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INSTITUTIONAL FACTORS AS EXPLANATIONS OF STATE EDUCATION GRANTS TO LOCAL SCHOOL DISTRICTS

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Abstract

The importance of state funding of K-12 education has increased nearly continuously for the past century. Currently, states contribute about roughly one-half of total revenue for K-12 education, allocated to local governments via state grants; however, there is substantial variation in this share across the states. The level of state grants to local K-12 school districts has been examined in attempts to explain both the increase over time in the state share of K-12 revenue or the differences across states. These studies have focused mainly on the role of such factors as the elderly population, income inequality, lotteries, court cases, or economic conditions. However, these studies have not typically considered such institutional factors as the overall role of state government in service provision or citizen attitudes about the appropriate responsibilities of state versus local responsibilities. We hypothesize that the role of the state in funding education reflects the relative magnitude of state government in providing overall public services and the general voter attitude towards fiscal decentralization. We explore these hypotheses using several empirical approaches, focusing on a panel dataset of the state share of state plus local revenue used to fund K-12 education for the 48 continental states for the period 1989 to 2007. The principal independent variables are per capita state expenditure net of K-12 education and measures of citizen attitudes toward decentralization; we also control for other variables that have been shown to be relevant in explaining state funding for K-12 education.

I. Introduction

The appropriate role of state versus local governments in funding K-12 public education remains a major source of controversy. For nearly 40 years this controversy has found its way into the courts, beginning in 1971 with *Serrano v. Priest* in California, and these cases have forced state governments to take an increased role in funding education. While the state share of funding for K-12 education has increased over time, there is still wide variation in the percentage of funding for K-12 public education that is attributed to state government.

Table 1 shows how the state share of education revenue differs across states. State share ranges from 29.0 percent in Nevada to 99.0 percent in Hawaii. Figure 1 illustrates the trend in state share at the national level, and shows a gradual increase in state share, increasing from 16.5 percent in 1919-20 to a high of 53.6 percent in 2000-01 before trending slightly down in the last several years. Figure 2 is a scatter plot of state shares averaged over the school years ending 1992-1996 versus 2002-2006. (The outliers in the upper left portion are New Hampshire and Vermont, both of which had court-mandated reforms in the late 1990s.) Figure 2 shows that for most states the state share decreased slightly over the period, while 16 states had modest increases in state share.

Although there is some research that attempts to explain the overall level of fiscal decentralization across U.S. states, there are few papers that examine more specifically the level of decentralization as reflected in state support for education. In this paper we explore determinants of the fiscal centralization of education funding. In particular, we explore inter-state differences in the state share of state plus local education revenue, considering the effects of standard economic factors but also focusing on the role of such institutional factors as the overall role of state government in service provision and citizen attitudes about their confidence in state

versus local governments. We hypothesize that the role of the state in funding education reflects the magnitude of state government in providing overall public services and voter attitudes towards fiscal decentralization. We explore these hypotheses using several empirical approaches, focusing especially on panel data of the state share of state plus local revenue used to fund K-12 education for the 48 continental states for the school years ending 1990 to 2006. The principal independent variables are per capita state expenditure net of K-12 education and measures of citizen attitudes toward decentralization; we also control for other variables that have been shown to be relevant in explaining decentralization and state funding for K-12 education.

II. Some Previous Work

There are several literatures that are relevant here: theoretical work on the determinants of “optimal” decentralization, empirical work on the general determinants of decentralization, and empirical work on the determinants of education spending. Each is discussed.

*On the Theory of “Optimal” Decentralization*¹

Decisions regarding the centralization of education funding are a part of the broader issue of “optimal” fiscal decentralization. There are several different ways that one might model the optimal choice of the degree of decentralization, especially the optimal degree of decentralization of school funding.

The most common approach here starts with the premise that the choice of the level of decentralization is made so as to maximize social welfare. Drawing on the Oates (1972) model

¹ Epple and Nechyba (2004) provide a comprehensive discussion of issues associated with fiscal decentralization.

of optimal jurisdiction size, this approach recognizes that there are social benefits and costs from decentralization. The benefits of decentralization include greater information about citizen preferences at the local level and greater potential for differential provision of local public services to a population with a diversity of preferences. Costs include foregoing the possibility of economies of scale or imposing benefit spillovers on neighboring jurisdictions, both of which are better captured by centralized provision. The empirical papers based on this approach then introduce variables reflective of how the benefits and costs differ across jurisdictions or countries; these studies are discussed in the next subsection.

A second approach focuses more on the “political economy” aspects of decentralization, and stems from the work of Borcherting and Deacon (1972) and Bergstrom and Goodman (1973). Here it is assumed that voters have preferences over the share of education funding that comes from the state. Such preferences might be based on one’s beliefs about the role of state versus local governments, their faith or trust in different levels of government, or their belief that the state (or local) government is better able to provide more equitable or adequate funding for education. This approach assumes that the decision on decentralization is based on political considerations (and not social welfare maximization), as represented by the preferences of the median voter.

This political economy framework can be expanded to consider other relevant institutional aspects. One strand recognizes the multi-tier aspect of governments, in which (say) state education revenue is determined by the state’s median voter while the local revenue is modeled as a median voter decision given the structure of the state education grant program. For example, de Bartolome (1997) suggests that state grants for education can be seen as a form of redistribution. Assuming a foundation aid program, he creates a median voter model in which

separate decisions are made as to the parameters of the foundation program. Given that median income is less than mean income, he shows that a political equilibrium is reached in which a more skewed distribution of income generates a larger share of state aid for education.

Hoxby (2001) explores how the structures of state education program and property taxation interact to affect the level of local education revenue; that is, once the state funding program is set, each local school district determines the local revenue within a median voter framework given the funding programs' effects on tax price and resources.

