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ABSTRACT

Public school finance equalization programs can be characterized by the change they impose on the tax price of an additional dollar of local school spending. I calculate the tax price of spending for each school district in the United States for 1972, 1982, and 1992. I find that using the actual tax prices (rather than treating school finance equalizations as events) resolves apparently conflicting evidence about the effects of equalizations on per-pupil spending. Depending on whether they impose tax prices greater than or less than one, school finance equalizations either "level down" or "level up." Poor districts enjoy increased spending under most equalization schemes, but they actually lose spending under the strongest schemes such as those that exist in California and New Mexico. More importantly, regardless of whether an equalization levels down or up, it should be understood as a tax system on districts' spending. I show that school finance equalization schemes have properties that are generally considered undesirable: they raise revenue on a base that is itself a function of the school finance system and they assign tax prices so that people with a high demand for education are penalized relative to otherwise identical people *with the same income*. I discuss some simple, familiar schemes that do not have these undesirable properties, yet can achieve similar redistribution.

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I. Introduction

When state courts and legislatures decide to equalize spending across school districts, they are usually clear about their goals and the legal issues. For instance, debate about the meaning of the words "adequate education" in a state's constitution can be sophisticated. States are far less clear, however, on how to frame a tax system to implement their goals. Since 1970, most American states have enacted one or more school finance equalization schemes, the distinctive feature of which is redistribution from districts with higher property values per student to districts with lower property values per student. School finance equalization schemes have frequently replaced categorical aid schemes that provided funds to districts with students coming from low income households. Despite all this activity, there is little to suggest that states have learned to calculate the incentives created by equalization schemes or have learned from one another's experiences so as to choose better schemes. Few states appear to have asked themselves whether the incentive properties of school finance equalization schemes are superior or inferior to those of categorical aid. In the last thirty years, no policy that so seriously affects American schools has been changed so significantly with so little understanding of the likely consequences as has school finance.

Courts and legislatures have generally not recognized that school finance equalization (hereafter, SFE) is a tax system that not only redistributes revenue but also contains price incentives and systematic income effects that make school districts change their fundamental revenue-raising and spending decisions. In fact, states usually calibrate their SFE schemes on school districts' initial revenues and spending (no behavioral responses), rather than on the revenue and spending levels that would be districts' predictable responses to the schemes. Behavioral responses can make SFE schemes have the unintended consequence of "shrinking the pie" until greater spending equality is only achieved through leveling down--that is, greater equality along with lower average spending per pupil. In extreme cases, spending can actually fall in school districts that were intended beneficiaries.

The best-known SFE is California's, which was a response to the second Serrano decision (1976).

Its notoriety is due both to its stringency (prohibiting differences in regular per-pupil spending of more than 200 dollars in school districts across the entire state) and to the unprecedented fall in school spending that followed it.[1] California is the classic case of leveling down.[2] However, some have argued that California's decrease in average per-pupil spending is unrelated to its SFE ,[3] and this argument has gained support from recent history in a few other states, such as New Jersey, where SFE is associated with unusually rapid growth in school spending.

In this paper, I show that understanding the tax prices imposed by various SFE schemes reconciles the apparently conflicting evidence on leveling up versus leveling down. Once we recognize that SFE schemes are tax systems for school districts, we can focus on a few key parameters affected by SFE schemes, most notably the tax price of local spending. If an SFE imposes a tax price greater than one on a district, the district has to raise more than one dollar in revenue to spend a dollar, and spending is discouraged. The converse is equally true. Past research and even some continuing research--such as Evans, Murray, and Schwab (1995, 1997), Downes and Shah (1994), Manwaring and Sheffrin (1996), and Card and Paine (1997)--has treated SFEs as events, using a single dummy variable that lumps together schemes that generally raised tax prices far above one, like California's, and schemes that lowered tax prices below one, like New Jersey's. Because this dummy variable methodology lumps schemes with conflicting incentives into the same "treatment group," it naturally produces poor results that do not reflect the actual equalization policies and are non-robust to small differences in specification. The dummy variable methodology is not improved by creating two separate dummy variables –one for those in which the SFE was court-ordered and one for

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[1] Relative to median household income, California's per-pupil spending fell by about 12-15 percent during the 1980s. The estimate varies slightly depending on the specification used to control for other factors.

[2] See Silva and Sonstelie (1994).

[3] The most popular alternative cause of the fall in spending is Proposition 13, a property tax limitation. However, Fischel (1989, 1994) makes a convincing case that the property tax limitation was not independent of the Serrano decision.

those in which the SFE was legislative. California and New Jersey, for instance, both had court-ordered SFEs. I also show below that some states in the "control" group of states that were supposed to have not experienced SFEs actually had larger changes in their tax prices than many states in the "treatment" group. There is a lesson here: because states did not think much about their SFE schemes' incentive properties, the hype that surrounded an SFE was often unrelated to the actual stringency of its tax formulae.

In this paper, I calculate the actual tax price and the systematic income effect that each district faces as a result of school finance laws in 1970, 1980, and 1990. Each SFE is thus fully characterized: all of the variation in schemes among states is appreciated and brought into a common framework and all of the within-state variation in the effect of each scheme can be used. I then use regression analysis to estimate the effect of SFE schemes on the level of per-pupil spending, within-state inequality in per-pupil spending, house prices, property tax rates, private school attendance, and student achievement as measured by the high school drop-out rate. I use two alternative simulated instrumental variables methods to account for the endogeneity of tax prices to the choice of per-pupil spending. The first method uses a prediction of the tax price each district would face if it had remained at its pre-SFE tax rates and property values (properly inflated). The second method characterizes each state's SFE scheme by calculating what its average tax price would be if all U.S. school districts *outside the state* were under the state's scheme. In both methods, the prediction is then used as an instrument for the actual tax price.

The results suggest that, for two reasons, near equality of per-pupil spending cannot be achieved without substantial decreases in the average level of per-pupil spending. First, districts do not react as strongly to "carrots" (tax prices below one) as they react to "sticks" (tax prices above one). Second, near equality of spending only appears to be achievable under schemes that contain extremely strong incentives (I show below that the schemes in California and New Mexico fit this description). However, a scheme with tax prices below one (designed to level up) *cannot* contain such extremely strong incentives. It would be far too expensive, requiring massive annual infusions from the state's general revenues. For both of these reasons, strong "sticks" (schemes with tax prices much greater than one) are needed to achieve near equality of per-pupil spending. But, since such schemes level down, poor districts can actually end up with *lower* per-pupil expenditure under SFE schemes that achieve near equality. I show that poor districts maximize their per-pupil spending under milder SFE schemes than those that exist in California or New Mexico.

The results also show that SFEs that level down increase the share of students who attend private school. This is important for the understanding the long-term consequences of SFE, because parents of students in private school typically support little public school spending despite having a high taste for education.[4] Finally, I find that SFE schemes that level down slightly increase the high school drop-out rate. That is, I implicitly estimate an education production function, using the high school drop-out rate as the measure of student outcomes and the SFE as the exogenous shock to a district's spending.

In the process of studying SFE, I realized that some of its key economic properties have not been appreciated. Since these properties are of general economic interest and, moreover, may make us question whether SFE schemes are desirable at all compared to alternative redistribution mechanisms, I devote a good part of the paper to explaining the properties. The general lesson, however, is easy to state. SFE schemes create redistributive taxes that are raised on a tax base (property) the value of which depends *directly* on the nature of the redistribution. As a result, they cause phenomena that a redistributive tax based on income or consumption (tax bases that depend on redistribution among school districts only very distantly) would not cause. In particular, SFE schemes generally contain feedback mechanisms–whereby the targets of the scheme are functions of districts' responses to the scheme–that create unintended downward or upward spending spirals. Also, SFE schemes make a district's tax price and income loss positive functions of its productivity, thus discouraging productive schools. Finally, SFE schemes can penalize the taste for education, by making families with greater taste for education redistribute to other families with identical

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[4] See Epple and Romano (1996), Glomm and Ravikumar (1994), and Nechyba (1996) for theoretical studies of the effect on public school spending of making private school alternatives relatively more attractive.

incomes but less taste for education.

II. School Finance Schemes

In this section, I describe two prototypical SFE formulas: foundation aid and guaranteed tax revenue/power equalization. The prototypes illustrate the general properties of equalization schemes, but we should keep in mind that every state's school finance formula is different and that the prototypes are *extremely* parred down compared to actual formulas.

Pure Local Property Tax Finance

Although no state's schools are currently financed through pure local property tax finance, it remains the core of most states' systems. Let i index districts, and let e_i be spending per-pupil, v_i be property value per pupil, τ_i be the property tax rate, and r_i be local revenue per pupil. Under pure local property tax finance, the per-pupil budget constraint is given by:

(1) $$e_i = \tau_i v_i \equiv r_i \quad .$$

Under pure local property tax finance, it does not matter whether the property value used above is market value or assessed value, since the local tax rate could be adjusted to account for assessment practices. As soon as states offer aid based on property values, they have to ensure that all districts assess at market value (or, at least, assess similarly relative to market value).[5] For the theoretical part of this paper, it is best to ignore differences in assessed and market values, and simply treat v_i as though it were always market value and treat τ_i as though it were the tax rate on market value.

Categorical Aid as an Add-On to Local Property Tax Finance

Before SFE schemes became popular in the early 1970s, categorical aid was the most common

[5] In fact, states do try to calculate consistent property values for their aid calculations, and their attempts show up in "Equalized Grand Lists" of property values that have been common parts of state aid formulae since early in the 20th century. Such Grand Lists are *not* school finance equalization. They are the necessary prior step that forms appropriate measures of property values so that aid formulae, such as school finance equalization formulae, can proceed.

method of redistributing among school districts. Categorical aid is still used by most states for limited purposes, but has been almost entirely displaced by school finance equalization for major redistribution.

Categorical aid formulas that have two features that distinguish them from SFE. First, categorical aid grants are not based on property values but, instead, are based on one or more socio-demographic characteristics of a school district, such as household income, the poverty rate, the percentage of families with a single parent, the share of households in which English is not the first language, and so on. The basic logic of categorical aid is to give revenue to school districts whose residents are likely to be liquidity constrained or to districts where children are unusually expensive to educate. Second, categorical aid is funded by state income or sales taxes–in fact, any state-level tax that affects the disposable income of individuals (and, thus, indirectly affects their demand for school spending) but does not *directly* enter a school district's budget constraint.[6]

Flat grant categorical aid just requires that the district per-pupil budget constraint be modified as follows:

(2) $$e_i = \breve{\tau}_i \breve{v}_i + CA(X_i) \quad ,$$

where *CA()* stands is the flat grant categorical aid, which is a function of district demographics, X_i. Since individual households' have to pay the income or sales taxes used to fund flat grants, there are breves on τ and v to remind us that households may change their purchases of housing services or their local tax rate because they have to pay income or sales taxes.

Matching grant categorical aid schemes not only use flat grants but also match locally-raised spending. The matching rate is usually a function of district demographics. The district per-pupil budget constraint becomes:

(3) $$e_i = \breve{\tau}_i \breve{v}_i + CA(X_i) + ca(X_i) \cdot \breve{\tau}_i \breve{v}_i \quad ,$$

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[6] Because some states have aid systems that mix categorical aid with school finance equalization, some practitioners jumble all types of redistributive aid together. But, the distinctions that have economic content and should remain clear regardless of the terminology used in certain localities.

where *ca()* is the matching rate. There are tildes on τ and v to remind us that households may change their purchases of housing services or their local tax rate because they have to pay income or sales taxes to fund the flat grants and matching grants.

So long as the vector of demographic variables, X_i, includes only factors that are exogenous to the conduct of a school district (at least in the short-run) and the tax base that funds categorical aid is invariant to an individual district's conduct (for instance, an income or sales tax), either type of categorical aid is a perfectly standard fiscal federalism problem. We expect flat grants to have income effects and matching grants to have both income and substitution effects. We may also expect flypaper effects.

