The Impact of Financial Centralization on the Support for Education: The Case of Michigan

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Background

The primary responsibility for the financing of U.S. primary and secondary education rests with state and local governments. In 1970-1971, local governments had, by far, the greatest role in education financing, providing 52.5% of the total education revenue. State governments contributed 39.1% of total education revenue. Since the early 1970s, the states' financial responsibility has increased such that in academic year (AY) 2001-2002 the state governments' 49.3% share was considerably larger than the local governments' share of 42.9% (U.S. Department of Education, 2004).

Even though states have assumed a larger financial role, local governments continue to be an important source of revenue for primary and secondary education. The largest source of local funds for education comes from the local property tax. However, given the unequal intrastate distribution of property wealth, combined with the extensive use of local property taxes to fund the local portion of education expenditures, it is not surprising that state education finance systems have been challenged in the state courts. Since 1972, nearly every state has witnessed a state constitutional challenge to its system of locally financed primary and secondary education. Between 1971 and 1999, plaintiffs in 17 states won state Supreme Court judgments that led to either overturning the state education finance systems or significantly altering them. Recent increases in the states' share of total education revenue can be largely explained as a result of state court decisions, which reduced the reliance on local property taxes.

Not all of the increases in the states' share of education finance were the result of state supreme court decisions, however. Some came through legislative action. One of the more dramatic, as well as surprising (to local citizens), education finance reforms occurred in Michigan. Legislative action in 1993 eliminated entirely the local school district property tax, which was replaced in early 1994 with a voter-approved increase in the state's sales tax and statewide education property tax, known as Proposal A.[1]

In 1995 (the midpoint year of the data used in this study), Michigan had more than 550 regular school districts.[2] The primary source of education revenue for school districts was generated by a local property tax levy applied to 50% of the assessed value of all eligible local property.[3] This tax was primarily on homestead property (i.e., owner-

[1] The decision to eliminate the local property tax came about as a political dare between Democratic members of the state legislature and the Republican governor. It was unexpected by all concerned. The Michigan reforms are described in many sources, including Kearney and Addonizio (2002), Courant and Loeb (1997), and Cullen and Loeb (2004).

[2] According to Hoffman, Sable, Naum, and Gray (2005), "regular school districts are the agencies responsible for providing free public education for school-age children residing within their jurisdiction." They are the primary type of local education agency. The other types operate under regional and state-operated agencies.

[3] Some properties, such as hospitals and churches, are exempt from property tax.

occupied primary residences) and nonhomestead property (i.e., second and vacation homes; rentals; and agricultural, commercial, and industrial property). Local tax rates consisted of an "allocated millage" rate of about 15 mills that did not require voter approval, plus an "extra voted millage" that required approval in local school district millage elections.[4]

The impact of the legislative action on the relative local vs. state share of education financial responsibility was particularly dramatic. The state legislative actions and the passage of Proposal A removed the "allocated millage" portion of the local tax levy. Local governments now must approve an 18-mill tax rate, which is applied to nonhomestead property only. This locally voted tax levy remains in the local school district. In addition, for three academic years after the reforms were passed—1994-1995, 1995-1996, 1996-1997—local school districts were allowed to levy an additional three "enhancement mills."

The effect of these reforms amounted to significant financial centralization. Prior to the legislative changes in the academic year 1994-1995, the state's share of the total public education revenue was about 30%. After the changes, the split became 75% from state sources and 20% from local sources. It is important to note that although the average state share across the entire state has increased, this percentage varies considerably across the individual Michigan school districts. The additional state revenues were generated from a 2-percentage-point increase in the state sales tax and a statewide property tax of 6 mills on all property (both homestead and nonhomestead), as well as a local property tax levy of 18 mills on nonhomestead property. The new revenue sources more than replaced the nearly $6.5 million of lost local property tax revenue. With the shift from local to state revenue sources came a significant decrease in property tax millage rates.

Along with this change in education funding came another change in the way state aid is provided to local school districts. Before the reforms in AY 1994-1995, Michigan had a form of District Power Equalization (DPE). The state guaranteed each school district a minimum amount of per-pupil revenue for each mill of property tax. In AY 1994-1995, the state replaced the DPE grant with a foundation grant. This foundation grant guarantees a school district some minimum amount of spending. For school districts that spend less than $3,950 per pupil in 1994, the 1995 foundation level was set at $4,200 or at least $250 above their per-pupil spending in 1994. The allowance was reduced for higher spending districts. Districts that spent between $3,950 and $6,500 in 1994 received between $160 and $250 per pupil. The highest-spending districts, those above $6,500, received only $160 above 1994 per-pupil levels in 1995.[5]

[4] One mill is one tenth of a cent or $0.001 per $100 of taxable assessed value.