Other political economy factors can also be introduced. Thomas (2000) develops a model based on Becker's (1983) model of lobbying by special interest groups. Although her real interest is in whether a more centralized school funding program will result in lower total spending on education, her model is also relevant to determining the level of centralization of school funding. Thomas assumes two local school districts, one wealthy and one poor; the poor district has a larger population and more students than the rich district, but the ratio of students to population is the same in the two districts. An agent from each district lobbies the state (where lobbying is a costly activity) for the state share of revenue for education in order to achieve the district's own interests. Total education grants are distributed based on a foundation program so that the poor district receives a larger per student grant. Whether the agent desires greater centralization depends on the progressivity of the state tax system: the more progressive the state tax system, the greater is the preference of the poor district for a more centralized school funding program. Once the state grant is set, local governments determine the amount of own source revenue to spend on K-12 education.

An alternative political economy approach based on a budget-maximizing bureaucracy has been suggested by Panizza (1999), as an extension of the Alesina and Spolaore (1997)

framework to two government levels. Panizza presents a stylized model in which there is a central government and local governments. He assumes that the central government has a utility function that depends on the size of central government's budget. Panizza also assumes that all individuals have the same income but differ in their tastes for public goods, and that the individuals are sorted over space so that tastes (and thus utility from public goods) fall uniformly the further the individual is from the center of the country. The level of the public good in each local jurisdiction is determined by voting. The central government acts first and determines the level of centralization by maximizing a utility functions that depends on the level of its budget (which is the total spending on public goods times the level of centralization) and the level of democracy (i.e., the degree to which the government's choice can differ from the preferred spending on public goods by the median voter). Given the level of centralization, citizens vote on the amount of the public good and on the type of public good. The level of centralization is determined through a sequential game in which the central government is the first mover. The central government thus sets the level of centralization by determining the level of spending on public goods that would be determined by the voters given the level of centralization. The model predicts that the level of centralization is inversely related to country size, income per capita, tastes differentiation, and the level of democracy.

Jametti and Joanis (2009) consider the cases in which the central and local governments jointly provide a public good. They assume that voters know the total level of the public good but have imperfect information as to the contribution of each of the two governments; they also assume that the contributions from the two governments are not perfect substitutes in the production of the public good. Both governments maximize expected rent extraction under the constraint that the respective officials need to be reelected, where spending by one government

affects the probability of its election as well as that of the other government. In equilibrium, each government's contribution to the public good equates its marginal benefit from reelection to the marginal cost of foregone rents, taking the other government's strategy as given. These results imply that decentralization should depend on the relative competencies of the two governments (i.e., the productivity of the two resources in producing the public good), the split of the tax base between the two governments, and the relative reelection uncertainties at each level, with greater uncertainty reducing the incentive to spend on the public good.

Hatfield and Padró i Miquel (2008) also derive a positive theory of fiscal decentralization in which the level of decentralization between a central government and several local governments is the result of balancing the desire for redistribution with the need to avoid distortive taxes. The outcome is determined by citizen voters, and thus the model does not depend on a benevolent government as in Oates (1972) or on rent seeking as in Panizza (1999). They assume two sources of revenue, a distortive capital tax and a head tax. Since a relatively poor median voter prefers to shift tax burden to capital owners, public goods supplied by the central government will be financed by capital taxes, while locally provided public goods will be financed by head taxes because of competitive pressures. In deciding on the level of centralization, the median voter faces a trade-off between the benefits of more redistribution of capital rents but at a cost of a reduced capital supply. They show that decentralization increases with redistribution efficiency and is non-monotonically related to existing inequality (e.g., negatively related when inequality is low but positively related when inequality is high).

On the Empirical Determinants of Decentralization

Most of the empirical literature that explores the determinants of decentralization focuses on comparisons across countries, although there are some studies that focus on U.S. states. Oates (1972) appears to be the first to investigate that factors associated with the overall degree of fiscal centralization. He argued that there are three sources for differences across countries in the level of centralization: differences in the assignment of service responsibilities, differences in the composition of services provided, and differences in the degree to which services are provided by the private sector. To explain the differences in the level of decentralization, he identified three factors from his own theory that he thought would be associated with differences in the optimal centralization across countries. First, if there are economies of scale, then smaller countries (measured by population or area) should be more centralized. Second, if there is substantial diversity of demands for public services, then higher decentralization should be expected. Third, given that Wagner's Law suggests that public expenditure increase as income increases, then increases in income could lead to a change in the mix of public services changes and thus to changes in centralization.

Oates (1972) explored these hypotheses using a cross-section of 58 countries, using four different measures of fiscal centralization. He found that centralization falls as population or area increases (e.g., economies of scale), and also as income increases (e.g., Wagner's Law). Oates used three dummy variables to measure diversity of preferences: linguistic, racial, and religious diversity. None of these coefficients was statistically significant. He also used an alternative measure of diversity that reflects the level of sectionalism (e.g., the extent to which people in geographical subareas identify with the subarea), and found that a higher level of sectionalism is associated with more fiscal decentralization. Note, however, that Oates did not include any political factors, which surely affect the level of centralization.

There have been many studies following Oates (1972) that have explored the determinants of decentralization across countries. The studies rely on some subset of a basic set of variables (which is somewhat larger than what Oates used) that include income per capita, size (usually measured by population), density, urbanization, income inequality, ethnic heterogeneity, and grants to sub-national governments. In a survey of this work, Letelier (2005) concludes that these studies are largely inconclusive.

Panizza (1999) tested the hypotheses that stem from his theory using a large cross-sectional dataset of 60 countries for three separate years. His findings are supportive of the predictions of this theoretical model, namely that the level of centralization is inversely related to country size, income per capita, taste differentiation, and the level of democracy. These results are also consistent with Oates' (1972) hypotheses.