For the remainder of this paper, I discuss categorical aid schemes as though income were the only demographic characteristic on which aid was based. This simplification is merely for convenience and, although income is the most important characteristic in practice, actual schemes can and do use a variety of other measures of ability-to-pay or the cost of educating local children.

Foundation Aid

Foundation Aid is the most common type of equalization scheme. Its name is deceptive because what distinguishes it from other aid schemes is not the fact that it incorporates a floor or "foundation" for spending. Floors for per-pupil spending are commonly found in categorical aid schemes and in the other type of SFE (power equalization/guaranteed tax revenue). Foundation Aid is like flat grant categorical aid *except* that it redistributes among districts based on per-pupil property values, not on the incomes (or other demographic characteristics) of households. The amount of foundation aid a district receives does not depend on the property tax rate it sets. Under a very simple foundation aid system, a district's budget constraint is:

$$e_i = \tau_i v_i + f - \tau^f v_i \quad , \tag{4}$$

where f is the foundation level of spending guaranteed to each district, and τ^f is the state-wide "foundation tax rate" on property that supports the aid system. Foundation aid systems are typically designed to be self-funding, so that the total of foundation taxes paid equals the total of foundation aid dispensed. A fairly typical formulation thus sets τ^f so that:

(5)
$$f = \tau^f \left(\frac{\sum_{i=1}^{N} s_i v_i}{\sum_{i=1}^{N} s_i} \right)$$

where s_i is the number of students in district i.

The stringency of a foundation aid program is greater as the foundation level, f, rises relative to per-pupil spending in the state (making τ^f rise relative to τ). A state that imposes a foundation aid program in which the foundation level is, say, at the 75th percentile of the per-pupil spending distribution is a state in which nearly all property taxes from nearly all districts have to go towards funding the foundation grant. In such a case, only few districts would want to set a τ_i higher than τ^f in order to raise additional local revenue to pay for spending beyond the foundation level. It is, of course, theoretically possible to set τ^f and f so high that no district wants to spend more than the foundation level.

Below, I explain why foundation aid schemes are fundamentally different from , say, categorical aid schemes that attempt to achieve a similar amount of redistribution. This explanation only makes sense after a Tiebout-style model of school spending determination is presented (in the next section).

Power Equalization/Guaranteed Tax Revenue Schemes

Most states that attempt stringent equalization do so through variants of guaranteed tax revenue schemes or power equalization schemes. These two types of schemes are fundamentally similar, so hereafter I use just the name "guaranteed tax revenue," which is more intuitive. Although all schemes of this type share certain key properties, the actual schemes tend to have very complicated and diverse formulas.

Guaranteed tax revenue schemes are like matching grant categorical aid schemes *except* that flat grants and the matching rate are based on property value per pupil. Most of school finance experts, however, do not express the logic of guaranteed tax revenue schemes in this way. Instead, they tend to say that guaranteed tax revenue schemes attempt to make the same tax *rate* τ generate the same revenue for each school district in the state, regardless of the district's own property value per pupil. Most guaranteed tax revenue formulas show this (latter) logic in the way they are written.

Many guaranteed tax revenue schemes provide stronger redistribution among districts that have higher tax *rates*. For instance, the scheme might guarantee average per-pupil revenue in the state (this would be the first guarantee, or g_1) for the first τ^{g1} mils of districts' property tax rates, guarantee per-pupil revenue at the 65 percentile in the state (this would be the second guarantee, or g_2) for the next τ^{g2} mils of districts' property tax rates, and guarantee per-pupil revenue at the 85 percentile in the state (this would be the third guarantee, or g_3) for any remaining mils of the property tax rate. A very simple guaranteed tax revenue scheme with two guarantees might have a budget constraint like:

(6) $$e_i = \min(\tau_i, \tau^{g_1}) \cdot g_1 + \min[\max(0, \tau_i - \tau_x), \tau^{g_2}] \cdot g_2 + \max(0, \tau_i - \tau^{g_1} - \tau^{g_2}) \cdot v_i$$

To prevent districts from opting out of the system altogether (and supporting no local public schools at all), states often impose a spending floor or a minimum tax rate, τ_i. In order to get the maximum amount of aid in the system described by equation (6), a district must both have low per-pupil valuation and high property tax rates.

Most (but not all) guaranteed tax revenue schemes are self-funding, so that tax rates and guarantees are picked to make contributions from districts with high property value per pupil fund all the aid to districts with low property value per pupil and high property tax rates. For instance, if the above system were self funding, the following equation would hold:

(7) $$\sum_{i=1}^{N} \min(\tau_i, \tau^{g_1}) \cdot v_i + \min[\max(0, \tau_i - \tau_x), \tau^{g_2}] \cdot v_i = \sum_{i=1}^{N} \min(\tau_i, \tau^{g_1}) \cdot g_1 + \min[\max(0, \tau_i - \tau_x), \tau^{g_2}] \cdot g_2 \quad .$$

California's school finance equalization formula is a simple and extreme guaranteed tax revenue scheme. It is, in essence:

(8) $$e_i = \min(\tau_i, \tau^{g_1}) \cdot g_1 \qquad where \ \sum_{i=1}^{N} \tau_i \cdot v_i = \sum_{i=1}^{N} \tau \cdot g_1$$

That is, regardless of how much local tax revenue a district raises and what its local tax rate is, it will always get the basic guarantee. California has a minimum tax rate of 10 mils so that districts cannot opt out of local public schools. Since there is no incentive for residents of a district to ever let themselves be taxed at more than the minimum rate and local schools do not benefit directly from increases in local property values, it is not surprising that Proposition 13, which makes 10 mils the maximum tax rate as well as the minimum tax rate and prevents house values from being reassessed for tax purposes so long as they remain under the same owners, was passed in a referendum soon after the Serrano II equalization scheme was put in place. Fischel (1989, 1994) explains the political process by which the Serrano II equalization led to Proposition 13. Thus, for equation (8), $\tau_i^{min}=\tau^{g1}=\tau_i^{max}$. California's formula was not initially self-funding because the state started with a large budget surplus. It has been more or less self-funding, however, in most years of its operation.

New Jersey's recent guaranteed tax revenue formula is very different from California's. An extremely simplified version of it is as follows:

(9) $$e_i=\tau_i v_i+\max\left(1-\frac{v_i}{v^g},0.10\right)\min\left(\tau_i v_i,f^{NJ}\right).$$

The parameter v^g is set at the 85th percentile of per-pupil valuation in the state, and f^{NJ} is usually set to be mean per-pupil spending in the state. For a district with per-pupil valuation that is at least 90 percent of v^g, the above system is not much of a guaranteed tax revenue system. Such a district simply spends its own locally raised revenue ($\tau_i v_i$) plus $0.10f^{NJ}$. But, consider a district that has per-pupil valuation equal to only half of v^g. Such a district spends 1.5 times its own locally raised revenue, up to a maximum of $\tau_i v_i+0.5f^{NJ}$. Note that, as in the basic guaranteed tax revenue system given by equation (6), a district will has to have low per-pupil valuation and high property tax rates to get maximum aid. Since every district receives at least some aid under the New Jersey formula, the scheme is obviously not self-funding. It requires substantial state revenues from income and sales taxes.

III. Some Useful Results from the Tiebout Literature with Local Property Tax Finance

Tiebout determination of school spending comes from households maximizing their utility by moving among different houses and among different districts, and voting on tax rates in the district where they reside.

In conventional Tiebout equilibrium, each district is subject to a district budget constraint given by local property tax finance: $e_i = \tau_i v_i$. See Epple and Platt (1997) for an exposition of Tiebout equilibrium with local property tax finance and households that differ both in income and tastes for education.

In order to understand school finance equalization, we need a few results from the Tiebout literature. First, in Tiebout equilibrium with local property tax finance, productivity differences between school districts are capitalized in house prices. If a district has a reputation for consistently being better run and using its money more efficiently than neighboring districts, households will be willing to pay more for houses in the district because the tax burden on homeowners will be small for any given level of school quality.

Second, in Tiebout equilibrium with local property tax finance, households' maximizing their utility is equivalent to households maximizing their property values. That is, households actually maximize their utility, but their actions are identical to those they would pursue if they were attempting to maximize their property values. If binding constraints are put on the property tax rates they can set or on the property values they can tax, their property values will end up being lower.[7] This is simply a matter of comparing a constrained with an unconstrained maximum. Another way to think of this result is based on recognizing that property plays two roles in a Tiebout market. Property provides people with housing and land services, but is it also the "ticket" whereby they can attach themselves to a specific school district and enjoy a specific local goods equilibrium. If we eliminate all or part of the specificity of the "ticket," we eliminate some of the usefulness, and thus, value of property. In short, property values are partly a function of the *freedom* a households have to set spending and property taxes as they prefer.

Third, districts that contain assets that convey fiscal externalities on residents tend to attract households with high taste for education (that is, households that want to spend above-average shares of their incomes on schooling). To see this result, consider a district that contains business or other property that

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[7] These results have been demonstrated by a number of authors. See Vigdor (1998) for a good survey and an application to property tax limitations.

forms a share of the property tax base far out of proportion to the local services it consumes (ski resorts are an extreme example). Households are willing to more for a house in the district because the tax burden on homeowners is small for any given level of local spending. This is the capitalization response. But, more importantly, the district attracts households whose taste for education is high because the absolute size of the fiscal externality is increasing in the tax rate. As a result, districts that contain households whose taste for education is high *systemically* have capitalization forming a large share of house prices, so that entire districts can be filled with residents all whom have a high taste for education and all of whose house prices contain a relatively large amount of capitalization.

So far, I have been describing the asset that conveys the fiscal externality as tangible property, but the asset could equally be something intangible but persistent, like a reputation for spending each tax dollar more productively. That is, school productivity is not only capitalized, but school districts with high productivity attract households whose taste for education is high.

It is worth noting that empirical evidence suggests that households with an unusually high demand for school spending relative to their incomes live in districts that have property prices that are unusually high given the properties' characteristics and tax rates that are above-average, but not dramatically so.[8]

In short, property values in a district reflect not just housing services, but (1) the productivity of schools, (2) households' taste for education, and (3) the degree to which state law constrains households from exercising their most preferred level of school spending and taxes. (State law can also make households less constrained, as I emphasize below.) Of course, we do not observe the division of each property price into the part that is payment for housing and land services and the part that reflects the local public goods equilibrium. Thus, the variable v_i in school finance formulae is impure--it means different things in different districts. It is convenient to write v_i as the sum $v_i = v_i^* + v_i^{**}(\alpha_i, \beta_i, \tau_i, e_i)$, where v_i^* is the asset price of housing

[8] See Vigdor (1998) for a review of this evidence. Very high tax rates are typically a feature of school districts "in a tailspin," where schools are relatively expensive but poor in quality so that high demand residents are being systemically driven out and house prices are falling.

and land services and v_i^{**} is the part of the price that depends on the association of the land with the particular school district i. v^{**} depends on tastes (α_i) and productivity (β_i). v depends on the tax rate τ_i under conventional Tiebout equilibrium, but I enter spending (e_i) separately in the v^{**} function since state laws can break the equality between $\tau_i v_i$ and e_i.

IV. How School Finance Equalization Schemes Affect School Spending

The results just described are for Tiebout equilibria in which district budget constraints are given by local property tax finance: $e_i = \tau_i v_i$. SFE schemes change the equilibria by changing the budget constraints –for instance, to the foundation aid budget constraint given by equations (4) and (5) or to the guaranteed tax revenue budget constraint given by equations (6) and (7).