[5] Cullen and Loeb (2004) describe this foundation plan in detail.

Does Centralization of Financing Affect Support for Public Education?

Some observers have argued that increased centralization of public activities (and consequent reductions in local control) will lead to a decrease in the popular support for these activities.[6] Applying this argument to education would imply that centralization of education finances at the state level leads to a reduction in the latitude that local school districts have to determine the level of educational spending and, thus, the quality of their local schools (Berger & Toma, 1994; Fuchs & Reklis, 1994; Southwick & Gill, 1997). This study attempts to examine the relationship between centralized funding and local support for education as it played out in voting patterns in Michigan millage elections, before and after the 1993 school finance legislation.

Centralization and education expenditure size. Although no studies of voting behavior have examined the relationship between voting outcomes and centralization, several median-voter model studies have considered this relationship.[7] In these models, a sign of decreased support would be a drop in education spending due to a shift in voting of the median-income voter. As described in Manwaring and Sheffrin (1997), when spending decisions are made by a local school district, the relevant decisive voter is the one with the median income level of preferred spending in each district. Relative to extreme positions, the median spending level gets the most electoral support. Under theoretical conditions outlined by Bergstrom and Goodman (1973), the median voter can be characterized as having median income. Therefore, when decisions are made at the district level, they are made by the individual in the district with the median income. Consequently, the "state average" education spending level is the average "median" or the weighted spending average of all state school districts. However, if spending decisions are made at the state level, then the expenditure level is the amount desired by the entire state's median income individual. The difference in spending between a purely decentralized system and a centralized system depends on the relative difference between the amount desired by the individual with the state's median income and the amount associated with the average of all the state's school district median incomes. As the authors describe, if school districts are homogeneous, then the average of the school district medians will approach the overall state average. However, under typical state income distributions, the state median is lower than the state mean, and this implies the state's average expenditure will be less than the amount determined by a decentralized system.

On a more practical level, without a dedicated tax to finance education, such as the local school district property tax, education must compete with other programs for revenues from general state income and sales taxes. This competition becomes more intense at the state level, where the scope of government functions is far broader than at the local level. An additional issue to consider in any switch of revenue sources is the

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[6] Fischel (2001) reviews this literature.

[7] One of the closest examples is Sielke's (1998) examination of the response of Michigan voters in bond-issue elections following the 1994 reforms.

relative volatility of the state and local tax systems. Specifically, how do the various tax bases—income, sales, and property—respond to changes in the state's economy? Local school districts that are tied to state revenue sources, such as income and sales, find their revenue is more sensitive to the business cycle than to the property tax (Sobel and Holcombe (1996).

The case of California is a particularly illuminating test of the relationship between centralization and expenditure size. The *Serrano I* decision in 1971 found unconstitutional the reliance on local property taxes to fund California public schools. The *Serrano II* decision in 1976 developed general principles to make the system constitutional, giving a significantly larger state role in the financing of primary and secondary education. Indeed, under strict requirements to meet equity goals, the system of local property tax financing of public education in California was effectively eliminated. The change in spending patterns in California in the post-*Serrano* era has been dramatic. In 1971-1972, California spending per pupil was 98% of the national average, and California ranked 19th among all states; by 1991-1992, California spending was only 86% of the national average, and the state's rank had fallen to 39th. The general consensus from the California work has been that the shift toward state financing of education has led to a significant decrease in spending on education. Silva and Sonstelie (1995) conclude that roughly one half of the spending decline in California can be attributed to the *Serrano* decisions and the remainder of the decrease to the growth of the student population during the 1980s.

The standard empirical method to estimate the impact of these state policy changes on education outcomes is to use a "dummy" variable to represent the presence of state court actions. Manwaring and Sheffrin (1997) use a panel data set from 1970-1990 to examine the relationship between equalization litigation and the level of state education funding outside of California. They find that, on average, successful litigation or legislative education reform raises education spending significantly—from an annual increase of $124 to $177 per pupil (in 1990 dollars)—or 2.2 to 3.5% of expenditures. In a similar model, Downes and Shah (1995) show that the stringency of constraints on local discretion determines the effects of reforms on the level and growth of spending. In a recent study that examines the types of redistribution that occurred after these court cases, Murray, Evans, and Schwab (1998) conclude that after these education finance reforms, states increased spending for education and left spending in other expenditure areas unchanged. By implication, states fund the additional spending on education through higher taxes. As a consequence, the state's share of total education spending rises as a result of court-ordered reform. Hoxby (2001) contends it is inappropriate to classify states, as these studies do, on the presence of school finance equalization reforms or whether the reforms were court mandated or legislated. She cites as support the increase in spending in New Jersey after court-mandated reform as compared with California's large decline after the *Serrano* decision. Rather than using a simple dummy variable, she observes differences in the effect of state finance reforms on the marginal tax price associated with equalization. When she includes the price of these reforms in a model of expenditure determination, she estimates that the average level of per-pupil spending falls

with effective equalization as a result of the large disincentives on high-demand school districts that are contained in these plans.

