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# The Effect of School Finance Reform on Population Heterogeneity

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## Abstract

This paper tests whether state school finance reform alters neighborhood income homogeneity. One implication of the Tiebout model is that within-community homogeneity declines as a result of an exogenous decrease in the ability of jurisdictions to set local tax and expenditure levels. The property tax revolt and the school finance equalization reform of the 1970s and 1980s offer a test of the role of state fiscal reform on aggregate population sorting behavior. The results show that school finance has a significant effect on school district income sorting, especially among low income communities.

## Introduction

During the 1970s and 1980s, many states initiated litigation and legislation that attempted to shift public school revenue from local to state sources. By reducing reliance on local tax bases, these fiscal reforms led to less local tax and spending discretion and a shift in the distribution of public service packages that communities offer. A number of papers have attempted to estimate the impact of these school finance reforms on revenue collection and spending. While the results are somewhat mixed, much of this work has found that reform, particularly when instituted through the courts, had an important effect on the distribution of public school funding.[1] For example, Evans, Murray and Schwab (1997) find that state revenues increased while local revenues were roughly unchanged after successful school finance litigation, resulting in some funding equalization across school districts. A critical result of this equalization is explored in Card and Payne (1997) and Downes and Figlio (1997), who find some evidence that equalization across districts led to a narrowing of test scores across families.

An unexplored consequence of this redistribution may be the reoptimization of household location decisions. Change in household location patterns is not a goal of fiscal reform. But it could be a byproduct that has important implications for public policy. Fernandez and Rogerson (1996) note that policies that increase the fraction of wealthier households in poorer communities are welfare enhancing because they increase the quality of education and decrease tax rates in every community. Benabou (1996) outlines a model whereby, under certain conditions, community income integration increases long-run growth.[2] If nonlinear peer effects like those described in Summers and Wolfe (1977) and Crane (1991) exist, it could produce further benefits

from the dispersion of the population. Nechyba (1996, 1997) analyzes the role of peer effects on public school finance and residential location decisions within a general equilibrium framework.

This paper examines the effects of school finance reforms on population homogeneity, looking specifically for evidence that states with reform measures encountered larger increases in the dispersion of neighborhood income distributions (e.g. fewer poor households in the poorest neighborhoods and fewer wealthier households in the wealthiest communities) relative to states with no reform history. As such, this paper is a test of one implication of the Tiebout model; within community homogeneity decreases as a result of an exogenous decrease in the ability of jurisdictions to set tax and expenditure levels.

The paper proceeds as follows. The first section describes how school fiscal reform might impact household location decisions. The narration emphasizes the potential ambiguity of the model's prediction given the reactions of households to the policy changes and the substitutability of neighborhoods within a given jurisdiction. The data used in the empirical analysis is described in the next section. A parametric strategy and resulting findings are described in the final section I find that school reform has some impact on the income stability of communities. In particular, states in which courts uphold the constitutionality of local school funding systems experience more income sorting among low income communities. This result is also found among states that are labeled anti-spending, as in Hoxby (1996). Among high income communities, school funding reform matter only in low property value school districts. In this case, the fraction of high income households drop when states uphold funding systems through the courts. Additional results on the impact of tax and expenditure limitation laws and school funding formula changes are also presented. While these results suggest that residential location decisions may be influenced by the

constraints put on local jurisdictional spending, the statistical model is not structural and therefore the inferences should be viewed with caution.

**A Sketch of a Model**

In the classic Tiebout (1956) model, jurisdictions compete for residents by offering packages of local public goods and taxes. Households choose communities that offer the most ideal combination. Aggregate sorting patterns depend on the composition of households and the range of packages offered by communities within a jurisdiction. In the extreme case, where all households have equivalent income and tastes for community amenities and each community is a perfect substitute, housing prices will be the same everywhere. Households randomly select a place to live and never move thereafter. At the other extreme, if there are two types of communities (high-quality and low-quality school districts) and two types of households (high and low tastes for education), households sort into communities based on taste for education.[3] Some residents might underconsume housing and other neighborhood-specific amenities in order to obtain higher-quality educational services. Other residents (say, those without children) might move to low-quality school areas and overconsume housing and other neighborhood-specific goods.