Giertz (1976) further extended Oates' (1972) analysis by considering the differences in decentralization across U.S. states. He used alternative measures of decentralization, and included variables that reflect economies of scale as well as several measures of demand diversity, including density range, urban range, income range (measured as the county with lowest value to the highest value), the Gini coefficient, an index of political conservatism, and the political composition of the lower house of the state legislature. Giertz (1976) found that the independent variables were generally of the expected sign and were statistically significant.

Wallis and Oates (1988) also explored factors associated with centralization across U.S. states, using the same basic framework that decentralization should be explained by factors associated with economies of scale, composition of services, and diversity of demand. They posit seven hypotheses that match the basic hypotheses in Oates (1972) and Giertz (1976). They expect centralization to be negatively related to land area, population, the percent urban, the

degree of income inequality, and the diversity of the population (as measured by the percent living on farms and by a racial variable measured as $[(\text{Percent White} - 0.5)^2]$). They also expect centralization to be positively related to per capita income on the assumption that greater income generates more “taste” for redistribution, which can most effectively be undertaken at a more centralized level. Wallis and Oates (1988) estimated equations using the state shares of expenditures and of revenues as alternative dependent variables with a dataset comprising a panel of 48 states for nine different years reflecting one year each decade between 1902 and 1982. They estimated an equation using the full panel (in which they include time and state dummies), and separate OLS regressions for each year. Their empirical results are somewhat mixed. For example, they found that land area, per capita income, and race are not statistically significant in the regression using the full panel, while the magnitudes and significance of the coefficients varied across the OLS-by-year regressions. In fact, their OLS regressions are weaker statistically than panel regressions, suggesting some kind of secular trend in the level of centralization that is better captured in the panel dataset. However, like Oates (1972), Wallis and Oates (1987) did not include any political factors.

More closely related to our work here is Dincer (forthcoming), who considers the relationship between decentralization and “trust” in people (as distinct from trust in government). Using an index of trust developed by others, Dincer explores whether trust across U.S. states is increased by fiscal decentralization. He finds a positive relationship between the level of trust and the level of fiscal decentralization, even when he instruments fiscal centralization.²

On the Empirical Determinants of Education Spending

² Note that Strumpf and Obersholzer-Gee (2002) found that states with more heterogeneous preferences are more likely to decentralize liquor control, where heterogeneity is measured by differences in education and religious affiliation.

There is a vast literature that has explored the determinants of the level of education funding. Many of these papers have considered the effects of school funding court cases (Evans, Murray, and Schwab 1997; Downes and Shah 2006) or have focused on the incentive effects of school funding formula (Hoxby 2001). Some of this work was also designed to test directly the implications of the theoretical models discussed earlier. For example, an implication of the theoretical model of de Bartolome (1997) is that an observed increase in state education revenue is due to increased income inequality. de Bartolome (1997) tested his model using state panel data for 1970, 1980, and 1990. In his regressions explaining the level of state education revenue, he found that the coefficient on median income was negative while the coefficient on mean income was positive, as predicted by his theoretical model. He also included a dummy for a court ordered reform of the state's education funding formula, which had the expected positive effect on state aid.

Similarly, Thomas (2000) used her theoretical model to examine empirically whether an increased state share leads to a reduction in total spending on education. Since the state share depends on the level of local funding, she also had to estimate an equation to explain the state share. The model was estimated with U.S. state-level data for 1990. For the regression equation with the state share of education funding as the dependent variable, Thomas (2000) found significant coefficients for the poverty rate (a positive sign), tax regressivity (a negative sign), the number of students per district (a negative sign), and losing a court case (a positive sign); the signs of the estimated coefficients on these variables were as expected.³

Focusing specifically on the centralization of education funding, one of the first papers to address the effects of school reform on centralization was Bahl, Sjoquist, and Williams (1990).

³ Thomas (2000) also included as independent variables in the state share equation the percent black, the percent urban, the unemployment rate, a dummy equal to one if the state required mandatory local effort, the percent voting Democrat in the 1988 presidential election, and the percent with a college degree.

They ran simple regressions using panel data with time and state fixed effects in which the dependent variable was either the state share of education revenue or the share of property tax revenue in total education revenue; the independent variables were dummies variables reflecting whether the state had a court-ordered reform of its education funding program or a legislative initiated reform. They found that the coefficients on both reform variables were positive and significant for the state share equation, and negative and significant for the property tax share equation.

III. Empirical Model and Data

We focus here on the determinants of the fiscal centralization of education funding, especially inter-state differences in the state share of state plus local education revenue, focusing on the role of such institutional factors as the overall role of state government in service provision and citizen attitudes about the appropriate responsibilities of state versus local governments.

There are several advantages in exploring fiscal centralization using K-12 education funding as the focus of the analysis. First, there are no differences across states in the mix of governmental levels in the provision of education, since education is always produced at the local level. Thus, we can focus entirely on the sources of funding. Second, education is a very important public service, accounting for 41 percent of total direct expenditures of state and local governments.

Here we examine the state share of total state and local (SL) spending on K-12 education, excluding federal funds to SL governments for education spending. We measure total spending by total revenues, rather than by SL actual expenditures because it is not possible to separate

expenditures by source. These data were obtained from the National Center for Education Statistics (NCES). Data were obtained from the *Digest of Education Statistics*, available at <http://nces.ed.gov/programs/digest/>. We restrict our analysis to the 48 continental states, excluding Hawaii because it is a state-funded education system and Alaska because of its heavy reliance on a unique revenue source (e.g., oil).