Centralization and student performance. Another reason why support for public education may decline with the centralization of finance is that homeowners lose the link between house values and local school performance. This theory hinges on the "capitalization" process, which occurs when the value of a stream of benefits and/or costs is incorporated into the asset (e.g., house) price. Oates (1969) was the first to find a relationship between house prices and local education taxes and expenditures. Fischel (2001) argues in his "homevoter hypothesis" that the capitalization of school quality into higher home values makes all homeowners in the school district, including those without school-age children, "invested" in the local schools. This investment is reflected in the concern over how local government services affect house values. In Fischel's theory, homeowners hold school administrators accountable for using higher property taxes (lowering property values) effectively to improve local public schools (raising property values). The link between the price of local education, through the property tax, and the educational outcome, usually measured by school test scores, is crucial for this support. When the revenue system is centralized at the state level and the direct local price and benefit are removed, then the incentives to monitor expenditures and the support for education by all homeowners are reduced.

The standard way to test theories related to student performance is to treat the education system as a production process.[8] In these "educational production function" models, student outputs/outcomes (usually measured by performance on standardized tests, graduation, and/or other levels of achievement) are "explained" with student, family, and school inputs. One modification is to include measures of various finance reforms (e.g., increased state revenue share as well as local property tax limitations) as explanatory variables. The state's share of total education revenue is usually included as an explanatory variable in the standard educational production function as a measure of the degree of centralization of financing responsibility.[9] Peltzman (1993) finds a marginally significant negative relationship between the change in the state share in spending and changes in SAT scores in the 1970s, but these variables are unrelated in regressions for the 1980s. In his later examination of the performance of noncollege-bound students, Peltzman (1996) finds that an increase in the state expenditure share is associated with a decline in Armed Forces Qualification Test (AFQT) test scores. Fuchs

[8] See Hanusheck (1986) for an overview of this modeling.

[9] The measure of state revenue share may be an inaccurate measure of centralization. For example, even though local governments in California and Michigan collect property tax revenue, the court and legislative decisions in those states took away local control over how much they spend. However, California's state share in 1994 is listed at 54.2%. A more appropriate measure of centralization might be a measure of expenditure equality, because the primary motive of recent state involvement in education finance has been to equalize spending. Husted and Kenny (1997, 2000) use a measure of state education spending inequality in their educational production function, rather than the state revenue share. Using six years of data (1987-1992) from 37 states, they conclude that the mean SAT score is higher in those states with greater intrastate spending variation.

and Reklis (1994) find that math scores are higher in states in which the state share in education revenues is lower.

A second approach at examining this relationship is to look at changes in outcomes that follow court-mandated reform. This approach captures any impacts of reform that are unrelated to changes in resources. In his look at the California experience following *Serrano*, Downes (1992) finds that greater equality in spending is not accompanied by greater equality in measured student performance. Downes and Figlio (1998) use individual-level data from the National Longitudinal Survey of the High School Class of 1972 (NLS-72) and the National Educational Longitudinal Survey (NELS). Their findings indicate that court-mandated school finance reforms do not result in significant changes in either the mean level or the distribution of student performance on standardized tests of reading and mathematics. They do find, however, that legislative reforms that are not a result of a court decision are associated with higher test scores in general; the estimated effect was particularly large in initially low-spending districts. Card and Payne (2002) focus on the impact of finance reform on SAT scores. Their most precise estimates imply that, on average, court-mandated reform in 12 states over the 1980s closed the gap in average SAT scores between children of highly educated and poorly educated parents by about 10 points.[10]

Study Design

The recent experience with education finance reform in Michigan provides an excellent opportunity for a direct test of the reaction of citizens to the centralization of education finance. As described above, Michigan voters approved Proposal A in 1993, and this dramatically shifted education financing responsibilities from local property taxes to state general income and sales taxes. For empirical purposes, it is important to note that these changes were entirely sudden and unexpected, so local policymakers and citizens could not adjust prior to the reform.