Of course, categorical aid schemes also change district budget constraints. What makes categorical aid and SFE schemes similar is that they tax districts on some measure of ability-to-pay (usually income in the case of categorical aid, v^* in the case of SFE). These taxes cause the usual distortions: income taxes distort income-related decisions like labor supply; property taxes distort decisions about purchases of housing and land services. What makes SFE schemes peculiar is they do not just tax a measure of ability-to-pay. They also tax v^{**}, which is a function of taste for education, school productivity, and actual levels of school spending. We will see that this feature of SFE schemes has peculiar effects.

State aid affect district budget constraints through two means: the tax price a district faces and the lump sum amount of tax revenue that a district gives to, or gets from, the state. When we want to determine whether an SFE scheme levels up or down, it is intellectually very useful to break the problem into parts.

(i) Relative to the scheme previously in place, does the SFE scheme contain lump-sum transfers among districts? If so,

 (a) what would the effect of the SFE scheme be if it were, instead, a flat grant categorical scheme with the same redistributive goals?

(b) what are the differences that exist because the scheme is an SFE scheme and not a flat grant categorical aid scheme with the same redistributive goals?

(ii) Relative to the scheme previously in place, does the SFE scheme affect tax prices? If so,

(a) what would the effect of the SFE scheme be if it were, instead, a matching grant categorical scheme with the same redistributive goals?

(b) what are the differences that exist because the scheme is an SFE scheme and not a matching grant categorical aid scheme with the same redistributive goals?

Under local property tax finance, a district must raise one dollar of revenue to spend one dollar. That is, the tax price is one. Local property tax finance provides for no lump sum revenue transfers among districts. Flat grant categorical aid schemes set the tax price equal to one and create lump sum transfers that depend on factors that reflect residents' ability-to-pay (but not on their education tastes *per se* or their actual spending choices). Matching grant categorical aid schemes create similar lump-sum transfers but also make tax prices depend on factors that reflect residents' ability-to-pay (but not on their education tastes *per se* or their actual spending choices).

Theoretical predictions about whether categorical aid schemes level up or down compared to local property tax finance are ambiguous. Whether the outcome is leveling up or leveling down depends on the relative shape of preferences for education in districts that contain poor people and districts that contain poor people. If rich and poor people have identical preference maps for education versus other goods, and if education is a normal good, then categorical aid will tend to level up. At the other extreme, even matching grant categorical aid schemes that lower tax prices for poor people can level down if rich people have much higher tastes for education than poor people. Fernandez and Rogerson (1998) analyze several categorical schemes, and they calibrate their theoretical analyses. (They claim to analyze SFE schemes, but since the schemes they consider are based on income and income taxes and have nothing to do with property values or property taxes, they actually analyze categorical aid schemes.)

Foundation Aid Schemes

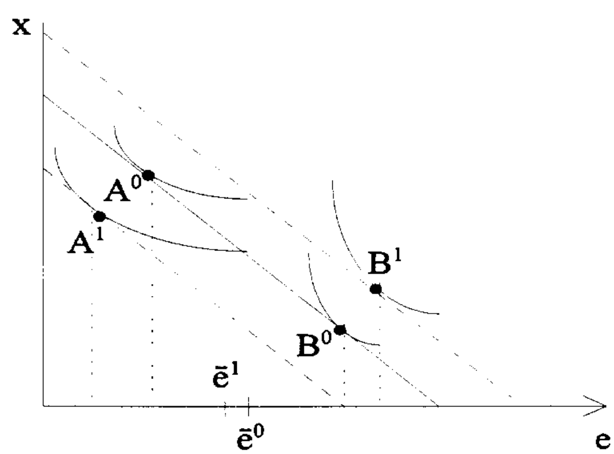
Under a foundation aid system, the tax price is one, just as under local finance and flat grant categorical aid. Foundation aid creates lump sum transfers that depend on districts' property value per pupil:

(12)
$$f - \tau^f v_i^{*} - \tau^f v_i^{**}(\alpha_i, \beta_i, \tau_i, e_i) \quad .$$

The middle term of (12) is a just tax on housing and land service wealth, but the right-hand term of (12) is a tax on education tastes and school productivity.

Let us compare foundation aid to flat grant categorical aid that attempts to achieve similar redistribution. This comparison not only clarifies the economic issues (because it holds the redistributive goals constant), it is also a practical comparison. As an historical matter, Foundation Aid schemes generally replaced categorical aid schemes. Districts that receive money under foundation aid that would *not* have received money under categorical aid are districts in which households prefer to spend an unusually small share of their incomes on schools. Districts that lose money under foundation aid that would *not* have lost money under categorical aid are districts in which households prefer to spend an unusually large share of their incomes on schools. Thus, average school spending under a foundation aid scheme will be lower than under similarly redistributive categorical aid. Because foundation aid generates income effects that are *systemically* related to households' taste for education, it creates leveling-down compared to categorical aid.[9]

[9] This is a fairly obvious point, but the figure may help. Suppose there are two districts, A and B, of equal size
that contain households whose incomes are identical but whose tastes for education are different. Either local public finance or flat grant categorical aid would make the districts spend at points A^0 and B^0 on the figure. Average education spending in society would be $\bar{e}^0$. The new budget constraints under foundation aid are given by the dotted lines. The districts now spend at points A^1 and B^1. Average education spending has fallen from $\bar{e}^0$ to $\bar{e}^1$.



Another difference between categorical aid and foundation aid is that capitalization will eventually un-do much of the redistribution in a foundation aid scheme. This is because the foundation aid scheme itself can be capitalized (in part, at least) by property prices. House prices will fall in districts that must routinely make net revenue transfers to other districts. Conversely, house prices will rise in districts that routinely receive net revenue transfers from other districts. The tax base for categorical aid (income or sales) is at the same level (the state) as the redistribution so that the tax is effectively a sunk cost for households choosing among houses within the state. In contrast, the tax base for foundation aid depends on exactly how much one house is preferred to another house *within the state* and, since many households are on the margin of choosing among houses within a state while retaining the same job, the intra-state distribution of house prices will take the redistribution scheme into account.

I measure the stringency of a foundation aid system by the share of the revenue from a marginal dollar of property value that a local district gets to keep:

(13) $$\frac{\tau_i - \tau^f}{\tau_i} \ .$$

To remind us capitalization and not just housing and land service wealth is taxed, I call this measure SORCALE, the share of revenue from capitalization available for local expenditure.

Guaranteed Tax Revenue/Power Equalization Schemes

Like foundation aid schemes, guaranteed tax revenue schemes systemically transfer revenues from districts with high capitalization to districts with low capitalization. But, in addition to this systematic income effect, guaranteed tax revenue schemes directly change the tax price for local school expenditure that each district faces. This is because guaranteed tax revenue schemes make the amount of local revenue that a district has to raise in order to have a dollar of local expenditure into a positive function of the district's per-pupil valuation.[10] Depending on the details of the scheme, this function may also be quasi-convex or

[10] Strictly speaking, a non-negative function.

quasi-concave in τ_i. The guaranteed tax revenue scheme given by equation (6), for instance, produces the following tax prices:

$$(14)\qquad \frac{\partial \tau_i \cdot v_i}{\partial \tau_i \cdot g_1} = \frac{v_i}{g_1}\ \ for\ \tau_i \leq \tau^{g_1}\ , \qquad \frac{\partial \tau_i \cdot v_i}{\partial \tau_i \cdot g_2} = \frac{v_i}{g_2}\ \ for\ \tau^{g_1} < \tau_i \leq \tau^{g_2}\ , \qquad 1\ \ for\ \tau_i > \tau^{g_2}\ .$$

As we will see in the next two sections, the tax prices actually produced by different states' guaranteed tax revenue formulae vary greatly. Here, let us examine just two extreme cases. California's guaranteed tax revenue scheme produces tax prices that are approximately infinite for every district since the only way that a district could increase its local expenditure by raising more revenue would be through the self-funding constraint. The typical district in California would see less than a 0.001 dollar increase in its per-pupil expenditure if it raised an extra dollar of revenue per pupil. Even the district with the most pupils in California (Los Angeles Unified) would see only a 0.14 dollar increase in per-pupil expenditure by raising an extra dollar of revenue per pupil.

Given the extreme incentives contained in California's scheme, we expect rather dramatic lowering of property tax rates (to the state's minimum level), no further capitalization of education tastes in house prices, large decreases in certain house prices due to the large penalties on capitalized tastes, capitalized productivity, and binding constraints how high local spending can be. We also expect feedback effects through the self-funding constraint. In fact, the two predictions not only came true, but came true almost immediately because voters reacted by passing Proposition 13.

New Jersey, on the other hand, has tax prices less than or equal to one *for every district*. Under the New Jersey formula given by equation (9), a district with per-pupil valuation above 90 percent of the 85th percentile in the state faces a tax price equal to one. A district with per-pupil valuation below this cut-off (and sufficiently low per-pupil spending) has a tax price given by:

$$(15)\qquad \frac{\partial \tau_i \cdot v_i}{\partial \tau_i \cdot v_i \cdot \left(2 - \frac{v_i}{v^g}\right)} = \frac{1}{2 - \frac{v_i}{v^g}}\ \ if\ \tau_i v_i < f^{NJ}\ .$$

There are intermediate possibilities as well: for districts below the cut-off, the tax price depends on their tax *rate* as well as their per-pupil valuation. Also, note that New Jersey has ample room for feedback effects since f^{NJ} is set by mean per-pupil spending in the state. Thus, if every district spends more under this scheme, as is possible under a scheme where every tax price is less than or equal to one, the target level of spending will rise –causing the targets to rise and encourage yet further spending.

It is useful to compare guaranteed tax revenue schemes to matching grant categorical aid schemes that attempt to achieve a similar amount of redistribution. As a rule, if a district gets a larger lump-sum transfer and has its tax price lowered more under a guaranteed tax revenue scheme than under a matching grant categorical aid scheme, it is a district in which households prefer to spend an unusually small share of their incomes on schools. If a district gets a smaller lump-sum transfer and has its tax price raised more under a guaranteed tax revenue scheme than under a matching grant categorical aid scheme, it is a district in which households prefer to spend an unusually large share of their incomes on schools. Compared to matching grant categorical aid schemes that attempt to achieve a similar amount of redistribution and are similarly self-funding (that is, receive similar infusions of revenue from general state funds), guaranteed tax revenue schemes always level down.

Most guaranteed tax revenue systems replaced either flat grant categorical aid or foundation aid schemes. Thus, whether they level down or up is a problem that should be broken into two parts. First, the guaranteed tax revenue schemes always levels down compared to the matching grant categorical aid scheme with similar redistributive goals that could have been imposed. Second, the matching grant categorical aid scheme that could have been imposed would have leveled up or down depending on its tax prices and SORCALES (relative to those of the previous system) and on the shape of educational preferences. We expect households to spend less on schooling than previously if they face higher tax prices and lower incomes as the result of the notional matching grant scheme. We expect households to spend more than previously if they face lower tax prices and higher incomes. The overall impact on school spending in a state depends not only on how many households of each type the formula creates but also household preferences--that is, on how elastically each type of household responds to the price and income changes. In a system like California's, the overall impact will obviously be negative *if the self-funding constraint binds* because *every* household faces a nearly infinite tax price. In New Jersey, the overall impact is likely to be positive because some districts face much lower tax prices and no district faces a higher tax price. We cannot be certain of the overall impact in New Jersey, however, because the system is not self-funding and households will spend less on everything–including schools–because they have to pay additional income and sales taxes. In most states, only empirical estimation can give us a sense of how the formula works.[11]

Thus, I attempt to test whether that districts that face increases in tax prices and decreases in their SORCALEs lower their spending and *vice versa*. I allow districts with different initial conditions (for instance, low versus high property value per pupil) to respond differently to the same change in tax price, and I attempt to show what combinations of tax prices and SORCALEs are likely to generate overall negative or overall positive effects on school spending. I expect systems that have both tax prices and SORCALEs very different from one to have the greatest effects on average spending. Empirical estimation of feedback effects would be so difficult that I do not attempt it.

