aid" defined below). The minimum local contribution and the aid amount depend on two criteria that categorize communities with respect to the preliminary impact of the new law on their finances. First, the community's local effort is compared with the statewide "standard of effort,"

ing at or above their "foundation" levels after the seven-year phase-in,[24] with the additional funds required to get there supplied locally or by the state (the division between them depends mostly on local ability to raise revenue and effort in doing so).

Row (B) in Table 3 indicates the impact on spending disparities of bringing all communities to at least their foundation in the first year instead of moving toward the foundation over seven years. The effect of using the foundation as a floor is a marked reduction in spending disparities between rich and poor districts, because most districts spending below their foundations are poor. The poorest quintile's spending in FY1993 averaged about $900 per pupil below their FY1994 foundation; the richest quintile's spending was $1,100 above. Row (B) shows that if all communities below their foundation were to raise spending to reach it, the richest quintile would spend only 18 percent more than the poorest, on average.[25]

The foundation, however, is not the only constraint placed on spending. Even for communities already spending more than their foundation, spend-

[24] "Net school spending" in the aid calculations and local requirements is not defined in the same way as the operating spending measure examined here. Net school spending includes expenditures made by the city or town government on behalf of the schools, for such items as fringe benefits. Net school spending excludes school transportation and debt service expenditures. Districts might not achieve the foundation goal in seven years if state contributions do not grow at the same pace as local, or because of waivers that can be (and were, in FY1994) granted by the Departments of Revenue and Education.

*Fiscal Aspects of Massachusetts' 1993 Education Reform Legislation (continued)*

which for FY1994 is an effective tax rate of 0.94 percent of taxable property values. Second, a community's FY1993 spending is compared with its foundation spending level. Communities taxing themselves more lightly than the statewide standard of effort are expected to contribute more from local funds. Communities making above-standard effort may be eligible for "equity" aid and communities spending below their foundation may be eligible for "foundation" aid. Equity aid need not be spent on schools; it may be used for tax relief.

Communities whose effort falls below the statewide standard of effort must increase spending each year by at least their municipal revenue growth factor. If they are currently spending above their foundation, then their local contribution must rise by their municipal revenue growth factor, and spending will rise by that amount plus any increase in their school aid. All communities are guaranteed their previous year's school aid (base aid) plus "minimum aid" of $50 per pupil in FY1994 and $25 additional per pupil in the ensuing fiscal years. These high-spending, low-tax communities receive no school aid above this guarantee.

Communities with below-standard effort that are spending below their foundation must raise their local contribution by the municipal revenue growth factor plus the additional amount needed to attain the standard or their foundation by the end of a seven-year period. These communities also receive no aid above the guarantee, except to the degree that meeting the standard of effort would still leave them with below-foundation spending (so they are eligible for foundation aid), or unless they have low property values. If their property values are below 95 percent of the statewide average, the state will provide transitional "overburden aid" to be repaid from later years' nonschool aid funds.

Communities whose effort exceeds the statewide standard of effort are not required to raise additional funds locally (until their effort falls to the standard). Communities with above-standard effort that are spending above their foundation may level-fund, and in some cases reduce, their local contribution. They receive the guaranteed minimum and base aid, and may receive "equity" aid to the degree that they would have to make effort above the standard even to achieve foundation spending.

Communities with above-standard effort that are spending below their foundation receive additional school aid to help them reduce their effort to the standard and attain their foundation spending level by the end of the seven-year phase-in. Foundation aid fills part of the gap between the foundation and what base aid, minimum aid, and last year's local contribution raised by the municipal revenue growth factor would cover; equity aid partly fills the gap between last year's local contribution raised by the municipal revenue growth factor and the standard of effort.

ing increases are required in most cases. The reform plan requires communities with implicit school tax rates below a defined standard (0.94 percent of taxable property values) to increase locally raised revenues for schools; at the same time, it promises at least some additional school aid dollars each year.

For each town, the reform plan calculates a required amount of school spending each year as the sum of a required local contribution and aid from the state; this calculation reflects required movements toward both the foundation and the standard of effort. Wealthy, high-spending districts as well as poor, low-spending districts are required to increase their spending. Indeed, the plan has equalizing effects on local effort or tax rate differentials as well as on spending disparities across quintiles: the local contributions (locally raised funds for schools) of rich districts rise from FY1993 to FY1994, on average, while the local contributions of poor districts fall on account of aid increases. This represents a reduction in interdistrict fiscal disparities, but on the local tax effort side of the ledger, not the spending side.