Two methods have been identified to determine the cross-sectional differences in the demand for government provided goods—the direct voting model and the median voter model. Both models are based on a common theoretical framework. Under

[10] There are other types of indirect reactions by high-demand families who are restricted by increased centralization. Some families augment the restricted public financing with their own private donations. Obviously, if these donations are large enough, they could potentially reduce the equality effects of the education finance reforms. Brunner and Sonstelie (2003) focus on the growth of local education foundations, nonprofit organizations designed to channel voluntary contributions to local schools in California after the *Serrano* court decision. There were six of these foundations in 1971, the year of the *Serrano* decision; by 1995 there were 537. Another reaction is the decision of high-demand families to "opt out" of the public school system altogether and send their children to private schools. The empirical evidence on this question is mixed. Brunner and Sonstelie (2003) and Husted and Kenny (2002) find some support for this relationship, but Downes and Schoeman (1998) do not.

relatively strict (but commonly imposed) conditions, the outcome of any direct election is determined by the preferences held by the "median voter" and, under an additional set of restrictions, the median voter can be identified as having median income. As a result, the common empirical model from this theoretical framework is

$$G = \beta 1 + \beta 2Ym + \beta 3tm + \beta 4Z + \varepsilon$$

where G is the amount of government expenditures (generally in per capita) or the government voting outcome, Ym and tm are the median voter's income and the "tax price" that faces the median voter. The variable Z represents taste parameters that affect the decisions of the median voter, and ε is a random error term. Given the form of the model, the standard statistical estimation procedure is ordinary least squares (OLS).

The primary difference between the direct voting model and the median voter model is the dependent variable. The direct voting model uses a measure of the popular vote outcome for the school district's millage election in place of the measure of government spending. The standard median voter model uses a measure of school district per-pupil expenditures. The independent variables in both models will overlap considerably, with the exception of a few election-specific variables in the voter model. In order to capture the impact of financial centralization on support, included as a "taste" variable in each of these models is the degree of centralization of education revenue in each school district.

Voting Model

Unlike goods traded in the private sector, decisions over the amount of government-provided goods in democracies are usually made either through direct citizen voting or by legislatures voting in a representative democracy. Of course, the secret ballot precludes a direct individual measure of the demand for "public goods." Instead, the standard way to examine voting behavior is through the aggregate voting outcomes. Two measures are typically used in a standard modeling framework. In cases where there is a direct vote on a government expenditure/tax measure, then the actual outcome of the popular vote can be used as a direct measure of support. In those cases, the dependent variable in these models is either a dichotomous variable indicating pass/failure or, when the vote totals are available, the proportion of affirmative votes in the election. In the standard empirical model, these voting measures are related to economic and demographic population variables. Voting in school millage rates is a popular type of election for these types of demand studies. Many states, such as Michigan, hold local school district elections to determine the size of the local property tax rate used for the local revenue share. These elections underscore the close relationship between the property tax (as a price for education and, in many districts, a dedicated education tax) and the amount of local education spending. Examples of these empirical studies include Alexander and Bass (1974); Romer and Rosenthal (1979, 1982); Romer, Rosenthal, and Munley (1992); and Ehrenberg, Ehrenberg, Smith, and Zhang (2003). In a related type of modeling, Rubinfeld (1977) and Bergstrom, Rubinfeld, and Shapiro (1982) use

individual-level data obtained from household surveys to estimate education demand functions.

The first way to estimate demand for education is to look at the results from the annual Michigan millage elections. Prior to the passage of the legislation and Proposal A, a large portion of the local education revenue contribution was determined through a local property tax millage election. Of course, these elections, prior to the reforms, could be examined. However, the difficulty with the direct voting model after the reforms were passed is this: because the Michigan finance reforms moved the financing to the state level, they removed the need for local millage elections. One potential source of information is in the enhancement millage elections. Districts were allowed to supplement their revenues though local school district millage elections for the three years immediately following the reforms in 1993. During this period, they could levy an additional three "enhancement mills." Enhancement millage election results for 1990-1997—three years prior to and three years following the 1993 reforms—are available.

A summary look at these election results, taken from Michigan's department of education before and after the education finance reforms, is revealing. Prior to the 1993 reforms, millage elections generally passed easily. Tables 1 and 2 break down the recent local millage election results overall and year by year. There were 1,419 elections to determine general operating expenditures between 1990 and 1994, an average of about 284 elections per year. Of those 1,419 elections, 1,128 of the millage proposals passed, about an 80% pass rate. During this period, the average support percentage (over all millage elections) was about 62%. As discussed above, the education finance reforms removed the need for local millage elections to fund general operating expenditures. The potential comparable elections are the special enhancement millage elections that were available to local school districts for three years after the reforms were passed. A review of these elections appears to reflect a change in attitude toward local education tax efforts. Over the three years that these special enhancement elections were available, there were 181 elections (Table 1), an average of about 60 elections per year. Out of this group of elections, about half of the proposed tax increases passed. The average support percentage (once again, over all elections) was less than 50%.