Suppose there is a change in the package of amenities from school finance reform. Public schools are financed by several sources of revenues: federal grants, state taxes, and local taxes. These school reform plans shift financing away from local sources and towards state-based revenues. As a result, a community with a smaller tax base encounters an increase in public service expenditures, and a wealthier community experiences a reduction in local tax revenue used to spend on their public schools. In a perfectly mobile world, if there is heterogeneity in

preferences within communities, this change could lead to community switching by residents who previously over or underconsumed neighborhood-specific goods.[4] Furthermore, among higher income neighborhoods, the diminished ability of local jurisdictions to determine revenue and spending levels might reduce the need to use zoning and other minimum income requirements to overcome the free rider problem.[5] As a result, there could be an increased flow of lower and middle income households into wealthier communities. Even with transaction costs, community switching could occur if, all else equal, the expected utility difference between the new and old neighborhood after the reform occurs outweighs the cost of moving. If I assume that this household is a representative consumer, a model of aggregate demand can be estimated.

However, there may be intervening factors that diminish the size or even reverse this prediction. As emphasized by Oates (1981), Clotfelter (1983), and Lamdin and Mintrom (1996), households might not be as "light on their feet" as the Tiebout model implies. On the supply side, jurisdictional choice in public service provisions may be limited. On the demand side, school funding schemes might not matter enough to instigate household movement. The impact of school quality on children's success remains a hotly debated issue, but the empirical evidence suggests a weak relationship between school financing and student performance relative to family factors.[6] If such a money-achievement link is wanting, it is likely that fiscal reforms will have few consequences on residential location decisions and, thus, the dispersion of households.

Furthermore, households with high tastes for educational services might find alternative ways to fund schools. This "bake sale" effect can offset state-mandated funding reforms and enable those with high income and high taste for educational services to continue to sort from the rest of the population. Downes (1992) suggests that such an effect played a role in the lack of

education funding changes found in post-*Serrano* California. Brunner and Sonstelie (1996,1997) document the impact of voluntary contributions on California's post-Serrano school financing, and show that most of the contributions went to districts that were constrained by school finance reform.

Another possibility is that wealthy households opt out of the public school system after local discretion is reduced beyond some threshold. Downes and Schoeman (1998) show that California's increase in private schooling can be partly attributed to the state's education finance reform package. However, it is not clear if increased private schooling increases or decreases sorting behavior. Bearse, Glomm, and Ravikumar (1996) hypothesize that centralized schooling could result in an equilibrium where those with preferences for low taxes and low educational services -- the wealthiest (since they are opting out of the public school system in the model) and poorest households -- live together. However, Fischel (1993) argues a decline in local funding discretion could reduce general support for educational services, making it less likely that low and middle income residents will react to policy shifts.

Therefore, assuming there exists a range of heterogeneity in preferences for public services and other neighborhood-specific goods, fiscal reform measures like school finance reform might affect location patterns by altering amenity packages between communities. However, the magnitude and perhaps even the sign of this effect is ambiguous given the reactions of households to the policy changes and the substitutability of neighborhoods within a given jurisdiction.

**Data**

The data used in this paper is created from several national sources on school districts from 1976, 1979, and 1989. The 1989 data comes from the School District Data Book created by the National Center for Education Statistics. This file merges information from the 1989-90 Population and Housing Census, the 1989-90 Census of Governments, which includes revenues and expenditure data by school district, and the Department of Education's 1989-90 Common Core Database, which includes additional information on school district demographics. A full description of the social, economic, and administrative characteristics of the over 15,000 public school districts are available for 1989-90.

Earlier school district information comes from a 1976 Department of Health, Education, and Welfare (HEW) file that merges the 1976-77 ELSEGIS School District file from the National Center for Educational Statistics, the 1976-77 Survey of Local Government Finances, the 1976 OCR Elementary and Secondary School Civil Rights Survey from the Office of Civil Rights, the 1976-77 file on State Administered Programs from the Office of Education, the 1976 Elementary and Secondary Staff Information from the Equal Employment Opportunity Commission, special tabulations from the 1970 census, and 1976 data on Equalized Property Value from Killalea Associates. This file contain 289 variables on enrollment, revenues and expenditures, some demographics, and property values.

Unfortunately, the 1976 files contain no information on household income beyond poverty rates. Therefore, I combined the HEW file with data from the 1980 census (1979 income data). This was done by merging the 1976 HEW file with the Census Bureau's 1980 Master Area Reference File 3 (MARF3), which links school district codes with census tracts, enumeration districts, and other geographic indicators. These detailed indicators are merged with the STF

census files.[7] Finally, I am able to link 13,890 of the 15,498 school districts in 1990 to their counterpart in 1976. Of the 13,890 districts, approximately 12,939 have valid income data in both sample years and are therefore used in the analysis.