V. Data and the Calculation of Tax Prices

Estimating the effects of SFEs requires school district data on expenditure, enrollment, property valuation (market valuation), property taxes, and characteristics of the population such as income, education,

[11] Since school finance equalization schemes change the budget constraints that school districts face, the natural way to proceed using theory would be to substitute the new budget constraints into a general equilibrium problem à la Epple and Platt (1997). This procedure would be nearly impossible to carry out with any generality because of the way in which tax prices depend on tastes. It would certainly be impossible to deal with complicated guaranteed tax revenue systems because they have tax price corners and strong feedback effects. It might be feasible to proceed à la Nechyba (1996) and simulate the effects of various schemes with computable general equilibrium techniques applied to a toy metropolitan area, whose initial characteristics were calibrated to those of some real U.S. metropolitan area.

and ethnicity. It also requires *detailed* information about each state's laws regarding public school finance.

Data

I derive the data from two principal sources, the Census of Governments and the Census of Population and Housing school district summary files. I use Census of Governments data from 1972, 1982, and 1992 matched district-by-district to Census of Population and Housing data from 1970, 1980, and 1990. Since both censuses are universal, data on nearly every district in the U.S. can be used and I end up with a panel of 14,700 districts spanning the 1970-90 period.

The key points about the selection of districts and variables are as follows. Districts that consolidate are kept in the sample if the component districts can be successfully identified in previous censuses and "pre-consolidated." A district is dropped if its composition changes such that it cannot be matched from one year to another or if a tax price cannot be calculated for a "pre-consolidated" district because the component districts faced different tax prices.

The U.S. Bureau of the Census provides a mapping from school district boundaries to census block groups and tracts. Demographic characteristics and property values are then summarized for each school district. There are published district summaries for 1980 (Summary Tape File 3f) and 1990 (the School District Data Book), but I created the district summaries for 1970 from Census block group and tract data.

I use property values from the Census for types of property taxed to support local public schools.[12] I use property tax revenue for the support of local public schools from the Census of Governments. The ratio of the property tax revenue to property market valuation generates my measure of the property tax rate. For calculating the tax prices, I take account of differences between assessed and market values that affect the formulas. Most formulas are written, however, starting from variables that are as close to market values as possible. This is because states want to eliminate districts' ability to get more aid simply by fiddling with their assessment. Current expenditure per pupil from the Census of Governments is the measure of per-pupil

[12] Minor types of property, such as motor vehicle property, are omitted even though they are sometimes taxed.

spending.

Calculation of Tax Prices

I derived basic information on states' laws regarding public school finance, especially state aid, from the series *Public School Finance Programs of the United States*. The editions that cover the 1970-71, 1978-79, and 1987-88 school years were used, as these are the editions that both precede and most closely match the Census of Governments years. It is necessary that the laws precede the finance data by long enough to have had an effect.[13] In states with simple school finance equalization formulas, the series *Public School Finance Programs* sometimes provided enough information to write down the formula accurately. In most cases, the series provided basic information and citations of the key pieces of legislation, which had to be sought out to get enough the detail needed to write the formula. This was particularly true for guaranteed tax revenue and stringent foundation aid formulas, which contain numerous rates, schedules, and even multiple calculations of aid for each district (so that a district might take the minimum, maximum, or average calculation). It is particularly important to take account of "hold harmless" clauses that exempt districts from participating in state aid if they would receive negative aid. Because they are "outside" the formula, such districts can end up with SORCALEs and tax prices of one –just as though they were in states with pure local finance. Writing each formula was onerous, but it should be noted that many parts of states' school finance laws did not need to be embodied in the formulas for this paper. Only some of each state's laws were relevant: for instance, aid for transportation expenses is usually not a function of per-pupil valuation.

Armed with formulas for SORCALE and the tax price as functions of τ_i, v_i, and other district-level and state-level variables for each state and year, I plugged each district's data into the formulas to get actual tax prices and SORCALEs.

[13] I have investigated the effects of including indicators for how long a law has been in effect. These results are available from the author.

VI. School Finance Equalization Facts and Why Dummy Variables Do Not Work

Table 1 shows school finance equalizations that occurred from 1970 to 1988 and the tax prices they imposed. In this and all the empirical work that follows, I invert the tax price. The inverted tax price is the increase in local expenditure that is associated with raising one dollar of local revenue. The inversion is convenient because there are some tax prices that are approximately infinite (California), and it is easier to work with an inverted tax price of zero than with an infinite tax price.

The first column of Table 1 is borrowed from Downes and Shah (1994). They organize states by whether they had a court-ordered, legislative, or no school finance equalization. The date of the equalization follows each state's name. A similar categorization is used by Evans, Murray, and Schwab (1995, 1997) and Manwaring and Sheffrin (1997).

The remainder of the table shows actual tax prices and SORCALE calculations before and after the equalizations. For most states, different districts faced very different tax prices and SORCALEs, so the minimum and maximum are shown. If most of the after-reform tax prices and SORCALEs are below one, the equalization scheme discourages spending overall. If most of the after-reform numbers are above one, the scheme encourages spending overall. An equalization is more stringent if its tax prices and SORCALEs are further away from one and go in the same direction.

For most states, the minimums and maximums shown in Table 1 do not adequately describe the incentives imposed by the equalization scheme: the entire distributions of tax prices and SORCALEs are needed. This fact is, of course, the motivation for the econometric evidence in the next section. Nevertheless, Table 1 demonstrates some key points. First, the categorization into court-ordered, legislative, and "no equalization" does *not* accurately reflect the incentives imposed. Within the "court-ordered" category, for instance, there are states that strongly discourage spending (California, Utah, Wyoming), states that strongly encourage spending (Connecticut, New Jersey), and states that neither strongly encourage nor discourage spending (Kansas, Kentucky, West Virginia). The same is true for the "legislative" and "no equalization" categories. The legislative category contains one of the most anti-spending equalizations (New Mexico) and one of the most pro-spending (Rhode Island). The "no equalization" category not only contains a fair amount of actual equalization activity, it also contains two of the most pro-spending equalizations (New York, Pennsylvania).

Table 1 also shows that some equalizations that have met with great fanfare (for instance, West Virginia) have been less dramatic than some that met with little (for instance, Delaware). The fame of an equalization appears to be a function not of its stringency, but of the drama surrounding the court decision or legislation. Some states' "routine" changes to their school finance laws have actually been stringent equalizations.[14] This is especially clear in the "no equalization" group, which is therefore not a good "control" group for the "treatment" group of states.

Table 1 clearly demonstrates that a methodology that assigns a dummy variable to a state if it had an equalization will do a very poor job of representing the real economic content of the school finance program. A methodology that assigns different dummy variables to states based on whether the equalization was court-order or legislative will do no better. This suggests that the results of empirical studies based on dummy variable methodology, such as Evans, Murray, and Schwab (1995, 1997), are unlikely to reveal the true effects of equalization and are likely to be sensitive to specification choice.

Based on the tax prices shown in Table 1, a number of states can be unambiguously described as anti-spending or pro-spending. For instance, define a state as "very anti-spending" if the inverted tax price is less than one for all districts and the maximum SORCALE is less than 0.3. Define a state as "anti-spending" if the inverted tax price is exactly equal to a dollar and the maximum SORCALE is less than 0.3. Define a state as "pro-spending" if the inverted tax price is greater than 1 for at least some districts and the minimum SORCALE is 0.6. According to these definitions, there are two states that are "very anti-spending"

[14] In my examination of school finance laws, I found that states adjust their formulae regularly. Even apparently innocuous adjustments (such as a change in the foundation tax rate) can significantly affect the anti-spending or pro-spending tendency of its laws.

after equalization: California (1978) and New Mexico (1974). Six states are "anti-spending" after equalization: Utah (mid-1970s), Wyoming (1983), Minnesota (1973), Delaware (early-1980s), Virginia (1975), and Maryland (1987). Five states are "pro-spending" after equalization: New Jersey (1976), Connecticut (1978), Rhode Island (1985), New York (early-1980s), and Pennsylvania (mid-1970s).

It is *essential* to understand that states not included in the above three categories do not necessarily have neutral regimes simply because their schemes are too complex to be put into the above categorization. For this reason, it would be unsound to use this categorization to form dummy variables for regression analysis in which the fifty states were included. However, we may learn something by comparing the paths of spending from 1970 to 1990 in just the three groups of states. Figures 3a through 5e show the comparison using residual per-pupil spending, where the residual is from a linear regression of real per-pupil spending on real household income, year effects, and state effects.[15] The differences in residual spending trends are obvious. The two "very anti-spending" states show sharply decreasing residual spending after their equalizations. The "anti-spending" states also show decreasing spending after their equalizations, with the exception of Wyoming.[16] In contrast, the "pro-spending" states show increasing residual spending after their equalizations.

VII. Econometric Evidence

In this section, I attempt to learn how school finance equalizations affect the level of per-pupil spending, inequality in per-pupil spending within states, private school attendance, and student outcomes as

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[15] The equation is:

$$e_{jt}=\beta_0+\beta_1 hhinc_{jt}+\beta_2 1980_t+\beta_3 1990_t+\beta_4 Alabama_j+...+\beta_{49} Wisconsin_j+\epsilon_{jt}$$

where j indexes states, t indexes time (1970, 1980, 1990), e is real per-pupil spending, $hhinc_{jt}$ is real median household income, 1980_t and 1990_t are indicator variables for years, and $Alabama_j$ (*et cetera*) are indicator variables for states. The residuals shown in Figures 3-6 are the estimated values of ϵ_{jt}.

[16] Wyoming's exception case may be due to a substantial rise in property values during the 1980s that was not associated with rising median household income of full-year residents. This may be due to ski property and second homes.

measured by the high school drop-out rate. I examine whether per-pupil spending responds to equalization through changing tax rates, changing property prices, or both. I estimate the different effects of school finance equalization programs on per-pupil spending in "poor" and "rich" districts in order to determine whether "poor" districts are actually better off under stringent equalization that have a potential for leveling-down.

As discussed above, theory can not give us predictions about the effects of equalizations that are precise enough for us to say that a particular empirical specification is "indicated" by theory. The data, which are only available at ten year intervals, do not permit rich dynamics. My basic specification is therefore a simple linear equation that has each district's log of per-pupil spending as the dependent variable and its tax price, SORCALE, and demographic characteristics as the independent variables. The demographics are included because they are determinants of the underlying demand for school spending. I include year effects to control for factors that influence per-pupil spending across all school districts in a given year. These include federal aid, long-term trends in education spending, and the growth rate of the national economy. I also include district-specific fixed effects, which control for variables that are relatively fixed over time within a district, such as taste for education, school organization, factors that affect the local cost of schooling, some demographic characteristics, and some forms of categorical aid. Of course, the district-specific effects subsume state fixed effects.