Table 1: Millage Election Results: AY 1990-1997

Period	Number of Elections	Percentage Passed	Average ρ
Pre-reform: 90-94	1,419	79.4%	.62
Post-reform: 95-97	181	49.7%	.51

As Table 2 shows, support for higher millage rates to support local education spending was lower after the reforms were passed and implemented. Here, the separate analyses are done on the budgets in the pre-reform years and on those from the post-reform years. This separation is necessary because of the nature of these elections. Millage elections during the pre-reform years were extra-voted mills, and the rate could vary considerably. Elections after the reforms were to enhance or supplement the already considerable state revenue support, and millage rates were limited to 3%.

Table 2: Annual Millage Election Results: AY 1990-1996

	Year	# of Elections	Percentage Passed	Average ρ
Pre-reform	1990	167	76.6%	0.62
	1991	264	80.0%	0.63
	1992	300	80.1%	0.64
	1993	402	70.1%	0.57
	1994	79	39.2%	0.50
Post-reform	1995	69	49.3%	0.49
	1996	33	75.7%	0.56

The next step in the analysis is to estimate the determinants of support in these elections in order to determine what relationship there is, if any, between increased centralization and voter support. Two dependent variables are used in this analysis. The first model incorporates a simple dummy variable as the dependent variable—PASS=1 if the millage election gained a majority of votes and PASS=0 if not. Because the dependent variable is dichotomous, the model is estimated using a probit technique. The second dependent variable for these election models represents the proportion of "yes" votes for the tax rate. The logarithm of the odds ratio—$\rho/(1-\rho)$, where ρ is the proportion of affirmative votes in the school district's millage election and varies between 0 and 1—is used. This common transformation of the dependent variable allows the error term to be distributed normally.

These election outcome data are combined with the school district census information.[11] The primary difficulty in this analysis is that census data are collected every 10 years. As a result, the census data from 1990 are used for the pre-reform elections and the census data from 2000 are used for the post-reform elections. The underlying assumption is that these population demographic characteristics change slowly.

The independent variables taken from the school district census include the percentage of the school district population 5-17 years of age (STUDENTS) and the percentage of the school district household population older than 65 (AGE65). While it seems obvious that families with school-age children will be more likely to support public education, previous empirical work has generally found the size of the school-age population to be negatively related to school spending.[12] There is some debate on whether older people demonstrate less support for public education. Poterba (1997) finds that the proportion of elderly voters in the state is negatively related to the amount of per-pupil education spending. However, Ladd and Murray (2001), using county-level data, did not confirm this negative relationship between the proportion of elderly population and the

[11] School district census information from the U.S. Census Bureau for 2000 can be found at http://nces.ed.gov/surveys/sdds/c2000.asp, and information for 1990 can be found at http://nces.ed.gov/surveys/sdds/c1990.asp.

[12] Poterba (1997) reviews some of these findings.

size of the school budget. House values, normally the older resident's biggest asset, are clearly related to the quality of the local education, and this might increase the support of the elderly population for greater local school expenditures.

Other socioeconomic factors may also affect support for school expenditures. The variables that may affect the demand for education include the percentage of the school district household population that is non-White (BLACK), the median real income in the school district (MEDIAN INCOME), the median real house value (MEDIAN HOUSE VALUE), the proportion of total education revenues that are contributed by the federal government (FEDREV), the percentage of householders who are homeowners (OWN), and whether the school district is in an urban area (URBAN). The first five of these variables reflect the resources available for local government expenditures. BLACK may be interpreted as race-related differences in the demand for education. It may also be a proxy for the lower end of the income distribution.[13] MEDIAN INCOME, MEDIAN HOUSE VALUE, and OWN have well-known relationships with the demand for education. MEDIAN INCOME reflects the ability to pay for more education and is expected to be positively related to demand. A higher MEDIAN HOUSE VALUE may reduce the demand for higher local millage rates, given that it represents the tax base for these property taxes. On the other hand, it will be related statistically to MEDIAN INCOME and does represent a potentially positive wealth effect. Homeowners (OWN) may understand the link between higher school quality and local house prices. On the other hand, millage taxes are local property taxes and will affect the homeowner directly. The type of community (URBAN) reflects the burden of the property tax system (i.e., agricultural land is heavily taxed under this system) and might also indicate the fact that suburban schools may face competition for students from nearby suburban or urban school districts.