We hypothesize that the state's citizens have preferences regarding the share of education funding contributed by the state that is independent of the level of total spending on education in the state. In particular we hypothesize that if citizens have greater trust in the state or centralized government as opposed to local government, the state share of funding for K-12 education would be greater. We measure this trust in two ways. First, we rely on an opinion poll conducted in 1996 by the American National Election Studies. There were two particularly germane questions, one asking the respondent in which level of government he or she had the most faith in and the other asking in which of government s/he had the least faith. The exact wording of the first question is:

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VCF0630 Government Level in which R Has Most Faith
=====
QUESTION:
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We find that people differ in how much faith and confidence they have
in various levels of government in this country.
In your case, do you have more faith and confidence in the national
government, the government of this state, or in the local government
around here?
VALID_CODES:
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1. National government
2. State government
3. Local government
9. DK; none; all; other; depends; refuses to choose;
combination of two
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Because of the small sample size, it is not feasible to have reliable values of the variable for all states. Thus, as an alternative variable we use per capita state spending net of K-12 education.

Larger state spending is taken as evidence that citizens either prefer or have more confidence in state government.

We control for other variables, drawing on those variables used in empirical determinant studies of decentralization and in studies that explore state funding for K-12 education. These variables reflect economic, demographic, and legal/institutional characteristics. As for *income* and *demographic* variables, we considered several controls, including per capita income, the fraction of college graduates in the states' overall population older than 25 years of age, the fraction of the population under the age of 18, the fraction of the population over age 65, and the fraction of homes owner-occupied.

Per capita income is commonly used in studies of decentralization. Some authors have argued that centralization may simply be a superior good, and thus a positive coefficient on per capita income would reflect a desire for fiscal equalization. Apart from the direct fiscal consequences for them personally, some citizens may have preferences for more equity in the available resources to local school districts, perhaps because of concern for possible externalities that arise from students getting a good education. It is commonly argued that the desire for equity increases with income. Alternatively, the effect of income could reflect citizens' preferences for state revenue sources. Each tax has different effects on such characteristics as stability, growth, and equity, and the resulting tax structure may be thought of as a portfolio of these characteristics. In most states, local revenue is raised by the property tax. Citizens with higher incomes may prefer the use of non-property taxes (i.e., state revenue). The effect of income could also reflect citizens' preferences for more local versus state control.

Income is also used in most studies focused on state spending on K-12 education, such as Fernández and Rogerson (1997), Lovell (1978), Poterba (1997), and Harris, Evans, and

Schwab (2001). These studies found significantly positive income elasticities for spending per student (e.g., 0.53 in Poterba (1997) and 0.79 in Harris, Evans, and Schwab (2001)). Relatedly, Alm, Buschman, and Sjoquist (2009) explored the effect of the 2000-01 recession on state and on local revenue per student, and found that the response by the two levels of government differed. The differential response is consistent with a decrease in state share of education funding in most states, although the authors did not explore that issue.

We consider several demographic variables often used in the education spending literature. We include adult educational attainment and school-age population share, with no expectation on the signs. The effect of the elderly population, measured by the fraction of the population over age 65, has also been used in studies of education spending per student. For example, Poterba (1997), who found a significant negative effect of the over-65 population share on per student spending, with an elasticity of -0.26 ; Harris, Evans, and Schwab (2001), who obtained a negative but not statistically significant coefficient on the elderly population share, and; Fernandez and Rogerson (1997), who found both positive and negative (and significant) estimates, depending on whether they excluded or included a linear time trend. We also include the fraction of owner occupied housing, expecting that greater homeownership would increase resistance to the property tax and thus increase the state share of funding. Poterba (1997) found a significant positive effect of home ownership rates on total education spending per student, while Harris, Evans, and Schwab (2001) found inconsistent and not significant results, even at the local source revenue level. The urban population share was used by Oates (1972), and we include it as well.

We consider housing prices as a proxy for the level of local resources, reflecting local dependence on property taxes for revenues. Local education revenue, in particular, is generated

largely by property taxes and it is commonly thought that raising property tax rates is politically difficult. However, if the property tax base is increasing, then local school districts can generate additional revenue without changing property tax rates. (Of course, if there is an institutional constraint on allowable increases in the property tax levy (e.g., a tax limitation), then increases in the property tax base may not translate into additional revenue.) The Federal Housing Finance Agency, formerly the Office of Federal Housing Enterprise Oversight, produces a quarterly home price index for each state, and we use these data to construct our proxy measures of the property tax base. We hypothesize that increased housing prices will increase local education funding and thus reduce the state share.

Many states have implemented state lotteries as a means of raising non-tax revenues that are, in many cases, earmarked for education. Using information in Evans and Zhang (2005) and from the website of the North American Association of State and Provincial Lotteries (<http://www.naspl.org>), we construct dummy variables for lotteries in operation each year that are earmarked for elementary and secondary education. Evans and Zhang (2005) estimated that lottery profits have a significant positive effect on per pupil education spending and that the effect is somewhat larger (though still less than dollar-for-dollar) where revenues are earmarked. Miller and Pierce (1997) likewise found a significant positive effect from earmarked lottery revenues. Alm, Buschman, and Sjoquist (2009) found a significant positive effect from an earmarked lottery on state per student revenues along with a partially offsetting negative effect on local revenues, but no effect from a non-earmarked lottery at either level. Consequently, we expect that the presence of an earmarked lottery will increase the state share.

We also include dummies for court-ordered and legislative reforms of school funding programs. Whether initiated because of a court order or legislative action, school finance reforms

have been shown to affect education spending (Bahl, Sjoquist, and Williams, 1990; Silva and Sonstelie, 1995; Evans, Murray, and Schwab, 1997; Manwaring and Sheffin, 1997; Murray, Evans, and Schwab, 1998; Baiker and Gordon, 2006; Downes and Shah, 2006; Downes, 2007). For example, Murray, Evans, and Schwab (1997) found that court-ordered reform had significant positive effects on total funding per student, increasing it in the poorest and the median districts without reducing it in the richest ones, thereby reducing inequality of spending across districts within the state. To examine this, we tested separate dummy variables based on Downs and Shah for court ordered (25 states) and legislative (34 states) school finance reforms occurring prior to 2000.