The basic estimating equation is:

$$ln(e_{ijt}) = \alpha_1 ITP_{ijt} + \alpha_2 SORCALE_{ijt} + \alpha_3 (ITP_{ijt} \cdot SORCALE_{ijt}) + \boldsymbol{X}_{ijt}\alpha_4 + \boldsymbol{YR}_t \alpha_5 + \boldsymbol{D}_i \alpha_6 + \epsilon_{jt} + \epsilon_{ijt} \quad (15)$$

ITP is the inverted tax price for district i in state j in year t. $\boldsymbol{X}_{ijt}$ is a vector of school district-specific demographic characteristics, $\boldsymbol{YR}_t$ is a vector of year indicator variables, and $\boldsymbol{D}_i$ is a vector of district indicator variables. The interaction between *ITP* and SORCALE is meant to pick up stringent guaranteed tax revenue systems, which, because they do not allow households to exercise high taste for education through any channel without large penalties, are most durable (they cannot be capitalized away as foundation aid can) and have the greatest potential for feedback effects. ϵ_{jt} is a state-year random effect, and ϵ_{ijt} is a district-state-year random effect.[17]

I initially estimate equation (15) by ordinary least squares, but this is not strictly correct because the tax prices and SORCALEs we observe are partly functions of school districts' responses to the equalization schemes under which they function. For instance, if property values fall in high-demand districts after an equalization, the new (lower) property values are incorporated in observed tax prices. I use two alternative instrumental variables methods to remedy this problem, both sometimes called "simulated instruments methods." Both attempt to recover the tax prices imposed by the state's equalization scheme, eliminating any behavioral responses by the districts. First, I instrument for the actual tax price and with the tax price the district would have based on its pre-equalization characteristics (inflated by a national price index). Second, I take the national sample of school districts, calculate the tax price each district would face *if it were under each state's formula*, and average the tax prices *for each state's formula* over all districts not actually within the state. The resulting average tax price is then used as an instrument for actual tax prices.

Table 2 shows the results of estimating equation (15) by ordinary least squares. I focus on the results in the second column, which have year and district effects. If SORCALE falls from 1.00 to 0.50 (a substantial but not uncommon fall, as shown by Table 1), there is an associated fall in per-pupil spending of 1.4 percent. If the inverted tax price falls from 1.00 to 0.50 (half of what was experienced by California and New Mexico), there is an associated fall in per-pupil spending of 4.5 percent. Conversely, if the tax benefit with respect to the tax rate rises from 1.00 to 1.5 (Connecticut and New Jersey), per-pupil spending rises by 4.5 percent. There is an additional effect if both SORCALE and the inverted tax price change. If the interaction between SORCALE and the inverted tax price falls from 1.00 to 0.50, there is a additional decrease in of 3.8 percent. Summing up over all these coefficients, California is estimated to have spending

[17] Since some school finance formulae make ITP and SORCALE vary only at the state-year level, it is necessary to have a state-year random effect in order to calculate the correct standard errors. See Moulton (1986).

that is 19 percent lower and New Jersey to have spending that is 5.5 percent higher than they would have if their tax prices and SORCALEs were equal to one.

In Table 3, I show both methods of accounting for the endogeneity of the tax prices. Column I contains the results of instrumenting with the tax price predicted for each district using the district's pre-equalization characteristics. Column II contains the results of instrumenting with the average tax price for each state calculated by applying the state's formulae to every district in the United States except the districts actually in the state.. I focus on the results in Column I, but the results in the two columns are actually quite similar. If SORCALE falls from 1.00 to 0.50, per-pupil spending falls by 0.6 percent. If the inverted tax price falls from 1.00 to 0.50, per-pupil spending falls by 1.5 percent. Of course, if the tax benefit with respect to the tax rate rises from 1.00 to 1.5 (Connecticut and New Jersey), per-pupil spending rises by 1.5 percent. If the interaction between SORCALE and the inverted tax price falls from 1.00 to 0.50, there is an additional fall in per-pupil spending of 2.0 percent. Summing up over all these coefficients, California is estimated to have spending that is 8.5 percent lower than it would be if its SORCALE and inverted tax price were equal to one. New Jersey is estimated to have spending that is 4.1 percent higher.

In general, the estimated effects when we do account for endogeneity are smaller than those we get when we treat the tax prices as exogenous. This is what we expect if school districts respond rationally to the incentives created by the equalization formulae. The changes in the tax prices that are used in Table 2 underestimate the true changes because districts' responses minimize the tax price they face. Since the regressors' variance understates the true variance, the effects on spending for a given change in the tax price are overestimated.

In Table 4, I decompose the log of per-pupil spending (the dependent variable of the previous tables) into the log of per-pupil market valuation and the log of the property tax rate. The intent is to see whether per-pupil spending reacts to equalization through market valuation per pupil or the tax rate or both. The answer appears to be "both." I again focus on the results from the instrumental variables method using the pre-equalization characteristics of districts. Per-pupil market valuation falls by 6.4 percent if SORCALE falls from 1.00 to 0.50. This is a substantial decrease in property values and reflects the importance of capitalized school value in property prices. If the inverted tax price falls from 1.00 to 0.50, per-pupil valuation *increases* by 0.8 percent. This is probably because--in the long term--there is some substitution between expressing demand by means of capitalization and by means of higher tax rates. If the interaction between SORCALE and the inverted tax price falls from 1.00 to 0.50, per-pupil valuation falls by an additional 3.0 percent.

Looking now at column IV of Table 4, we see results that show something of a mirror image. The property tax rate is depressed by a low inverted tax price and is raised a small, statistically insignificant, amount by a low SORCALE. If both the inverted tax price and SORCALE fall, the property tax rate is additionally depressed. Summing up Table 4, it is important for policy-makers to observe that *both* components of per-pupil spending (property values and tax rates) react to school finance equalizations. To the extent that past analysts have considered *any* reaction to equalization in their calculations, they have only considered tax rate responses. If we take into account only the reaction of tax rates to equalization formulae, we understate the effects on per-pupil spending.

Table 5 uses three measures of the inequality of per-pupil spending to show the effect of tax prices on the inequality of spending among districts within a state. I chose these three measures for comparability with past research, especially Evans, Murray, and Schwab (1995, 1997). The three measures all have the desirable property that a dollar moved from a district with higher per-pupil spending to one with lower per-pupil spending always lowers inequality. The first measure is the standardized Theil Index. The unstandardized Theil Index is

$$(10) \qquad T_j = \frac{\sum_{i=1}^{N_j} s_{ij} pps_{ij} \ln\left(\frac{pps_{ij}}{\bar{X}_j}\right)}{\sum_{i=1}^{N_j} s_{ij}} \qquad where \quad \bar{X}_j = \frac{\sum_{i=1}^{N_j} s_{ij} pps_{ij}}{\sum_{i=1}^{N_j} s_{ij}}$$

which varies from 0 (equality) to the natural log of state enrollment (one district has all state spending). The standardized Theil Index divides by the natural log of state enrollment. The second measure is the coefficient of variation: the enrollment weighted standard deviation of per-pupil spending divided by the enrollment weighted mean of per-pupil spending. The third measure is the log of the ratio of per-pupil spending at the 95th percentile to per-pupil spending at the 5th percentile as a measure of inequality. This has the desirable property that it is relatively insensitive to outliers compared to the Theil Index and coefficient of variation.

Table 5 shows the results of regressing the three measures of inequality on the tax prices, year effects, state effects, and measures of states' demographic heterogeneity. These regressions are at the state level since the inequality measures are defined at that level. I account for endogeneity of the tax price using the simulated instruments based on the states' regime (between-state variation). Differences that make the tax benefit greater than one are separated from those that make the tax benefit less than one. In other words, the "carrot" and the "stick" methods of forcing school districts' spending to converge are not restricted to be equally effective.

Table 5 primarily shows that the effects of school finance equalizations on spending inequality are generally insignificantly different from zero at conventional levels. This is mainly because the point estimates are small, though an additional difficulty is that some of the standard errors are not small. (There are, after all, only 150 observations. The number of observations and amount of variation is fundamentally small: this is the entire population of states and much finer cuts of the time period would not allow time for district reaction.)[18] The probable reason that the effects of equalization on spending inequality are not large is that equalization programs generally replace categorical aid programs with broadly similar goals.

Districts need not respond symmetrically to rewards and penalties, especially since the districts receiving rewards systematically have different preferences than the districts being penalized. The point

[18] If demographic characteristics were not needed to calculate the tax prices, two additional Census of Governments years could be added: 1977 and 1987. Adding years beyond these could not be sensible given the possible reaction time of school districts to equalization formulae.

estimates in Table 5 suggest that the response is asymmetric. The stick appears to eliminate spending inequality more effectively than the carrot. This is a weak speculation, however, because it is based only on the point estimates--the differences between the effects of tax rewards and tax penalties are not statistically significant at conventional levels.

In Table 6, I attempt to see whether "poor" districts are better or worse off under various equalization schemes. Looking at poor districts is helpful because, as noted in the introduction to this paper, courts and legislatures are explicitly trying to achieve a combination of educational equity goals and educational adequacy goals. A *minimal* standard for whether a equalization system is achieving a good mix of equity and adequacy is the criterion: "Do no harm to poor districts." That is, if in pursuit of equity goals, an equalization makes average spending fall so much that educational spending is *less* adequate in poor districts, it has gone too far. Leveling down that makes poor students *worse off* is particularly likely to happen under formulas that encourage feedback--that is, systems that have targets that are depressed by the working of the system. Essentially, a poor child may have more spent on his education when the target is high and mild equalization is attempted than when the target is low and total equality of spending is attempted.

People often suggest that districts with a high demand for spending evade SFE schemes by using private funds to pay for some school activities and staff. Brunner and Sonstelie (1996) show this has occurred in California. Such evasion has real consequences for target depression. Consider a high demand district that is able to spend the same amount after an SFE because it uses private funds. The state's targets will nevertheless be depressed; they depend on public spending.

To see how equalizations affect poor districts, I estimate equation (15) separately for "poor" and "rich" districts. I define poor and rich districts in three different ways, meant to match different conceptions of what makes a district needy. In the first panel of Table 6, a district is poor if its median income is below the 25th percentile for its state in 1970. A district is rich if its median income is above the 75th percentile for its state in 1970. In the second panel of Table 6, a district is poor if its poverty rate is above the 90th percentile poverty rate for its state in 1970. A district is rich if its poverty rate is below the 10th percentile poverty rate for its state in 1970. The third panel focuses on so-called "property poor" districts. A district is property poor if its market valuation per pupil is below the 25th percentile for its state in 1970. A district is property rich if its market valuation per pupil is above the 75 percentile for its state in 1970.

A good way to summarize the results of Table 6 is to calculate the inverted tax prices and SORCALEs at which poor districts would just break even under equalization. This calculation allows us to gauge how rewarding or penalizing a system would have to be before poor districts were made better off or worse off. Since this is only meant to be a metric of the stringency required, I calculate the break-even points assuming that they are the same with respect to both the inverted tax price and SORCALE. Poor districts end up with higher spending so long as the inverted tax price and SORCALE are greater than 0.76 (in the first panel), 0.82 (in the second panel), or 0.84 (in the third panel). In fact, most of the schemes shown in Table 1 level down, but not enough to harm poor districts.

However, the results imply that poor districts are actually worse off in California and New Mexico, where the inverted tax prices and SORCALE are well below the 0.76-0.84 threshold. This empirical evidence accords with anecdotal observation: the teachers' unions in the poorest districts in California have gradually turned against the Serrano II equalization.[19]

As expected, Table 6 indicates that rich districts end up with lower spending so long as the inverted tax price and SORCALE are less than 0.95 (in the first panel), 0.97 (in the second panel), or 0.96 (in the third panel). Most states fit into this category, with the notable exceptions of New Jersey, Connecticut and the other leveling-up states. Again, this empirical evidence accords well with anecdotal observation. Rich districts in New Jersey have attracted attention in recent years because their spending growth has been high compared to that of rich districts in other states.