The conditions of the millage election are also considered to be potential determinants of its passage, specifically, the level of the proposed millage rate (MILLAGE) and whether or not it has failed previously (PDEFEAT). Ehrenberg and colleagues (2003) found that previous school budget rejections by voters (in New York school districts) reduced the probability that any new budget proposals would be approved.

The key variable representing the degree of school finance centralization is the measure of the percentage of the state's contribution to total school district education funding (PSTATEREV). As described above, these state revenue percentages show that considerable variations in this percentage were present across the local school districts even before the reforms took place.[14] If local support for schools is negatively affected by the degree of centralization, then changes in this variable should be negatively related to

[13] See Poterba (1997).

[14] These data are found in *Information on Public Schools and School Districts in the United States* (various years) from the U.S. Department of Education, available at http://nces.ed.gov/ccd/f33agency.asp.

the probability that the millage proposal passes and also negatively related to the log of the odds ratio, holding district socioeconomic characteristics constant.

Results from the probit model. Tables 3 and 4 present the results from the two empirical models for each data set. Table 3 has the coefficient estimates using data from the pre-reform years (1990-1994), and Table 4 has the coefficient estimates using the data from the post-reform years (1995-2000). The structure of the reported results is similar in each table. Columns 1 and 2 present the entire coefficient estimates from the probit model as well as the marginal effects calculated for the statistically significant coefficients. Column 3 presents the coefficient estimates from the model using the log odds ratio as the dependent variable. Table 4 has two sets of regression results because of the use of two different measures of state control.

Table 3: Voting Models: Parameter Estimates and Marginal Effects (*t*-statistics in parentheses)

Variable	**Probit PASS=1**	**∂F/∂X**	**OLS Log-Odds**
MEDIAN INCOME	-.000018 (1.55)	__	-.00001 (2.39)
MEDIAN HOUSE VALUE	5.14×e-06 (1.01)	__	.000001 (0.76)
AGE65	.78904 (0.85)	__	-.5397 (1.58)
STUDENTS	-2.466 (1.69)	-0.618	-3.2847 (5.88)
URBAN	-.4227 (2.71)	-0.106	-.1462 (2.48)
BLACK	.4615 (1.45)	__	.005 (0.06)
OWN	-.2286 (0.33)	__	.3449 (1.35)
MILLAGE	.0523 (12.45)	0.013	.0231 (15.46)
PDEFEAT	-.4137 (3.85)	-0.118	-.2230 (5.33)
PSTATEREV	.003 (0.94)	__	.0025 (2.10)
R2	0.15		0.15
Observations	1356		1356

Table 4: Voting Models: Parameter Estimates and Marginal Effects (*t*-statistics in parentheses)

Variable	Probit PASS=1	∂F/∂X	Probit PASS=1	∂F/∂X	OLS Log-Odds	
MEDIAN INCOME	-.3.03×e-06 (0.49)	__		__	.000009 (0.86)	.000006 (0.58)
MEDIAN HOUSE VALUE	.000026 (1.31)	__		__	-6.13×e-07 (0.20)	.000001 (0.53)
AGE65	2.988 (1.38)	__	2.295 (1.15)	__	-.2399 (0.23)	-.4418 (0.44)
STUDENTS	-2.048 (0.60)	__	-.808 (0.24)	__	-2.671 (1.67)	-1.745 (1.08)
URBAN	-.3108 (2.02)	-0.124	-.2187 (1.51)	-0.087	-.2252 (3.01)	-.229 (3.08)
BLACK	1.0395 (2.29)	0.415	.7956 (1.95)	0.317	.1464 (0.80)	.1665 (0.92)
OWN	-.2286 (0.33)	__	.3697 (0.24)	__	-.7297 (0.94)	-.6038 (0.79)
MILLAGE	-.0831 (0.71)	0.013	-.0457 (0.40)	__	-.0356 (0.65)	-.0345 (0.64)
PDEFEAT	-.5251 (1.99)	-0.118	-.4321 (1.68)	-0.169	-.1401 (1.15)	-.1225 (1.00)
PSTATEREV	.002 (0.21)	__		__	.0036 (0.97)	__
DSTATEREV	__	__	-.0044 (0.63)	__		.0059 (1.74)
R2	0.11		0.11		0.14	0.14
Observations	180		180		180	180
Year Effects	Yes		Yes		Yes	Yes

The coefficient estimates across both time periods are not consistently strong. The estimates in Table 3 show the results from the pre-reform data. In these probits, STUDENTS, URBAN, and PDEFEAT are consistently statistically significant (at the 10% level of confidence). These variables are negatively related to the support for higher millage rate. Interestingly, the level of the millage rate (MILLAGE), holding the socioeconomic variables constant, is positively related to its passage. PSTATEREV is not statistically related to the probability that the millage proposal passes.