We include the number of students (in natural log form) to control for overall size of the state system. Oates (1972) argued that larger countries should be more decentralized due to economies of scale, but this argument seems not to apply when considering the state share of funding for a locally provided service. Another hypothesis is that larger state systems are likely to see greater inequality across districts and thus require greater centralization for the purpose of redistribution. In addition, we include the average number of students per local school district. The impact of this variable on decentralization can take several forms. If there are few districts, then inequality across districts should be less, so that we might expect a smaller state share. However, with lots of districts, citizens might be more content with the level of education that is provided and thus exhibit a smaller demand for state funding. The number of districts might also reflect the desire for decentralization or the heterogeneity of preferences, both of which implies less state share. Finally, a larger number of districts for a given number of students (i.e. fewer students per district) seems a fairly direct indicator of a preference for decentralization via more localized control.

Finally, we include state year-end fiscal balances (general fund and “rainy-day” fund balances) divided by total state expenditures as an indicator of budgetary pressures on the state level. Alm, Buschman, and Sjoquist (2009) found that higher relative fiscal balances are associated with significantly higher state funding per student, with no significant effect on local funding, suggesting a positive effect on the state share.

IV. Empirical Results

We begin with some simple cross-section results. Tables 2 and 3 present some 48-state cross-section regression results for a variety of single years and five-year spans, and Table 3 also incorporates the “Faith in Government” survey response variable. The dependent variable in each model is the state share of spending in the single year or a five year span. Explanatory variables are for periods falling prior to the school year(s) of the dependent variable, as indicated in each table. Table 2 presents models with only two explanatory variables, Real Per Capita Income and Real Per Capita State Spending Net of K-12 Education, both in logs. We tried a host of other variables, including demographic, economic, and institutional variables (e.g., school age population share, over-65 population share, adult educational attainment, fraction of homes owner occupied, real housing costs, earmarked lotteries, and fiscal balances). However, none of these variables proved even remotely significant, and adding them, while sometimes marginally increasing the R-squared, reduced the adjusted R-squared. These results are not reported.

The results are fairly consistent across the different periods. The coefficient estimates for the income variable ranged from -0.41 to -0.67 (always significant at 1 percent), indicating that a 1 percent higher per capita real income implies about a 0.4 to 0.7 percentage point lower state share of education spending. These results run somewhat counter to expectations, given the

results from the literature on decentralization. State non-education spending had a somewhat less consistent impact, with positive estimates for all periods but with p-values of 0.22 for the 1996 model and 0.095 for 1996-2001. For the later periods, p-values were much better, and the estimates suggest that 1 percent higher per capita state spending net of education is associated with a 0.20 to 0.33 percentage point higher state share of education spending.

Table 3 includes the 1996 survey variable. We tried different measures drawn from both the positive “most faith” and the negative “least faith” questions. Each was a ratio of the respondents’ choices, either local-to-state or state-to-federal. The only measure that produced significant results was the local-to-state ratio from the “most faith” survey question. Adding the survey variable reduced the sample size to only 23 states because we only included states with at least 25 survey responses. Reducing the threshold below that level includes more states, but at the cost of greater measurement error in this attitude variable. Increasing the threshold makes the sample size exceedingly small.

For the 1996 and the 1997-2001 models, coefficient estimates for the income variable are both around -1 (compared to -0.59 to -0.67 without the survey variable) and significant at 1 percent. The coefficient on state non-education spending is also somewhat larger in magnitude than for the same periods in Table 2, 0.34–0.35 compared to 0.14–0.15, and the p-values fall to 0.03 and 0.01 respectively. Coefficient estimates for the survey variable are negative, as one would expect: greater faith in local government versus state government seems consistent with a lower state share of education spending. The p-values for the attitude variable in the 1996 and 1997-2001 models are slightly over 10 percent. For the 2001 and the 2002-2006 models, the income and state non-education spending coefficients are closer to those in Table 2 (without the survey variable), at around -0.5 and 0.3 respectively, and are all significant at the 5 percent or 1

percent levels. The coefficient on the survey variable is slightly larger in magnitude than for the earlier periods, at about -0.13 in both the 2001 and 2002-2006 models, and with a p-value of about 3 percent in both as well. R-squares for all periods' models are between about 0.44 and 0.47.

Table 3 also includes for the 1997-2001 model two other candidates for gauging (or influencing) attitudes toward decentralization of government, average school district size (also in logs) and the urban share of the population in 1990. Inclusion of these variables added to the explanatory power of the model (i.e., the R-squared rose from 0.47 to 0.55) without sacrificing precision (i.e., the adjusted R-squared also rose). The coefficient estimate on the survey variable is now -0.11 (p-value of 0.07), indicating that an increase of 0.1 units in the ratio of local-to-state “most faith” responses (e.g., from 1.0 to 1.1) is associated with a 1.1 percentage point decrease in the state share of education spending (e.g., from 50 percent to 48.9 percent).

Table 4 contains the results using the full panel (48 states over 17 years) and, except for the first column, the full set of explanatory variables (excluding those that were not available on an annual basis). The first two columns of Table 4 are pooled OLS regressions, first with only the income and non-education spending variables for comparison to the cross-section regressions. Notice that the coefficients are comparable to those in the cross-section results in Table 2. The second column adds:

- log students as a measure of the size of the state system
- log average district size as a measure of Tiebout decentralization
- demographic variables (percent 5-17 years of age, percent over 65, and percent of those over 25 years of age with at least a BA degree)
- fraction of homes that are owner occupied
- the real housing cost index
- earmarked lottery dummy
- the Downs and Shah (2006) court-ordered and legislative reform dummies
- state fiscal balances divided by expenditures

The third column of Table 4 includes state fixed effects. The results are, for many variables, dramatically different from the pooled regression. The likely reason is that the fixed effects model estimates the effects of the explanatory variables *within* the states over time, but does not very well explain *cross-sectional* differences that are persistent over time. Because the fixed-effects model “time-demeans” the data, cross-sectional differences in the mean levels of explanatory variables that might help explain cross-sectional differences in the dependent variable are subsumed into the fixed effect. The coefficients therefore measure the partial effect of variations from the mean *within the state*, not the effect of differences in the mean *across the states*, and it is the latter that we are interested in (i.e., explaining cross-sectional differences in the state share, not within-state variation in the state share).