[25] The legislation stipulates a seven-year phase-in period rather than an immediate move to the foundation because of budgetary and institutional difficulties that would result from the sizable increase in school spending that would be required in some communities to jump to the foundation in one year. Neither the state aid budget nor local communities' revenues could finance the spending increase in one year. Furthermore, it would probably be difficult for the schools in communities spending the least to effectively employ such a sizable infusion of money without a gradual phase-in.

Table 3
*Impact of New FY1994 School Aid Formula in Massachusetts*
By Quintile of Equalized Property Value per Pupil (in dollars except ratios)

| | Average (N = 322) | Poorest Quintile | Second Quintile | Middle Quintile | Fourth Quintile | Richest Quintile | Ratio: Richest/ Poorest |
|---|---|---|---|---|---|---|---|
| *FY1991 Actual Spending and Aid:* | | | | | | | |
| School spending per pupil | 4,973 | 4,263 | 4,509 | 4,758 | 5,270 | 6,065 | 1.42 |
| Municipal and school aid per pupil | 2,153 | 2,995 | 2,463 | 1,920 | 1,982 | 1,402 | |
| School aid per pupil | 1,474 | 2,493 | 1,950 | 1,349 | 939 | 641 | |
| Simulations with FY1993–94 Changes in Aid and Requirements | | | | | | | |
| *Simulated School Spending per Pupil If:* | | | | | | | |
| (A) FY1993–94 combined aid increase added to school spending in the manner of FY1991 combined aid | 5,038 | 4,371 | 4,591 | 4,819 | 5,316 | 6,098 | 1.40 |
| (B) All districts spending less than FY1994 foundation in FY1993 are brought up to adjusted foundation | 5,423 | 5,179 | 5,187 | 5,177 | 5,463 | 6,111 | 1.18 |
| (C) FY1993–94 dollar increase in "required" school spending added directly to spending or (A), whichever is higher | 5,198 | 4,523 | 4,718 | 4,974 | 5,468 | 6,310 | 1.40 |
| (D) (B) or (C), whichever is higher | 5,500 | 5,195 | 5,206 | 5,208 | 5,572 | 6,323 | 1.22 |

Notes: School aid is aid for schools excluding construction aid; municipal aid excludes tax-related or tax-replacement aid; combined aid is school and municipal combined.
Source: Author's calculations based on data from Massachusetts Department of Revenue, Division of Local Services, Municipal Data Bank. Simulation (A) is based on estimated regression coefficients; (B) adds the difference between FY1994 foundation and FY1993 net local spending, when positive, to FY1991 actual spending; (C) adds the difference between FY1994 net spending requirement and FY1993 net local spending to FY1991 actual spending and compares the result with (A), choosing whichever is larger; (D) combines (B) and (C).

To calculate the impact of the reform law's minimum spending requirements, simulation (C) assumes that communities will respond to the incremental aid as the regression equation predicts, *unless* the spending requirements mandate even more additional spending.[26] The results show higher average spending for simulation (C) than for (A), but the same spending disparity. Thus, the spending requirements do not reduce spending disparities more than the aid alone. To a large degree, these spending changes may also be quite similar to what would occur simply in response to rising school costs, including enrollment increases.

The final row (D) in Table 3 takes a stab at simulating the potential longer-run impact on school spending disparities of the new school finance law. Row (D) combines the scenarios simulated in rows (B) and (C). That is, it shows the spending pattern that results if districts are assumed to spend at least their foundation amount, and more if the FY1993–94 aid increase would elicit such a response or the FY1994 spending restrictions would require it. Thus, the simulation involves the full seven-year adjustment to the foundation, but only one year of new aid and adjustment toward the standard of effort. The data indicate considerably more equalization than the first year of the program (C), but less equalization than the move to the foundation alone (B) because, as noted earlier, the "effort" requirements add to spending even for rich districts.

[26] As noted earlier, the spending definition for the requirements differs from the operating spending measure employed here, so an additive approach was taken. The spending requirements are assumed to add to FY1991 per-pupil spending the difference between the FY1994 net spending requirement and FY1993 net local spending. The results are virtually identical if a percentage increase is calculated for FY1993–94 and applied to the FY1991 base. The entries in line (C) choose, for each district, the higher of (i) the predicted spending resulting from the combined aid simulation and (ii) the predicted spending resulting from the required spending increment. These simulations, like the reform program itself, beg the question of whether the spending requirements can be attained only with overrides in some towns.