Finally, Table 7 examines the effect of equalization on private school attendance and the high school

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[19] Conversation with the chief legal counsel of the California Education Association, March 1997.

drop-out rate. If SORCALE falls from 1.00 to 0.50, private school attendance rises by 1.86 percentage points. Approximately 10 percent of American students attend private school, so this percentage point increase is a 19 percent increase, which is a substantial increase from a private school's point of view even though it is only a small enrollment loss from a public school's point of view. If the inverted tax price falls from 1.00 to 0.50, private school attendance rises by a quantitatively unimportant amount. If the interaction between SORCALE and the inverted tax price falls from 1.00 to 0.50, private school attendance rises by 0.1 percentage points. Summing up over all these coefficients, California is estimated to have private school attendance that is 4.0 percentage points (or 40 percent) higher than it would be if its SORCALE and tax prices were equal to one. Of course, such increases in private school attendance are not equally distributed across districts. Districts whose residents have high demand for school spending are the districts that experience the biggest decreases in SORCALE and inverted tax prices. These districts, where residents are likely to feel frustrated with the level of public school spending and their inability to increase local spending via local revenue-raising, are the districts most likely to lose students to the private schools. As demonstrated in theoretical work by Epple and Romano (1996), Glomm and Ravikumar (1994), and Nechyba (1996), the public sector's loss of high demand parents can have disproportionately large effects on the political equilibrium. When such parents send their children to private schools, their desired level of school spending falls dramatically from the top to the bottom of the distribution of preferred public school spending. Their departure can create further feedback effects, especially in systems where state-wide politics determine the scheme's targets or determine the grant from general state revenues needed to keep a non-self-funded system afloat.

The second half of Table 7 focuses on the only measure of student performance that we have on a consistent basis for every school district in the United States: the high school drop-out rate as measured by U.S. Census of Population. Fortunately, this measure of student achievement has the advantage that it should pick up the effects of equalization on the poorest, most "at-risk" districts.[20] Some of the coefficients of interest for the drop-out equations in Table 7 are insignificantly different from zero at conventional statistical levels. I am therefore wary of drawing firm conclusions about the drop-out rate, but the signs of the point estimates and the two coefficients that are statistically significantly different from zero indicate that a leveling-down equalization increases the drop-out rate slightly and that a leveling-up equalization has the opposite effect. These effects, such as they are, are probably due to the effects that equalization schemes have on poor schools where students are most likely to be drop-out prone. The drop-out results implicitly estimate an education production function in which school spending is exogenously shocked by the advent of school finance equalization. Although school finance equalizations are inherently a rather credible method to identify exogenous changes in school spending (credible identification is typically a very serious problem for estimating education production functions), the weak results of Table 7 suggest that the method may have limited practical value.

VII. Conclusion

I find that all school finance equalizations are not created equal. I resolve empirical controversies created by the previous literature, which lumped equalizations together as though they were simple events. I explain how equalizations work and how they interact with school spending determination. I use the actual tax price consequences of each equalization for each district to show that school finance equalizations can level spending down or level spending up. I also show that only equalizations that level down achieve near equality of per-pupil spending across a state. I demonstrate that equalizations are capitalized into house

[20] In this sense, the drop-out rate is a much better measure of achievement than SAT scores, which Card and Payne (1997) use. The SAT test is taken by only a *minority* of students who attend 4-year colleges, and it is taken by only tiny percentages of students in the schools that are intended beneficiaries of SFE schemes. Moreover, the SAT test taking rate varies systemically from state to state depending on whether the public college system uses the SAT, ACT, or neither for its basic colleges. This means that SAT-score based measures of the effect of state SFEs on achievement are likely to be dominated by selection bias.

prices, so that house prices fall under schemes that penalize high property value per pupil. Property tax rates also fall under the equalization schemes that implicitly penalize districts that express a desire for higher school spending through higher tax rates. I show that equalizations that level down tend to make parents send their children to private rather than public schools, and I show that the rate of private school attendance rises particularly in districts where equalization makes it costly for parents to express their demand for high local public school spending. I find that equalization schemes have weak effects on student achievement: for instance, schemes that level down increase the high school drop-out rate slightly.

One of the most striking results is that students from poor households actually end up experiencing lower school spending after very stringent school finance equalizations such as California's and New Mexico's. Because stringent equalization schemes contain feedback mechanisms that depress their own spending targets, poor students can be worse off under school finance equalization even if the school finance equalization appears to have replaced a categorical aid program that was apparently less generous.

If these were the only conclusions of this paper, the implications would simply be that equalization schemes should be chosen carefully to balance desires for equality against desires for adequacy (which becomes an issue if leveling down occurs) and desires for low sales and income taxes (which are need to fund leveling up equalizations).

I also point out, however, that equalization schemes have unintended consequences because they make redistribution a negative function of taste for education and school productivity. School finance equalization schemes do not merely redistribute from richer people to poorer people, or from districts with greater ability-to-pay to districts with lesser ability-to-pay, or from households whose children are less expensive to educate to households whose children are more expensive to educate. They redistribute from people whose taste for education is higher to people whose taste is lower. Compared to a categorical aid system based on income that does a similar amount of redistribution, an SFE system always causes leveling-down because it systemically gives money to districts whose residents want to spend unusually small shares of their incomes on schooling. This statement holds equally for school finance equalizations that level up and level down.

It is well-known that property taxes used to finance local public goods mimic user fees. The user fee qualities of property tax finance make achievement of allocative and productive efficiency in local public goods more possible. Redistribution schemes based on property taxes, however, have the unintended consequences described above. Fortunately, it is possible to have both redistribution and relatively undistorted user fees in a school finance system if it combines redistribution among districts via categorical aid based on income (and/or other demographic variables) financed by an income or sales tax with local property tax finance for spending beyond the state aid.

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Table 1
School Finance Equalizations Differ in the Tax Prices They Impose

Actual Minimum and Maximum in a State Are Shown*
(where minimum and maximum are identical, only one number is shown)

	Inverted Tax Price (increase in local expenditure associated with raising an additional dollar of local revenue)		SORCALE (share of revenue from capitalization available for local expenditure)	
	Before Reform	After Reform	Before Reform	After Reform
CENTRALIZED SCHL FINANCE THRU ENTIRE PERIOD				
Hawaii	0***	0***	0	0
COURT ORDERED				
Arkansas 1983	1	1	0.16/0.82	0.06/1
California 1978**	1	0***	0.50/0.84	0
Connecticut 1978	1	1/1.53	1	0.67/0.95
Kansas 1976**	1	1	0.63/1	0.23/0.70
Kentucky 1989	1	1	0.59/0.94	0.39/0.86
New Jersey 1976	1/1.3	1/1.5	0.67/1	0.93/1.1
Utah mid-1970s	1/1.2	0/1.05	0/0.46	0/0.11
Washington 1978	1	1	0.22/0.82	0.14/0.80
West Virginia 1979	1	1	0.73/0.91	0.16/0.73
Wyoming 1983	1	1	0.04/0.21	0.04/0.11
LEGISLATIVE				
Arizona 1980	1	1	0.50/1	0.03/1
Florida 1973	1	1	0.79/0.91	0.23/0.87
Georgia 1986	1	1/1.3	0.75/0.95	0.10/0.90
Idaho 1978	1	1	0.10/0.56	0.10/0.56
Illinois 1973-80	1	1	0.44/1	0.08/1
Iowa 1972	1	1	0.46/1	0.61/0.88
Maine 1978	1	1	0.37/0.70	0.22/0.59
Maryland 1987	1	1	0.13/0.48	0/0.24
Massachusetts 1985	1	1	0.27/0.72	0.21/0.56
Minnesota 1973	1	1	0.06/0.92	0.09/0.17

	Inverted Tax Price (increase in local expenditure associated with raising an additional dollar of local revenue)		SORCALE (share of revenue from capitalization available for local expenditure)	
	Before Reform	After Reform	Before Reform	After Reform
Missouri 1977	1	1	0.75/0.87	0.30/0.70
New Hampshire 1985	1	1	0.54/1	0.19/0.86
New Mexico 1974	1	0***	0.89/0.98	0.05
Ohio 1975-82	1	1	0.27/1	0.20/1
Oklahoma 1987	1/1.80	1/1.48	0.05/1	0.20/1
Rhode Island 1985	1.30/1.51	1.28/1.58	0.37/1.30	0.62/1.28
South Carolina 1977	1	1	1	0.26/0.61
South Dakota 1986	1	1	0.18/0.55	0.10/0.43
Tennessee 1977	1	1	0.66/0.83	0.15/0.51
Vermont 1987	0.15/0.58	1	0.29/1.10	0.15/0.63
Virginia 1975	1	1	0.60/0.82	0.04/0.28
Wisconsin 1973	1	1	0.23/0.80	0.36/1
NO SCHL FINANCE EQUALIZATION	1972	1992	1972	1992
Alabama	1	1	0.82/0.98	0.92/1
Delaware	1	1	0.80/0.91	0.15/0.20
Indiana	1	1	0.05/0.46	0.07/0.40
Michigan	1	0.48/1.80	0.22/0.63	0/1.03
Mississippi	1	1	1	1
Nebraska	1	1	0.20/0.57	0.65/0.79
New York	1	1/1.23	0.30/1	0.64/1
North Carolina	1	1	1	1
North Dakota	1	1	0.05/0.40	0.09/0.42
Oregon	1	1	0.43/1	0.62/0.83
Pennsylvania	1	1/1.1	0.75/0.86	0.57/0.83

* This table illustrates the variety of tax prices imposed by school finance equalizations. For many states, the maximums and minimums shown do not adequately describe the states' school finance systems because the distribution of tax prices is at least as important as the minimum and maximum.

Furthermore, actual minimums and maximums (as shown) partly incorporate the responsive behavior of school districts. They are not suitable for econometric evaluation until the responsive behavior has been partialed out.

Note that several states not typically characterized as having school finance equalizations over the 1972-92 period had significant changes in school finance: Delaware, Michigan, New York, Pennsylvania.

Colorado, Louisiana, Montana, Nevada, and Texas are omitted from this table because timing issues or their aid formulas make it impossible to summarize their school finance equalizations with any accuracy in this simple format.

** These states had legislative school finance equalizations prior to their court-ordered equalizations.

*** No variation in tax rates is seen when local spending cannot benefit from higher local tax rates. Every district uses the mandatory minimum rate.

Table 2
The Effect of School Finance Equalizations on Per-Pupil Spending

Dependent Variable: ln(per-pupil spending) $1990

	I	II
SORCALE.	0.0486 (0.0083)	0.0272 (0.0083)
Inverted Tax Price	0.0372 (0.0141)	0.0905 (0.0100)
SORCALE*Inverted Tax Price	0.0451 (0.0137)	0.0753 (0.0120)
ln(median income)	0.0460 (0.0090)	0.0649 (0.0118)
ln(population)	-0.0003 (0.0011)	-0.0050 (0.0049)
pct. of adult population with 12+ years of education	-0.0012 (0.0002)	0.0001 (0.0002)
pct. of adult population with 16+ years of education	0.0077 (0.0002)	0.0015 (0.0003)
pct. of population black	0.0001 (0.0004)	0.0012 (0.0004)
pct. of population hispanic	0.0013 (0.0001)	0.0031 (0.0002)
unemployment rate	0.0014 (0.0005)	0.0006 (0.0004)
pct. of households in poverty	-0.0025 (0.0004)	-0.0047 (0.0004)
pct. of population urban	0.0005 (0.0001)	0.0003 (0.0001)
pct. of enrollment black	0.0023 (0.0003)	0.0002 (0.0003)
year effects	yes	yes
state effects	yes	
individual district effects		yes
observations (school districts, 3 yrs)	44100	44100
r-squared	.33	.44

Least squares weighted by enrollment. Standard errors in parentheses. SORCALE is the share of revenue from capitalization available for local expenditure. The inverted tax price is the increase in local expenditure associated with raising an additional dollar of local revenue.