In conjunction with running the fixed effects regression, we also test for cross-sectional correlation of the errors and for group-wise heteroskedasticity. The results indicate that these problems are present and suggest using the panel-corrected standard errors model (PCSE), which produces standard error estimates that are robust to cross-sectional dependence and group-wise heteroskedasticity. Column 4, then, is a PCSE model with no state or year fixed effects – effectively a pooled model with corrected errors. Notice that the coefficient estimates are the same as in column 2, but the coefficient standard errors are generally (though not always) somewhat larger.

Column 5 adds year fixed effects on the grounds that there may be unobserved effects that vary by year, but are consistent across the states. Coefficient estimates in column 5 related to column 4 do not change much (though some are a bit larger in magnitude), but a few that were not significant in column 4 are significant at the 5 percent or 10 percent level in column 5. The year effects are jointly significant, and tell an interesting story themselves. Figure 3 presents the

value of the year fixed effect estimates, with 1993 as the base year (chosen to minimize the absolute magnitude of other years' fixed effects). Figure 3 shows a pattern of state shares dropping on average (conditional on the other variables) for several years after each of the two recessions during the period.

This final model, with year effects, indicates that there are aggregate, unobserved factors affecting the state share for all states and also a number of economic, demographic, and institutional variables that explain differences across the states. With the additional controls, the income coefficient is consistent with the simpler regressions and, again, contrary to expectations based on the literature. Estimates of the effect of the school-age population share are not statistically significant, but a larger elderly share has a negative effect on the state share of education spending. The share of adults with at least a bachelor's degree and the fraction of homes owner-occupied both have significant positive effects on state share. Coefficient estimates for real housing costs, state fiscal balances, and the two reform dummies are also positive and significant (at 1 percent), as expected, although the estimate for housing costs is quite small. The coefficient estimate for an earmarked lottery was not as expected, coming in at about -0.04, significant only at the 10 percent level. While the introduction of an earmarked lottery may increase a given state's state share from its level before launch of the lottery (as suggested by the literature and by the significantly positive estimate in the fixed effects regression of column 3), it does not imply positive cross-section differences.

The variables that seem most reflective of differences in attitudes toward decentralization are per capita real state spending levels, net of K-12 education spending, overall numbers of students, and average school district size (holding total students statewide constant). All of these variables show significant positive coefficients. The estimate of 0.27 on state non-education

spending indicates that a 1 percent higher non-education spending levels is associated with 0.27 percentage points higher state share of education spending. Larger statewide student populations and larger school districts are also associated with larger state shares of education funding. A 1 percent larger statewide number of students and a 1 percent larger average district size each imply a 0.03 percentage point higher state share of education funding.

V. Conclusions

We have explored the hypothesis that the level of centralization of K-12 education funding depends on the relative faith that citizens have in state as opposed to local government. Using an opinion poll regarding respondents' confidence in state versus local government and per capita state spending net of K-12 expenditures, our empirical results are generally supportive of the hypothesis. These results are preliminary. In particular, there are several variables that we hope to include in subsequent revisions.

One potential explanatory fiscal factor on the local level is whether local governments are able to rely on revenue other than the property tax to finance K-12 education, in which case they may have an easier time weathering fiscal difficulties brought on by recession (Downes, 2007).

To the extent that states can run a deficit, the state may be less inclined to cut K-12 spending. To measure the balance budget requirement, we hope to use data that show which states can carry forward a deficit.

Lastly in the institutional category of controls, we will use information from the National Conference of State Legislatures to construct political dummy variables that indicate states with a Republican governor serving in 2001 and those with Republicans or Democrats in control of both houses of the state legislature

Finally, in addition to per capita state expenditure net of K-12 expenditures, we will use the state share of non-K-12 education expenditures to reflect the attitude of citizens toward state government versus local government.

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Table 1. State Share of State plus Local K-12 Revenue

State	State Share (percent)	State	State Share (percent)
Alabama	67.1	Montana	56.3
Alaska	71.7	Nebraska	37.3
Arizona	56.5	Nevada	29.0
Arkansas	66.6	New Hampshire	42.4
California	67.2	New Jersey	45.3
Colorado	48.0	New Mexico	84.9
Connecticut	41.1	New York	46.1
Delaware	69.8	North Carolina	72.0
Florida	45.6	North Dakota	45.5
Georgia	50.6	Ohio	49.0
Hawaii	99.0	Oklahoma	65.1
Idaho	64.3	Oregon	57.6
Illinois	33.1	Pennsylvania	39.3
Indiana	54.3	Rhode Island	45.0
Iowa	51.5	South Carolina	52.4
Kansas	61.6	South Dakota	41.0
Kentucky	66.3	Tennessee	51.3
Louisiana	53.8	Texas	39.4
Maine	48.0	Utah	62.5
Maryland	43.1	Vermont	94.2
Massachusetts	50.6	Virginia	43.4
Michigan	65.9	Washington	69.2
Minnesota	78.8	West Virginia	68.7
Mississippi	66.5	Wisconsin	57.1
Missouri	38.4	Wyoming	49.9
United States	52.5		

Source: U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics: 2008*, Table 172, available online at: http://nces.ed.gov/programs/digest/d08/tables/dt08_172.asp?referrer=list (accessed 2/2/2010)

Table 2: Cross-section Regressions**Dependent variable: State share of state plus local elementary and secondary education revenues**