The difficulty in predicting the long-run impact of the plan on spending disparities centers on the uncertain future paths of the foundation, education costs, and richer districts' resources. To the degree that the foundation is adjusted upward over time to reflect rising school costs and hence continues to reflect an "adequate" education package, as is planned, it may catch up to some wealthier communities' spending levels. To the degree that actual costs and the revenues of communities spending above foundation grow faster, increases in required effort as well as the direct effect of cost and resource increases on spending will cause their school outlays to outstrip the foundation. As a result, spending disparities will be larger than those shown in row (D), although smaller than they were in FY1991 under the previous aid approach.

Other states, including California and New Jersey, have imposed spending caps on rich districts to minimize disparities as state funds are used to raise spending in poorer districts. While such caps reportedly create at least as many problems as they solve, they contrast markedly with this Massachusetts approach, which not only allows high-spending districts to spend more but requires some of them to do so.[27]

In summary, while it is difficult to judge spending impacts on the basis of changes for only one year, the basic fiscal outlines of Massachusetts' education reform plan appear to move the Commonwealth toward reduced school spending disparities between rich and poor communities. The key factor determining the plan's longer-term impact on spending disparities is the degree to which the substantial equalizing impact of an adequate floor under the spending of poor districts is eroded by failure of that floor to rise as fast as many richer communities' educational costs or preferred service levels.

## IV. Conclusions

School spending per pupil is higher in rich than in poor school districts within a state for a variety of reasons. Most important, rich districts by definition have more resources available locally to finance school spending, and this and other research has shown that local resources are key determinants of per-pupil school spending. In school year 1990–91, the school aid provided by state governments in Massachusetts and Rhode Island, while directed more at poor than at rich communities, did not fully offset the spending disparities resulting from local resource disparities.[28] The regression results and aid impact calculations reported in this article yield some conclusions about the reasons for aid's inability to further equalize spending.

*The basic fiscal outlines of Massachusetts' education reform plan appear to move the Commonwealth toward reduced school spending disparities between rich and poor communities.*

Communities use the aid dollars they receive to add to school spending, to add to nonschool spending, and to reduce local taxes. In Massachusetts and Rhode Island, one-fifth to two-fifths of each aid dollar shows up in school spending. Thus more aid dollars channeled through the school aid formula would reduce spending disparities. Nevertheless, relying solely on aid to bring about equal spending is expensive when districts are allowed to set their own spending levels and resources are unequal. By the

[27] The approach presumably involves political problems as well; some of the rich high-spending districts are likely to feel that the reforms impose restrictions on them without substantially helping them, since they receive only minimum aid. Many, however, would increase their spending more than required even in the absence of the requirements.

[28] As noted earlier, the poorest quintile in Massachusetts receives about $1,600 more aid per pupil than the richest quintile, which adds an estimated $500-plus to school spending in the poorest quintile relative to the richest, according to the regression estimates. But other coefficients imply that income and property tax base differences lead the richest quintile to spend about $1,700 more dollars per pupil than the poorest. The actual spending disparity between the richest quintile and the poorest is $1,800.

Rhode Island communities in the poorest quintile enjoy matching rates more than 40 percentage points higher, on average, than the richest quintile, which adds an estimated not-quite-$600 to relative spending in the poorest communities, on average. But income and property tax base differences add almost $1,600 to spending in the richest quintile relative to the poorest, according to the estimates. Property tax base disparities between the richest and poorest quintile are much smaller in Rhode Island than in Massachusetts, but the estimated coefficient on property tax base is significantly higher in Rhode Island than in Massachusetts.

same token, the equalizing impact of the aid would be greater if the dollars were distributed in a more pro-poor way.[29]

Furthermore, each state aid dollar would go further toward equalizing school spending if local districts' responses were greater, that is, if more than one-fifth to two-fifths of each aid dollar found its way into school spending. Rhode Island's pro-poor matching aid delivers more "bang per buck" than non-matching aid in Massachusetts, but not much more. Direct minimum spending requirements to bring up the lowest-spending districts (with aid to cover the increased cost) have a greater impact on the effectiveness of each dollar of aid; the Massachusetts simulations bringing below-foundation districts up to their foundations indicate the power of a mandated spending floor—at an adequate educational level—in reducing spending disparities.

In sum, spending disparities between rich and poor districts persist in the face of redistributive aid programs, at least in Massachusetts and Rhode Island, for most of the reasons hypothesized in the introduction: the "incentives" embedded in the aid formulas for poor districts to spend more than rich are not very strong (perhaps in order to buy rich as well as poor districts into the plan); the spending responses of school districts to aid dollars are relatively weak (the aid that does not go into reducing spending disparities presumably helps to reduce tax rate disparities, however); and the dollars funneled through state aid formulas are not very large relative to total school spending.[30]

These findings shed some light on why school finance is a perennial issue in the United States. No widely acceptable resolution has surfaced regarding the basic trade-off between the state's interest in equal educational opportunity, on the one hand, and on the other, local government control of schools with its associated dependence on local (and hence unequal) resources.