I consider the effects of state fiscal reform on several measures of neighborhood income dispersion. The first two dependent variables are measures of the sorting behavior of wealthy and poor households. In particular, I calculate the fraction of poor and wealthy households that live in the poorest and wealthiest school districts of each state.[8] Poor households are defined as those that fall in the bottom quintile of their state's income distribution, while poor school districts are defined as those that fall in the bottom quintile or bottom half of their state's across-district income distribution. Likewise, wealthy households and school districts are defined as those that fall in the top quintile or top half of the state's income distribution. Therefore, when using these measures of poor and wealthy sorting as dependent variables, the sample size is a fraction (usually 20 or 50 percent) of the total sample.

To calculate the income variables, I use the census' bracketed income data to compute the fraction of households that fall in a particular state's income quintile for each school district.[9] The income brackets are used to compute state income quintile breakpoints for each of the census years. To compute the breakpoints, it is assumed that the cumulative distribution function of individuals within an income bracket is linear. This assumption is likely to be incorrect if, for example, the income distribution is log-linear.

The first two measures examine the fraction of poor and wealthy residents in poor and wealthy school districts. As an alternative dispersion measure, I use median household income in these poor and wealthy communities. The median income measure captures additional

information on the characteristics of these neighborhoods. This measure is taken directly from the census files. Again, this stratified sample consists of twenty or fifty percent of the full census tract sample.

Finally, in order to assess other parts of the neighborhood income distribution, a variance measure is constructed to account for overall dispersion in within-district income distributions. Because the census does not report within-district household income variance, I calculate such a measure using the census income brackets. However, assumptions must be made about the distribution of household income within brackets. For the purpose of this calculation, it is assumed that the household income is log normally distributed but other assumptions are also tried.[10] Fortunately, the results are not sensitive to these distributional assumptions, and therefore I report results that assume a log normal distribution. Analysis with this variable is done on the full census tract sample and subsamples of the wealthy and poor districts.

To account for heterogeneity in school district income evolution, controls in the analysis include 1976 or 1979 school district information on racial composition, education, family composition, industry and occupational status of workers, home ownership rates, average house value, and median rent. See appendix 1 for a full list.

State Reform History

As has been noted by many authors (e.g. Downes and Shah 1995, Hoxby 1996, Figlio 1997), there is no standard path to school finance reform. Therefore, distinguishing heterogeneity in reform activity is an important component of analyzing school funding reform initiatives on population patterns. I take an agnostic approach and use several categorizations that have been employed in the literature. The primary categorization is from Card and Payne (1997), who

distinguish between states with no court-ordered reform, states where courts upheld the constitutionality of the school financing system, and states where courts found the school funding system unconstitutional. The reason for concentrating on court-ordered reform is that Downes and Shah (1995), among others, have argued that court reform has tended to allow less local discretion and larger reductions in inter-district inequities than legislated reform.

Alternatively, I take into account the impact of legislative action by dividing reform into court-ordered or legislative reform as was done in Downes and Shah (1995). It is hypothesized that the effect of school finance equalization on population sorting will be larger in states with judicial reform relative to states with legislated reform. Finally, I classify reforms into pro-spending and anti-spending initiatives, as was suggested in Hoxby (1996). Hoxby criticizes the use of court-initiatives because it ignores any across-state heterogeneity of court and legislated reform. Instead, her pro- and anti-spending measures reflect the impact that reform has on local tax prices.

Furthermore, I augment the school finance reform measures with measures of school funding formula changes from Card and Payne (1997) and tax and expenditure limitation laws (TEL) from ACIR (1995). School funding formulas are classified into three broad categories: a flat grant, minimum foundation plans, and variable grants. Hoxby (1996) describes these systems in detail. I use Card and Payne's classification to determine the degree to which state formula changes between 1977 and 1992 had an impact on inter-district spending inequality. For example, states that switch from flat grants to minimum foundation plans are classified as more equal since flat grants provide a fixed sum per student, while the minimum foundation plan aims to compensate districts that are not able to meet certain minimum revenue targets. However, their

categorization does not allow for changes in the parameters of existing plans or the extent of equalization built into the formulas.