School year(s) ending	1996		1997-2001		2001		2002-2006		2006	
Real Pers Income p.c.	-0.6673	***	-0.5911	***	-0.4244	***	-0.4084	***	-0.4821	***
	(0.159)		(0.128)		(0.101)		(0.102)		(0.117)	
Real State Expend. p.c., net of elem. & sec. educ.	0.1357		0.1492	*	0.2056	**	0.2490	***	0.3292	***
	(0.108)		(0.087)		(0.082)		(0.083)		(0.090)	
Constant	6.1988	***	5.3420	***	3.2560	***	2.7247	**	2.7852	**
	(1.457)		(1.178)		(1.081)		(1.094)		(1.212)	
Year of explanatory variables	1995		1995		2000		2000		2005	
Observations	48		48		48		48		48	
F-test of joint signif. (p-value)	0.0005		0.0002		0.0002		0.0002		0.0001	
R-squared	0.2862		0.3216		0.3086		0.3124		0.3429	
Adj R-squared	0.2545		0.2914		0.2779		0.2818		0.3137	

Standard errors in parentheses.

*** indicates significance at 1% level, ** at 5%, * at 10%.

Explanatory variables in natural logs.

Table 3: Cross-section Regressions

Dependent variable: State share of state plus local elementary and secondary education revenues

School year(s) ending	1996	1997- 2001	1997- 2001	2001	2002- 2006
Real Pers Income p.c.	-1.0309 *** (0.305)	-0.9431 *** (0.264)	-0.8198 ** (0.329)	-0.5374 *** (0.177)	-0.5024 ** (0.180)
Real State Expend. p.c., net of elem. & sec. educ.	0.3356 ** (0.144)	0.3540 *** (0.125)	0.4023 *** (0.134)	0.3003 ** (0.109)	0.3438 *** (0.111)
Most faith in local/state (1)	-0.0987 (0.066)	-0.0937 (0.057)	-0.1137 * (0.059)	-0.1280 ** (0.055)	-0.1273 ** (0.056)
Avg District Enrollment, 1996			0.0324 (0.025)		
Urban population share, 1990			-0.2867 (0.251)		
Constant	8.4458 *** (2.400)	7.4160 *** (2.081)	5.7621 ** (2.604)	3.7935 ** (1.523)	3.0685 * (1.549)
Year of income & state expenditure variables	1995	1995	1995	2000	2000
Observations (2)	23	23	23	23	23
F-test of joint signif. (p-value)	0.0101	0.0059	0.0129	0.0083	0.0077
R-squared	0.4408	0.4732	0.5451	0.4532	0.4575
Adj R-squared	0.3525	0.3901	0.4113	0.3668	0.3718

Standard errors in parentheses.

*** indicates significance at 1% level, ** at 5%, * at 10%.

Income, state non-educ. Expenditures, and average district size variables in natural logs.

(1) Ratio of "most faith in" survey question respondents indicating local gov't over those choosing state.

(2) States included only where survey participants numbered 25 or more.

Table 4: Panel Regressions**Dependent variable: State share of state plus local elementary and secondary education revenues**

	Pooled OLS	Pooled OLS	Fixed Effects	PCSE(1)	PCSE w/ Yr FE(1)
Real personal income p.c. (log)	-0.5019*** (0.032)	-0.7105*** (0.052)	0.2947*** (0.062)	-0.7105*** (0.059)	-0.7782*** (0.041)
Real state expenditures p.c., net of elem. & sec. educ. (log)	0.1995*** (0.017)	0.2121*** (0.018)	-0.1536*** (0.023)	0.2121*** (0.026)	0.2678*** (0.027)
Students (log)		0.0256*** (0.006)	-0.1382*** (0.045)	0.0256*** (0.008)	0.0309*** (0.008)
Average district size (log)		0.0295*** (0.005)	0.0557** (0.023)	0.0295*** (0.005)	0.0298*** (0.005)
Pop. share age 5-17		0.2871 (0.360)	0.9086** (0.356)	0.2871 (0.286)	0.0863 (0.254)
Pop. share age 65+		-0.3154 (0.295)	1.6358*** (0.520)	-0.3154 (0.196)	-0.3570* (0.195)
Pop. share age 25+ w/ B.A.		0.2613* (0.147)	0.4167*** (0.145)	0.2613 (0.161)	0.3526** (0.146)
Fraction homes owner occupied		0.3728*** (0.084)	-0.3474*** (0.130)	0.3728*** (0.065)	0.3941*** (0.060)
Real housing cost index		0.0003*** (0.000)	0.0004*** (0.000)	0.0003*** (0.000)	0.0003*** (0.000)
Earmarked lottery		-0.0298** (0.012)	0.0990*** (0.012)	-0.0298 (0.020)	-0.0361* (0.020)
Court-ordered reform		0.0697*** (0.009)	0.0714*** (0.010)	0.0697*** (0.006)	0.0737*** (0.005)
Legislative reform		0.0233** (0.009)	0.0511*** (0.012)	0.0233*** (0.008)	0.0297*** (0.007)
	Pooled OLS	Pooled OLS	Fixed Effects	PCSE(1)	PCSE w/ Yr FE(1)
State fiscal balances/expenditures		0.3120*** (0.065)	-0.0190 (0.043)	0.3120*** (0.062)	0.2967*** (0.059)
Constant		5.2119*** (0.495)	-1.1990** (0.545)	5.2119*** (0.534)	5.3552*** (0.365)

Observations	816	816	816	816	816
Pesaran's test (2)			17.16***		
Modified Wald test (3)			805.09***		
χ^2 -test, year fixed effects (p-val.)					0.0000
R-squared	0.2392	0.4067	0.2627(within)	0.4067	0.4432
Adj. R-squared	0.2374	0.3971			

Standard errors in parentheses.