[29] In Massachusetts in FY1991 the richest quintile averaged $1,400 in school and municipal aid per pupil, while the poorest received $3,000 per pupil. If the same dollars were redistributed to give the richest quintile $400 per pupil and the poorest $3,500, for example, the aid would raise spending by $1,000 in the poorest quintile relative to the richest, rather than $500. Similarly, in Rhode Island, reducing the minimum matching rate (as has occurred since FY1991) should cause any total aid pool to reduce spending disparities to a greater degree.

[30] The fraction of school spending covered by state aid for schools is below the national average in Rhode Island and Massachusetts. (See Table 2 of Bradbury 1993.) If general purpose municipal aid is added to school aid in Massachusetts, the sum still appears to be below the national average school aid fraction.

Appendix A

## *Variable Definitions, Sources, and Means: Massachusetts*

| Variable | More Detailed Definition | Mean (N = 322) |
|---|---|---|
| *Dependent Variable:* Total operating school spending per pupil | Integrated operating cost (IOC) divided by net average membership (NAM); IOC is a comprehensive school spending measure. | 4,973 |
| Instructional spending per pupil | Instructional costs per FTE pupil; instruction includes supervision, principals, guidance, and textbooks as well as teaching | 3,204 |
| *Measures of Resources:* Income per capita, 1989 ($000) | Per capita census money income in 1989 (in thousands of dollars) | 17.8 |
| Equalized property tax base per pupil ($000) | 1990 Estimated market value of taxable property (EQV, in $000) divided by NAM | 548 |
| Nonresidential property tax share | Tax levy on commercial, industrial, and personal property as percent of total levy | .205 |
| City or town at Prop 2½ levy limit for at least 3 years | Dummy variable = 1 if excess capacity was less than 0.1% of community's levy limit in fiscal years 1989, 1990, and 1991 | .317 |
| Federal aid per pupil | Federal aid for schools divided by NAM | 169 |
| State school construction aid per pupil | Aid from the state for school construction projects divided by NAM | 168 |
| State non-construction school aid per pupil | All state school aid other than school construction aid divided by NAM | 1,474 |
| State municipal aid per pupil | All non-school aid except for distributions of state-collected taxes or abatement reimbursements divided by NAM | 679 |
| *Measures of Preferences and Institutional Factors:* Town is member of regional K–12 district | Dummy variable = 1 if town does not operate its own school district | .202 |
| *More Measures of Preferences and Institutional Factors:* Town is member of regional high school district | Dummy variable = 1 if town operates only elementary schools | .261 |
| Percentage of households with school-age children | Percentage of households with members under age 18 in 1990 | 36.4 |
| Percentage of resident children attending private schools | Percentage of resident children in school (January 1990) attending private schools | 8.2 |
| Percentage of population age 65 and over | Percentage of all residents who were age 65 or older in 1990 | 12.9 |
| *Indicators of Costs:* Average annual wage at all establishments ($000) | Total annual payroll divided by average annual employment in establishments subject to unemployment compensation laws | 22.8 |
| Log of number of students | Natural logarithm of net average membership (NAM) | 7.26 |
| Enrollment growth, 1986–91 (percent change) | Percentage change in NAM from 1986 to 1991 | 1.02 |
| Membership Mix: | | |
| Special needs | Percentage of NAM in each category, as defined for purposes of pupil weighting in the basic school aid formula | 5.3 |
| Bilingual | | .8 |
| Occupational day | | 3.4 |
| residential | | .1 |
| Low-Income | | 6.5 |
| Enrollment Mix: | | |
| Pre-K and kindergarten | Percentage of enrollment (in October) in each grade level group | 9.8 |
| Grades 1–4 | | 33.6 |
| Grades 5–8 | | 29.6 |
| High school | | 27.1 |

Note: Variables refer to school year 1990–91 unless otherwise noted. NAM is net average membership, an enrollment measure. These data were obtained from (or were derived with author's calculations from data obtained from) the Massachusetts Department of Education or the Massachusetts Department of Revenue, Division of Local Services, Municipal Data Bank, except as follows: Average wage data were taken from Massachusetts Department of Employment and Training, "Employment and Wages in Massachusetts' Cities and Towns, 1982–1991," printed 9/92. Data on the percentage of households with members under age 18 and percentage of children attending nonpublic schools were obtained from Edith R. Hornor, Editor, *Massachusetts Municipal Profiles, 1991–92*, 1991, Information Publications. Percent of population age 65 and older obtained from U.S. Census of Population.