The results from the log-odds regressions generally confirm the results obtained from the probit estimations. STUDENTS, URBAN, and PDEFEAT are all negatively related to the log-odds ratio, and MILLAGE is positively related. MEDY is also unexpectedly negatively related to the log-odds ratio. The one difference is the estimated relationship between these dependent variables and a variable that represents the percentage of state revenue averaged over the five years prior to the finance reform

passage. PSTATEREV is positively related to the log-odds ratio. However, as is discussed more fully below, the education finance system prior to these reforms was primarily locally based in most of the school districts, with only a relatively minor role for the state government.

The estimates in Table 4 present the results from the post-reform data. These results are generally consistent with those found in the pre-reform years. URBAN and PDEFEAT are statistically significant and negatively related to the passage of the millage enhancements. BLACK is positively related. In the log-odds ratio equations, only URBAN is negatively related. Two variables were used in separate equations to represent the state's financial role—the difference between the state revenue percentage in the three years before the reforms and the state revenue percentage in the five years after the reform (DSTATEREV) and the percentage of state revenue averaged over the six years after the legislative reforms and the ballot initiative were passed (PSTATEREV). Neither of these variables is statistically significant in any of the models that explain the election results.

Discussion of the voter model estimates. As shown, a cursory examination of the voting outcomes of millage elections in Michigan before and after the major education finance reforms reveals a potential reduction in the support for local education, as expressed through the reduction in passage and percentage support at the ballot box. However, the results from a formal examination of the determinants of these voting outcomes do not indicate that the shift toward the state in financial responsibility is necessarily driving this change.

Prior to the reform measures, the state had a much different and constrained education finance role. As described previously, the state percentage was low relative to the local percentage in most of the Michigan school districts before 1995. The state did not have much of a role in the operations of most school districts, and it did not threaten local control over school financial operations during this period, so a negative outcome is not necessarily expected.

The lack of a negative relation (or, for that matter, any relation) was not expected in the enhancement local millage elections that were held after the financial reforms were put in place. However, it is the case that these elections do represent supplemental financing and they are short term. After the education finance reforms, the bulk of the responsibility for financing local school district expenditures now lies almost exclusively with the Michigan state government. Voters are probably not driven by the same factors after the reforms as before the finance reforms. A better way to measure the change in support for education expenditures in Michigan after the centralization is to look at the determinants of the school district's current instructional expenditures. This type of analysis requires the use of a different empirical technique. The standard empirical model is the median voter model.

Median Voter Model

Another empirical method to determine demand for government-provided goods is the "median voter model." The typical framework for these empirical models is to explain the cross-sectional differences across some governmental observation (e.g., states) in government expenditures on a particular item with characteristics of the "median" voter in that observation. Under fairly restrictive assumptions, the outcome of a majority vote is determined by the preferences of the median (middle) voter, who (under additional assumptions) is identified as the voter with median income. The median voter model is the standard empirical framework for the estimation of demand for public goods.[15]

The appropriate dependent variable for this particular empirical model is the real, per-pupil, school district, instructional expenditure, averaged over the five years after the reform was passed. Averaging is done, rather than a time series, because of limited availability of school district data. The data are obtained from the U.S. Census Bureau's census of governments.[16]

A set of explanatory variables similar to the one used in the voting model is used.[17] In particular, measures of the financial resources available to the school district are expected to be positively related to the level of per-pupil spending in the district. These financial measures include median income (MEDIAN INCOME), the median real house value (MEDIAN HOUSE VALUE), the proportion of total education revenues that is contributed by the federal government (FEDREV), the percentage of householders who are homeowners (OWN), the percentage of the state population that is African American (BLACK), and whether the school district is in an urban area (URBAN). The age of the population is also expected to be an important determinant. The variables AGE65 and STUDENTS are used to represent these important age groups. The only new variable in this group is FEDREV. Because it represents outside income to the school district, it is expected to be positively related to per-pupil instructional spending. The expected relationships between the other variables and the per-pupil education expenditure are identical to the expectations described in the voter model.