*** indicates significance at 1% level, ** at 5%, * at 10%.

All models include 48 states over 17 years ending 2006. All variables except students and avg. district size are as of the prior calendar year to

- (1) Panel-corrected std. errors, correcting for group-wise heteroskedastic and cross-sectionally dependent errors.
- (2) Pesaran's test is for cross-sectional dependence; H_0 : no contemporaneous correlation.
- (3) Modified Wald test if for groupwise heteroskedasticity; H_0 : $\sigma_i^2 = \sigma^2$ for all i .

Figure 1. State Share of State Plus Local Revenue

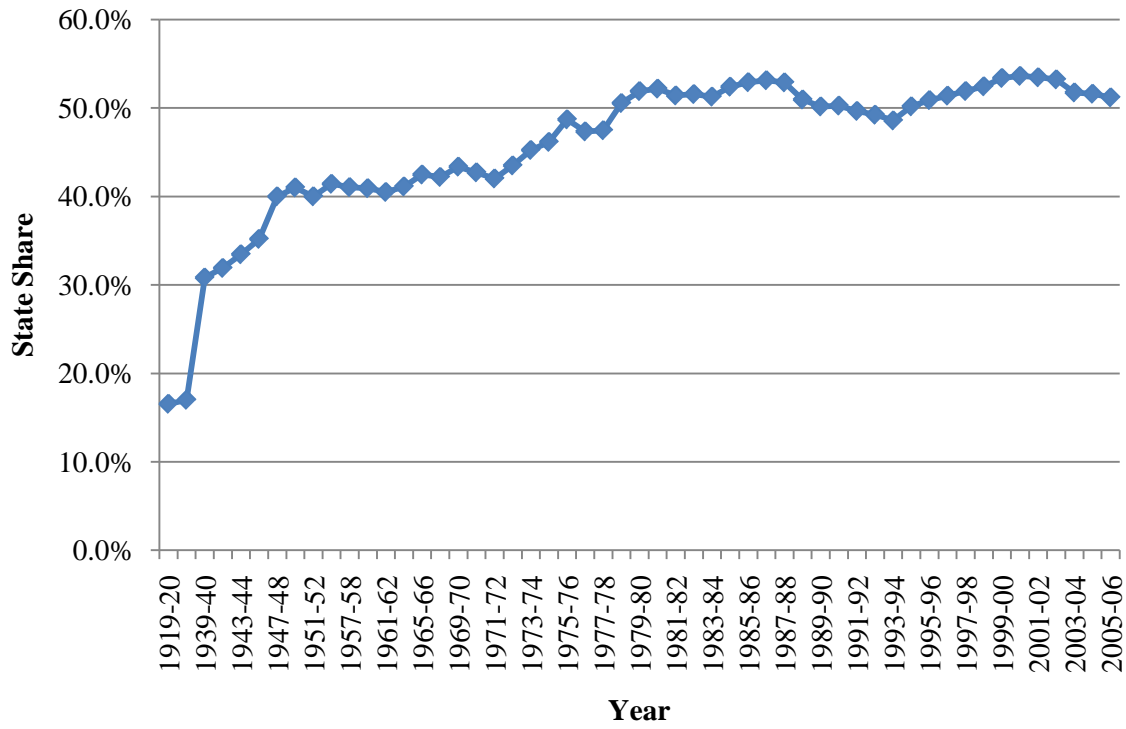


Figure 2. State Share of State plus Local Education Revenues

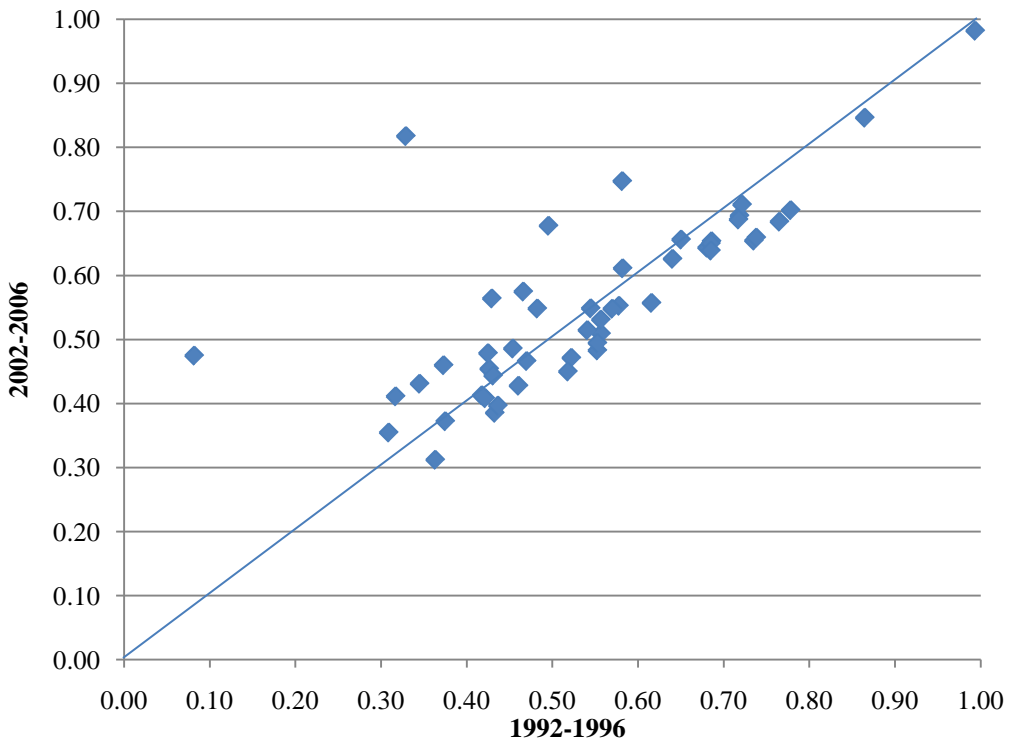


Figure 3. Year Fixed Effects