Finally, the TEL measures control for the existence of revenue and expenditure limitations placed on state and local governments. These laws were designed to control and reduce property taxes, limit the growth of government and public spending, and improve fiscal accountability. The primary measure accounts for the existence of general tax and expenditure limitation laws and was provided by Kim Rueben. However, we may be most interested in laws that constrain school district behavior. Therefore, I use five alternative revenue and expenditure limit laws that specifically constrain school districts (ACIR 1995). They are overall property tax rate limits, specific property tax rate limits, property tax revenue limits, assessment increase limits, and general expenditure limits. According to ACIR, many of these initiatives can by binding, particularly limits on annual increases in property tax levies, annual revenues, and annual expenditures, because they impose a fixed ceiling on local spending discretion.

**Empirical Strategy and Results**

The basic estimating equation relates growth in school district income dispersion pre- and post-reform to characteristics of the community and an indicator for whether the state experienced school finance reform:[11]

$$(1) \qquad Y_{ist} - Y_{ist-1} = \alpha X_{ist-1} + \beta R_{st} + \varepsilon_{is}$$

where $Y_{ist}$ is a measure of household income dispersion in neighborhood i of state s in period t, $X_{ist-1}$ is a vector of log neighborhood characteristics in period t-1 -- such as family, education, and racial attributes -- that might influence the growth of a community, and $R_{st}$ is a vector of dummies

indicating whether state s passed a reform by year t.

Because of concern raised by Moulton (1986) about the presence of a state specific error term on the efficiency of OLS estimates of (1), I employ a two-stage estimator outlined in Borjas (1987) and Borjas and Sueyoshi (1994). In the first stage, I estimate equations like (1) but substitute state dummies for the reform dummies.

(2) $$Y_{ist} - Y_{ist-1} = \alpha X_{ist-1} + \gamma S_s + \varepsilon_{is}$$

In the second stage, the parameters $\hat{\gamma}$ are regressed on the school finance reform indicators $R_{st}$

(3) $$\hat{\gamma} = \phi R_{st} + \varepsilon_s .$$

From (2) and (3), the variance of the errors is calculated as the scalar covariance matrix derived from OLS estimates of equation (3) plus the proportion of equation (2)'s variance matrix corresponding to the state dummy variable coefficients ($V_{ss}$).

(4) $$\Omega = \sigma_u^2 I_N + V_{ss}$$

The sigma term in (4) is used to compute GLS estimates of the reform effect $\phi$. In the results presented below, I report the GLS estimates, but the OLS estimates, which are very similar to the GLS estimates, are available upon request. This model is estimated for various reform indicators and measures of income homogeneity, Y.

The sample for nearly all of the regressions reported in the following tables are stratified by the 1979 average household income of school districts and households to get measures of low and high income population sorting. In table 1, columns (1) to (2), the dependent variable is growth in the fraction of households that are among the state's poorest quintile, and the school district sample is restricted to the poorest half of districts within a state. A negative sign on the reform parameters can be thought of as a decline in poor household clustering due to reform

policies.[12] The results suggest that low income sorting increases by roughly 13 to 15 percent (with a standard error of five to six percent) in states where the highest courts affirm the constitutionality of the school financing system, even after controlling for the existence of school funding formula changes and tax and expenditure limitation laws. In a low income school district where 25 percent of the households are among the poorest quintile of the state, the results suggest that upholding school finance systems will increase the share of low income households by 3.5 percent. This result is even stronger when the poorest quintile of school districts are examined in columns (3) and (4). This is not surprising. It implies that states where local discretion remains high are those where low income sorting persists. Consistent with this notion, states that switch to school funding formulas with more spending equality between school districts have a negative (although not statistically significant) effect on low income sorting. Finally, the broad existence of state TEL laws do not matter to low income sorting, although specific school district limitation laws may, as will be discussed below.

Columns (5) to (8) show the same computations for wealthy households in wealthy communities. In this case, there appears to be no impact from school financing decisions or funding formulas. However, there is a significant effect from TEL laws. The existence of limitation laws reduces high income sorting by 10 to 12 percent. However, with a standard error of six to seven percent, we cannot rule out the possibility that this result arose by chance.

The last four columns in table 1 look at the impact of school finance and other reform measures on the growth in median income of the poorest and wealthiest half of school districts. For these regressions, decreased sorting is consistent with a positive sign in the low income school district regressions and a negative sign in the high income school district regressions.