Two measures of centralization are used in this model. The percentage of the state's contribution to total education funding (PSTATEREV), averaged over the five years after the reform, is one of the centralization variables. The other is the change before and after the financial reform of this average state percentage (DSTATEREV). If local support for schools is affected by the centralization of finance, then we would expect to see per-pupil instructional spending fall as the degree of centralization has increased. The means and variances of all of these variables are listed in column 1 of Table 5.

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[15] Mueller (2003) reviews this modeling and the empirical literature.

[16] http://www.census.gov/govs/www/estimate.html

[17] This set of explanatory variables is similar to the one used in Poterba (1997).

Results from the median voter model. Columns 2 and 3 of Table 5 list the coefficient estimates for the two models. Many of the empirical results from the median voter model are what were expected, given the results from the previous literature. The variables that represented the school district's financial resources were generally statistically significant. MEDY, MEDH (in the first set of regression results), and FEDREV are all positively related to current instructional spending, indicating the income and wealth effects associated with greater education spending. The age variables have interesting, if not unexpected, relationships with real instructional spending. However, both results are consistent with some of the past literature. AGE65 is positively related to spending, and STUDENTS is negatively related. The last two resource variables are also as expected. BLACK is positively related, and OWN is negatively related to current instructional spending.

Table 5: Median Voter Models: Dependent Variable—Real Current Instructional Expenses (*t*-statistics in parentheses)

Variable	**Mean (Standard Deviation)**	**Parameter Estimates**	
Intercept	__	4.46 (16.12)	3.539 (12.93)
MEDY	50803 (13725)	0.000018 (4.71)	0.0000005 (4.08)
MEDH	104806 (40023)	-1.76×e-07 (0.15)	0.000005 (4.08)
AGE65	0.228 (0.063)	1.146 (4.06)	3.239 (8.61)
STUDENTS	0.174 (0.0353)	-1.109 (1.94)	-3.766 (6.53)
URBAN	0.408 (0.401)	0.011 (0.46)	0.027 (0.82)
BLACK	0.105 (0.297)	0.274 (3.37)	0.254 (2.98)
OWN	0.808 (0.093)	-0.583 (2.19)	-0.794 (2.85)
FEDREV	0.416 (0.539)	0.841 (8.95)	0.745 (7.32)
PSTATEREV	67.889 (17.26)	-0.018 (11.78)	__
DSTATEREV	36.774 (17.98)	__	-0.013 (8.67)
Adj. R2		0.51	0.46

The coefficient estimates for the two measures of state control are of particular interest. The first measure (PSTATEREV) is the state's share of the total education revenue in each of the school districts. It is negatively related to current, real instructional

spending. The other measure (DSTATEREV) represents the change in this variable before and after the Michigan education finance reforms. It too is negative and statistically significant. An increase in the state's financial role in the school district is negatively related to current, real instructional spending.

Conclusions and Importance of This Study

As described in the introduction, education expenditure inequities or outcome inadequacies created by the local-property-tax-financed system have resulted in education finance litigation as well as state legislative response in many states. The remedies created by this litigation decrease the reliance on the local government's property tax and increase the involvement of the state government in the financing of local school districts. The Michigan experience is instructive. The actions by the Michigan state legislature and the subsequent passage of Proposal A dramatically increased the financial role of the state government and virtually eliminated the local financial control. There is some suggestive empirical evidence that this shift from local to state control weakened the support for education spending. After the reforms, a smaller percentage of local millage elections passed, and the percentage of support decreased. Although there was no direct empirical evidence that linked the state financial percentage to voting outcomes, these same measures were negatively related to per-pupil instructional spending.

It is important to understand the relationship between the level of public support for education spending and the source of education funds. Citizens are very aware of the relationship between their asset price (house) and the neighborhood amenities (schools). If the citizens lose local control over that relationship, then they may be less likely to support the schools. Many states continue to use the court and political systems to centralize financial control over school districts. For example, actions taken by the Kentucky legislature in the early 1990s dramatically increased the state's responsibility in the financing of local schools.[18] In 2002, the Tennessee Supreme Court (*Tennessee Small School Systems vs. McWherter*, 2002) found that the recently approved teacher salary equity plan violated the state's obligation for equal education opportunity. Indeed, these two states currently rank near the top of all states in percentage of public education revenues provided by state sources.

Although the general goal of education funding litigation is to increase the equity of education expenditures and opportunities across the state, centralization reduces a local school district's ability to affect the support and quality of its local schools. Indeed, there is a large amount of indirect evidence that local support for public education is reduced as the financing centralization has increased. The results from this study may indicate a direct cost in terms of reduced political support and lower education expenditures due to centralization.

[18] Kentucky Supreme Court Opinion: *Rose v. Council for Better Education,* 790 S.W.2d 186 (1989).

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