Appendix B

## *Variable Definitions, Sources, and Means: Rhode Island*

| Variable | More Detailed Definition | Mean (N = 36) |
|---|---|---|
| *Dependent Variable:* | | |
| Total operating school spending per pupil | Total operating school spending divided by average daily membership (ADM) | 5,966 |
| Instructional spending per pupil | Including K-12 instruction, voc. and tech., regular instruction of spec. needs, libraries, instructional media, and guidance | 3,234 |
| *Measures of Resources:* | | |
| Income per capita, 1989 ($000) | Per capita census money income in 1989 (in thousands of dollars) | 15.9 |
| Equalized property tax base per pupil ($000) | Full value based upon 1990 market value of property (in $000) divided by ADM | 473 |
| Nonresidential property tax share | Tax levy on commercial, industrial, and personal property as percent of total levy | .328 |
| Federal aid per pupil | Federal aid for schools divided by ADM | 210 |
| Matching school aid per pupil | All state school aid with a matching component divided by ADM | 2,155 |
| Matching rate | Operations aid "share ratio" | 54.5 |
| Non-matching school aid per pupil | School aid with no matching component divided by ADM | 292 |
| Aid to municipalities per pupil | All non-school aid except for distributions of state-collected taxes or abatement reimbursements divided by ADM | 39 |
| *Measures of Preferences and Institutional Factors:* | | |
| Town is member of regional K–12 district | Dummy variable = 1 if town does not operate its own school district | .139 |
| *More Measures of Preferences and Institutional Factors:* | | |
| Town is member of regional high school district | Dummy variable = 1 if town operates only elementary schools | .056 |
| Percentage of households with school-age children | Percentage of households with members under age 18 | 46.4 |
| Percentage of resident children attending private schools | Percentage of resident children in school attending private school | 12.9 |
| Percentage of population age 65 and over | Percentage of all residents who were age 65 or older in 1990 | 13.7 |
| *Indicators of Costs:* | | |
| Average annual wage at all establishments ($000) | Total annual payroll divided by average annual employment in establishments subject to unemployment compensation laws | 19.9 |
| Log of number of students | Natural logarithm of net average membership (NAM) | 7.94 |
| Special education percentage | Percentage of public and private school children with special needs | 13.7 |
| Bilingual percentage | Percentage of ADM who are "limited English proficient" | 2.9 |
| Enrollment mix: | | |
| Pre-K and kindergarten | Percentage of enrollment (in October) in each grade level group | 8.3 |
| Grades 1–4 | | 33.6 |
| Grades 5–8 | | 30.5 |
| High School | | 27.6 |

Note: Variables refer to school year 1990–91 unless otherwise noted. ADM is average daily membership, a public school enrollment measure. These data were obtained from (or were derived with author's calculations from data obtained from) the Rhode Island Department of Education, except as follows: Per capita income figures from the U.S. Census were provided by the Rhode Island Department of Economic Development. Percentage of households with school-age children and percentage of population 65 and over were obtained from the U.S. Census of Population. Average wage data were provided by the Rhode Island Department of Employment and Training.

Appendix C

## *Per-Pupil School Spending Regression: Rhode Island*

Dependent variable is operating school spending per pupil

| Explanatory Variable | Estimated Coefficient (Standard Error) |
|---|---|
| Constant | 1658** (793) |
| Income per capita, 1989 ($000) | 99.5*** (26.7) |
| Equalized property tax base per pupil ($000) | 2.38*** (.51) |
| Federal aid per pupil | .893* (.442) |
| Matching rate for school aid (%) | 16.8*** (5.8) |
| Non-matching school aid per pupil | 1.72* (1.00) |
| R-squared | .59 |
| Adjusted R-squared | .52 |
| Number of observations | 36 |
| F-statistic | 8.54 |
| Mean of dependent variable | 5966 |
| Standard error of regression | 367 |

*Significantly different from zero with better than 90 percent confidence.

**Significantly different from zero with better than 95 percent confidence.

***Significantly different from zero with better than 99 percent confidence.

Note: Dependent variables are for school year 1990–91; explanatory variables refer to school year 1990–91 or to fiscal year 1991 unless otherwise noted.

See Appendix B for variable definitions and means.

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