Table 3

The Effect of School Finance Equalizations on Per-Pupil Spending, Accounting for Endogeneity of Tax Prices

Column I: Simulated Instruments from Prediction: Each District's Tax Price is Calculated
Using Predicted Mkt. Val. Per Pupil & Tax Rate
Prediction is Based on District in 1970 (before Equalization)

Column II: Simulated Instruments from State Regime: Each State's Tax Price Regime is Calculated
by Putting All Out-of-State School Districts thru the State's Rules &
Creating an Enrollment Weighted Average of Inverted Tax Prices

Dependent Variable: ln(per-pupil spending) $1990

	I	II
SORCALE	0.0123 (0.0012)	0.0207 (0.0079)
Inverted Tax Price	0.0312 (0.0021)	0.0249 (0.0008)
SORCALE*Inverted Tax Price	0.0413 (0.0029)	0.0348 (0.0137)
ln(median income)	0.0503 (0.0120)	0.0692 (0.0154)
ln(population)	0.0225 (0.0060)	0.0541 (0.0115)
pct. of adult population with 12+ years of education	0.0001 (0.0003)	0.0001 (0.0003)
pct. of adult population with 16+ years of education	0.0020 (0.0002)	0.0014 (0.0003)
pct. of population black	-0.0012 (0.0005)	-0.0033 (0.0013)
pct. of population hispanic	-0.0014 (0.0002)	-0.0012 (0.0006)
unemployment rate	0.0112 (0.0011)	0.0073 (0.0037)
pct. of households in poverty	-0.0068 (0.0004)	-0.0039 (0.0007)
pct. of population urban	0.0001 (0.0001)	0.0002 (0.0001)
pct. of enrollment black	-0.0007 (0.0003)	-0.0005 (0.0003)
year effects	yes	yes
individual district effects	yes	yes
observations	44100	44100

Instrumental variables weighted by enrollment. Standard errors in parentheses. SORCALE is the share of revenue from capitalization available for local expenditure. The inverted tax price is the increase in local expenditure associated with raising an additional dollar of local revenue.

Table 4
The Effect of School Finance Equalizations on Property Prices and Property Tax Rates

To Account for Endogeneity of Tax Prices:
Columns I & III: Simulated Instruments from State Regime
Column II & IV: Simulated Instruments from Prediction

	Dependent Variable			
	ln(per pupil valuation) $1990		ln(property tax rate)	
	I	II	III	IV
SORCALE	0.2146 (0.0717)	0.1269 (0.0405)	-0.0593 (0.0537)	-0.0346 (0.0393)
Inverted Tax Price	-0.0097 (0.0048)	-0.0171 (0.0008)	0.1524 (0.0340)	0.2123 (0.0741)
SORCALE*Inverted Tax Price	0.0595 (0.0306)	0.0360 (0.0187)	0.1067 (0.0925)	0.0559 (0.0194)
ln(median income)	0.9367 (0.0819)	0.7586 (0.0428)	-1.2271 (0.0889)	-1.1208 (0.0424)
ln(population)	0.6381 (0.0581)	0.3677 (0.0206)	-1.2109 (0.0750)	-1.3541 (0.0202)
pct. of adult population with 12+ years of education	0.0025 (0.0068)	0.0047 (0.0011)	-0.0079 (0.0092)	0.0106 (0.0010)
pct. of adult population with 16+ years of education	0.0227 (0.0073)	0.0282 (0.0039)	0.0271 (0.0100)	0.0101 (0.0010)
pct. of population black	0.0181 (0.0068)	0.0019 (0.0018)	-0.0077 (0.0090)	-0.0054 (0.0017)
pct. of population hispanic	-0.0081 (0.0029)	-0.0076 (0.0009)	-0.0221 (0.0037)	-0.0149 (0.0008)
unemployment rate	-0.0488 (0.0181)	-0.0004 (0.0036)	0.0749 (0.0248)	0.0324 (0.0037)
pct. of households in poverty	-0.0012 (0.0036)	-0.0091 (0.0017)	-0.0218 (0.0043)	-0.0162 (0.0017)
pct. of population urban	0.0044 (0.0005)	0.0023 (0.0003)	0.0017 (0.0006)	0.0024 (0.0003)
pct. of enrollment black	-0.0019 (0.0015)	-0.0009 (0.0011)	-0.0017 (0.0010)	-0.0010 (0.0011)
year effects	yes	yes	yes	yes
individual district effects	yes	yes	yes	yes
observations	44100	44100	44100	44100

Instrumental variables weighted by enrollment. Standard errors in parentheses. SORCALE is the share of revenue from capitalization available for local expenditure. The inverted tax price is the increase in local expenditure associated with raising an additional dollar of local revenue.

Table 5
The Effect of School Finance Equalizations on Within-State Inequality of Per-Pupil Spending
To Account for Endogeneity of Tax Prices: Simulated Instruments from State Regime

	Dependent Variable: Measure of Inequality in Per-Pupil Spending		
	Theil Index (Standardized)	Coefficient of Variation	ln(95-5 Differential)
the difference between 1 and SORCALE *when the difference is positive*	0.0056 (0.0272)	0.0773 (0.1589)	0.1938 (0.3665)
the difference between 1 and the Inverted Tax Price *when the difference is positive*	0.0069 (0.0030)	0.0028 (0.0066)	0.0037 (0.0255)
the Interaction of the Above Two Differences	0.0097 (0.0459)	0.0124 (0.1020)	0.0333 (0.6341)
the absolute value of the difference between 1 and SORCALE *when the difference is negative*	-0.0008 (0.1540)	-0.0690 (0.5967)	0.0555 (0.4775)
the absolute value of the difference between 1 and the and Inverted Tax Price *when the difference is negative*	-0.0020 (0.0111)	-0.0004 (0.0114)	-0.0052 (0.0109)
the Interaction of Above Two Absolute Values of Differences	-0.0032 (0.2652)	0.0040 (0.2737)	0.0026 (0.1683)
std. dev. of ln(median income)	.576 (.20)	.668 (.352)	.717 (.332)
std. dev. of ln(population)	.234 (.112)	.462 (.316)	.054 (.362)
std. dev. of pct. of adult population with 12+ years of education	-.020 (.005)	-.001 (.007)	-.005 (.012)
std. dev. of pct. of adult population with 16+ years of education	.023 (.005)	.035 (.012)	.012 (.012)
std. dev. of pct. of population black	-.012 (.006)	-.023 (.011)	-.003 (.013)
std. dev. of pct. of population hispanic	.003 (.002)	.001 (.006)	-.002 (.008)
std. dev. of unemployment rate	.003 (.003)	.012 (.011)	-.003 (.014)
std. dev. of pct. of households in poverty	-.003 (.004)	-.003 (.012)	-.001 (.015)
std. dev. of pct. of households urban	-.002 (.0007)	-.007 (.003)	-.005 (.002)
std. dev. of pct. of enrollment black	.011 (.006)	.011 (.006)	.001 (.010)
year effects and state effects	yes	yes	yes
observations (states, 3 yrs)	150	150	150

Instrumental variables. Standard errors in parentheses. SORCALE is the share of revenue from capitalization available for local expenditure. The inverted tax price is the increase in local expenditure associated with raising an additional dollar of local revenue.

Table 6
The Effect of School Finance Equalizations on Per-Pupil Spending in Poor and Rich Districts
To Account for Endogeneity of Tax Prices: Simulated Instruments from State Regime

Dependent Variable: ln(per-pupil spending) $1990

	Define "Poor" & "Rich" Districts by Median Income		
	All	"Poor"	"Rich"
SORCALE	0.0207 (0.0079)	-0.0205 (0.0071)	0.0057 (0.0059)
Inverted Tax Price	0.0249 (0.0008)	-0.0174 (0.0022)	0.0025 (0.0032)
SORCALE*Inverted Tax Price	0.0348 (0.0137)	0.0498 (0.0144)	-0.0086 (0.0018)
all other covariates listed in Table 3	yes	yes	yes
year effects & individual district effects	yes	yes	yes
observations (school districts, 3 yrs)	44100	11025	11124

	Define "Poor" & "Rich" Districts by Poverty Rate		
	All	"Poor"	"Rich"
SORCALE	0.0207 (0.0079)	-0.0140 (0.0042)	0.0090 (0.0060)
Inverted Tax Price	0.0249 (0.0008)	-0.0165 (0.0024)	0.0083 (0.0010)
SORCALE*Inverted Tax Price	0.0348 (0.0137)	0.0371 (0.0045)	-0.0179 (0.0050)
all other covariates listed in Table 3	yes	yes	yes
year effects & individual districts effects	yes	yes	yes
observations (school districts, 3 yrs)	44100	4743	4419

	Define "Poor" & "Rich" Districts by Mkt. Value Per Pupil		
	All	"Poor"	"Rich"
SORCALE	0.0207 (0.0079)	-0.0185 (0.0067)	0.0113 (0.0088)
Inverted Tax Price	0.0249 (0.0008)	-0.0050 (0.0006)	0.0035 (0.0007)
SORCALE*Inverted Tax Price	0.0348 (0.0137)	0.0278 (0.0117)	-0.0154 (0.0125)
all other covariates listed in Table 3	yes	yes	yes
year effects & individual district effects	yes	yes	yes
observations (school districts, 3 yrs)	44100	3735	3987

Instrumental variables weighted by enrollment. Standard errors in parentheses. SORCALE is the share of revenue from capitalization available for local expenditure. The inverted tax price is the increase in local expenditure associated with raising an additional dollar of local revenue.

Table 7
The Effect of School Finance Equalizations on Private School Attendance and Drop-Out Rate

To Account for Endogeneity of Tax Prices:
Columns I & III: Simulated Instruments from State Regime
Column II & IV: Simulated Instruments from Prediction

	Dependent Variable			
	Pct. of Students in Private School		Drop-Out Rate (betw. 0 and 1)	
	I	II	III	IV
SORCALE	-3.5574	-3.7339	-0.0195	-0.0108
	(1.8995)	(0.2912)	(0.0311)	(0.0059)
Inverted Tax Price	-0.0534	-0.0137	-0.0571	-0.0291
	(0.0212)	(0.0051)	(0.0911)	(0.0122)
SORCALE*Inverted Tax Price	-0.6146	-0.2511	-0.0335	-0.0017
	(0.3272)	(0.0700)	(0.0054)	(0.0014)
ln(median income)	-1.9322	-3.5173	3.0386	1.4790
	(0.3678)	(0.2868)	(0.4631)	(0.4115)
ln(population)	1.1172	0.6891	-2.6726	-2.3824
	(0.2559)	(0.1444)	(0.4264)	(0.3614)
pct. of adult population with 12+ years of education	-0.0596	-0.1079	0.1321	0.0869
	(0.0329)	(0.0073)	(0.0534)	(0.0194)
pct. of adult population with 16+ years of education	0.1280	0.1854	-0.3637	-0.3369
	(0.0322)	(0.0057)	(0.0580)	(0.0259)
pct. of population black	0.0459	0.0119	0.3272	0.0857
	(0.0328)	(0.0119)	(0.0521)	(0.0345)
pct. of population hispanic	-0.0412	-0.0854	0.1333	0.0433
	(0.0136)	(0.0057)	(0.0211)	(0.0204)
unemployment rate	-0.3910	-0.3110	-0.9022	-0.0808
	(0.0881)	(0.0269)	(0.1439)	(0.0563)
pct. of households in poverty	-0.1178	-0.1494	0.1488	0.1229
	(0.0159)	(0.0100)	(0.0236)	(0.0196)
pct. of population urban	0.0409	0.0406	0.0189	0.0117
	(0.0021)	(0.0018)	(0.0030)	(0.0028)
pct. of enrollment black	0.0269	0.0111	0.0132	0.0136
	(0.0062)	(0.0072)	(0.0021)	(0.0020)
year effects	yes	yes	yes	yes
individual district effects	yes	yes	yes	yes
observations	44100	44100	44100	44100

Instrumental variables weighted by enrollment. Standard errors in parentheses. SORCALE is the share of revenue from capitalization available for local expenditure. The inverted tax price is the increase in local expenditure associated with raising an additional dollar of local revenue.

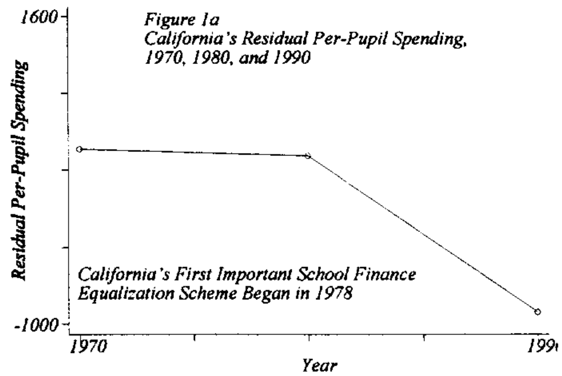


Figure 1a
California's Residual Per-Pupil Spending, 1970, 1980, and 1990

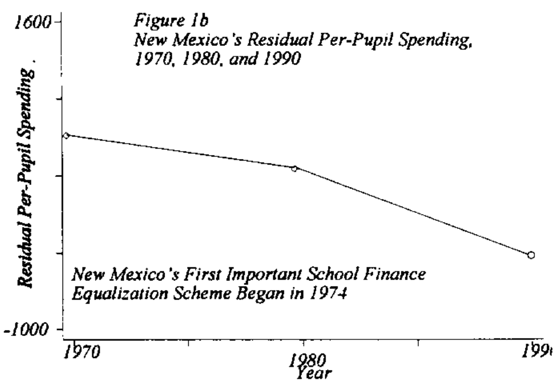


Figure 1b
New Mexico's Residual Per-Pupil Spending, 1970, 1980, and 1990

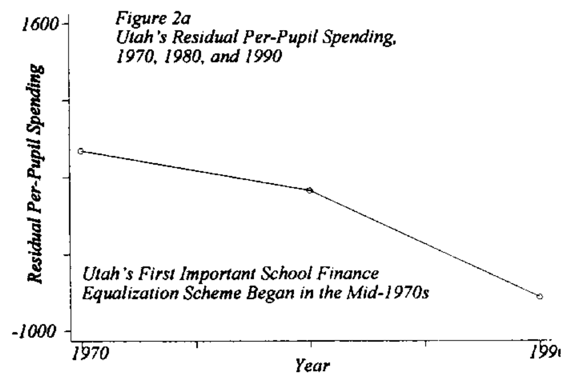


Figure 2a
Utah's Residual Per-Pupil Spending,
1970, 1980, and 1990
1600
-1000
Residual Per-Pupil Spending
Utah's First Important School Finance
Equalization Scheme Began in the Mid-1970s
1970
Year
1990

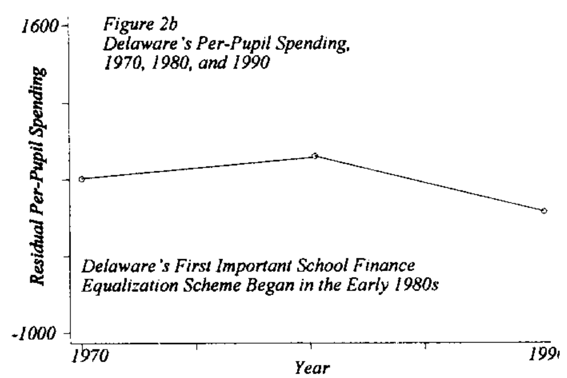


Figure 2b
Delaware's Per-Pupil Spending,
1970, 1980, and 1990
1600
-1000
Residual Per-Pupil Spending
Delaware's First Important School Finance
Equalization Scheme Began in the Early 1980s
1970
Year
1990

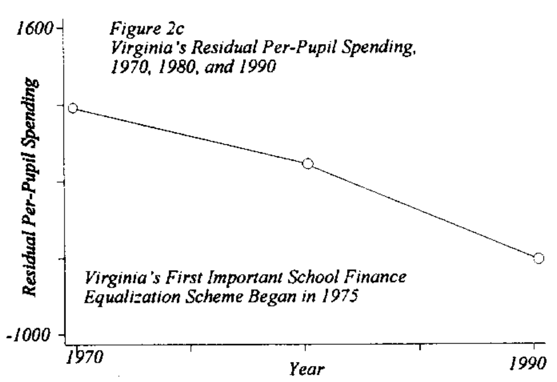
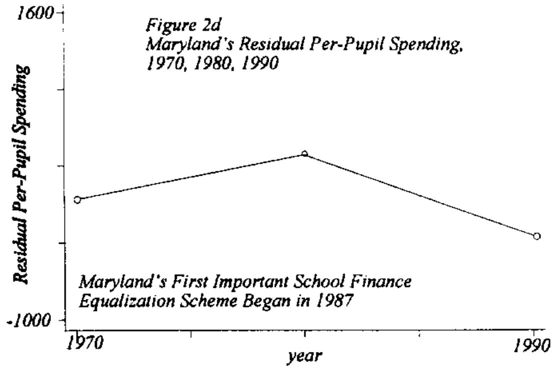
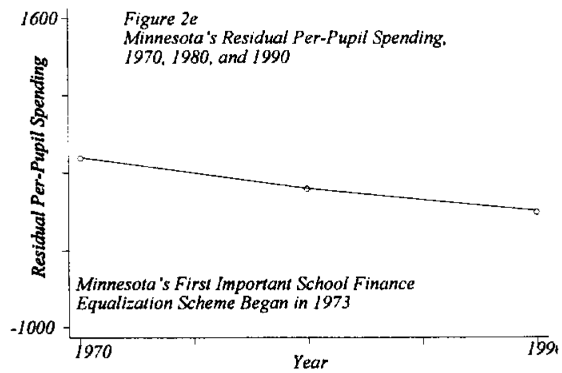
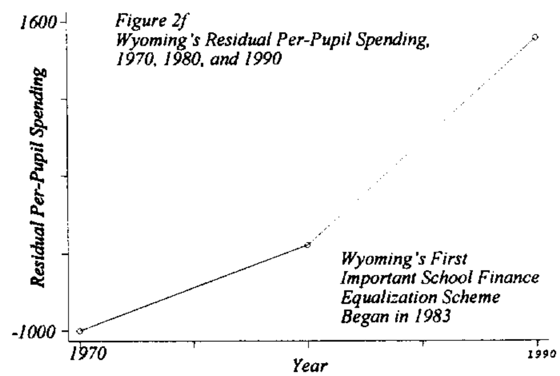


Figure 2c
Virginia's Residual Per-Pupil Spending,
1970, 1980, and 1990
1600
-1000
Residual Per-Pupil Spending
Virginia's First Important School Finance
Equalization Scheme Began in 1975
1970
Year
1990


1600
-1000
Residual Per-Pupil Spending
Figure 2d
Maryland's Residual Per-Pupil Spending,
1970, 1980, 1990
Maryland's First Important School Finance
Equalization Scheme Began in 1987
1970
year
1990


1600
-1000
Residual Per-Pupil Spending
Figure 2e
Minnesota's Residual Per-Pupil Spending,
1970, 1980, and 1990
Minnesota's First Important School Finance
Equalization Scheme Began in 1973
1970
Year


1600
-1000
Residual Per-Pupil Spending
Figure 2f
Wyoming's Residual Per-Pupil Spending,
1970, 1980, and 1990
Wyoming's First
Important School Finance
Equalization Scheme
Began in 1983
1970
Year
1990

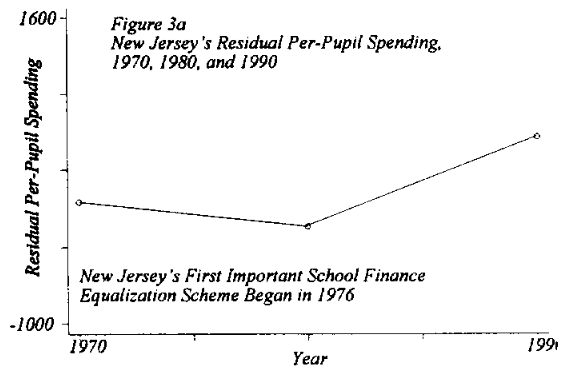


Figure 3a
New Jersey's Residual Per-Pupil Spending,
1970, 1980, and 1990
1600
-1000
Residual Per-Pupil Spending
New Jersey's First Important School Finance
Equalization Scheme Began in 1976
1970
Year
199

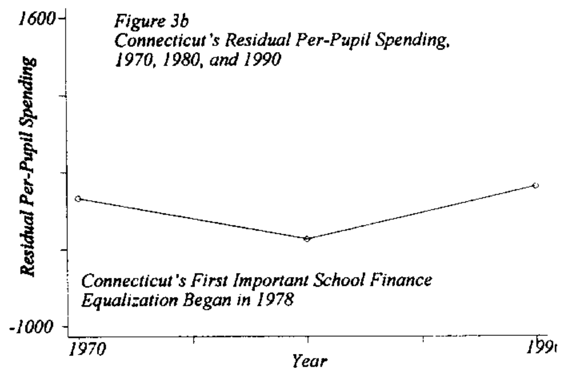


Figure 3b
Connecticut's Residual Per-Pupil Spending,
1970, 1980, and 1990
1600
-1000
Residual Per-Pupil Spending
Connecticut's First Important School Finance
Equalization Began in 1978
1970
Year
199

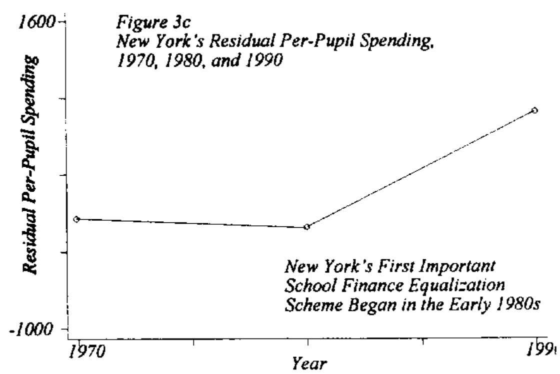


Figure 3c
New York's Residual Per-Pupil Spending,
1970, 1980, and 1990
1600
-1000
Residual Per-Pupil Spending
New York's First Important
School Finance Equalization
Scheme Began in the Early 1980s
1970
Year
199

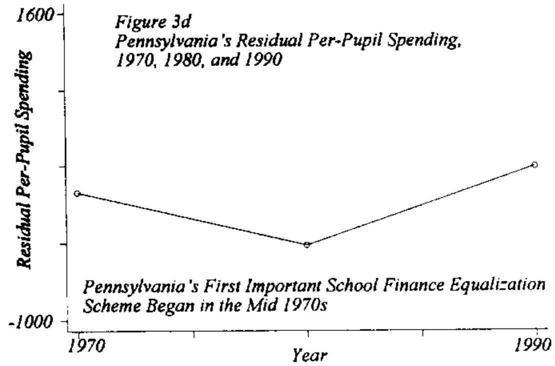


Figure 3d
Pennsylvania's Residual Per-Pupil Spending, 1970, 1980, and 1990

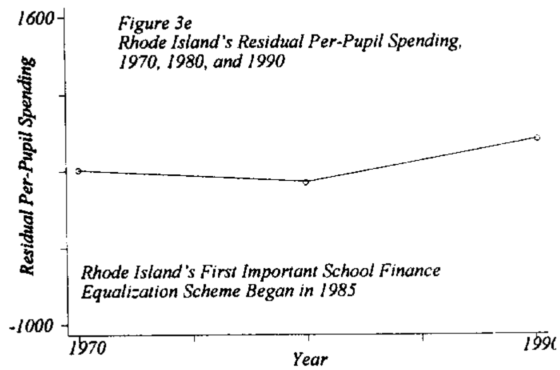


Figure 3e
Rhode Island's Residual Per-Pupil Spending, 1970, 1980, and 1990