There is some evidence that household income increased in low income districts when funding formulas became more equal, consistent with the finding that very low income households were sorting less into these communities. Also consistent with columns (1) and (2), there is some evidence that median household income falls in low income school districts in states where the courts uphold the school finance system. No sorting effect is found among high income districts.

It is possible that the results presented thus far are driven by alternative time-varying factors that affect the attractiveness of communities. Therefore, I attempted to control for other time-varying polices and demographics that might impact the sorting behavior of communities. First, I added five alternative policy variables to equation (3): the 1980 to 1990 change in federal aid to state and local governments for community development grants, federal aid to state and local governments for low income housing assistance, state expenditures per capita on public welfare, AFDC average monthly payments per family, and total crime rates.[13] Increases in the federal aid measures for community development grants and low income housing assistance significantly lower low income sorting but none of these policy variables, by themselves or together, impact the school finance reform (or TEL) parameters. Second, I controlled for school district changes in racial composition and population in the first stage regressions. This had no impact on the policy parameters.[14]

It should be noted that the state may be an inappropriate way to categorize the local market for communities. Therefore, the analysis in table 1 was repeated using SMSA income distributions rather than state income distributions to measure the upper and lower income tail of households and school districts. For urban school districts, I calculate the fraction of poor and wealthy households using SMSA income distributions, but for non-SMSA school districts, the

income shares are computed from the total non-SMSA population of the state. The results reveal that this change does not make a large difference to the inferences already reported, although it does reduce the magnitude of the school reform effect. Low income sorting increases by six to seven percent (with a standard error of 2.5 percent) in states where a school system is upheld by the court, but such a ruling has no impact on high income sorting. The impact of TELs and funding formula changes are of approximately the same magnitude as the elasticities reported in table 1.

Table 2 explores whether school finance reform affects all low income and high income communities equally. In this table, the low income community sample is split into two subsamples -- those that are in low property value districts (defined as those below the state median house value) and those in high property value districts (above the state median house value). The results suggest that low income sorting is more prevalent in districts with low house values when courts uphold school finance systems. Table 2 also shows that funding formula changes that result in more equality have a larger impact in reducing sorting among communities with low property values. Perhaps this is because middle income residents are more likely to move into low income communities if funding formulas improve public service packages in these districts but are less likely to move in when school system funding remains heavily tied to the local property tax base.

Among high income districts, the most interesting finding is that sorting decreases by 13 percent (standard error of six percent) in low property value districts when courts uphold school finance laws. However, there is no change in income sorting among high income households in high property value communities when courts uphold financing systems. On the other hand, when TELs place a constraint on spending, high income sorting decreases in high property value

districts but does not impact low property value districts. These results are generally consistent with a Tiebout world where constrains on spending matter to residential decisions.

Tables 1 and 2 employ part of the income distribution to explore population shifts resulting from fiscal reform. Table 3 reports results that use a dispersion measure – the coefficient of variation of household income -- that accounts for the entire income distribution of school districts. Columns (1) and (2) shows the fiscal policy parameters when using the full sample. Columns (3) to (10) stratify the sample into poorer and wealthier school districts, as in table 1. If fiscal reforms matter, it may increase within-district variance and, therefore, result in a positive coefficient on the reform parameters. In fact, there is no evidence that any of the reform measures significantly affect within-district income variance.

The remaining tables check the robustness of the results to potential specification and data problems. First, table 4 reports results that use two alternative school funding reform categorizations; one proposed in Downes and Shah (1995) distinguishes between court-mandated reform, legislature-mandated reform and no reform prior to 1990 and a second approach, introduced by Hoxby (1996), labels states as pro-spending and anti-spending.

Using Downes and Shah's categories, there appears to be no effect of school finance reform on low income or high income sorting. Recall that much of the increase in low income sorting occurs in states where the constitutionality of the school funding system is upheld by the courts. In Downes and Shah's categories, these states are split into those that eventually change school funding laws through the legislature and those with no reform by 1990. Hoxby's categorization suggests a larger effect on low income sorting. In states with mandates that are anti-spending, low income sorting increases. There is some evidence that high income sorting

decreases in anti-spending states but this result is not robust to looking at the upper quintile of communities. All of the results are robust to adding TEL and school funding formula controls.

Table 5 reports regression results that add more specific school district-level tax and expenditure limitation initiatives -- overall property tax rate limits, specific property tax rate limits, property tax revenue limits, assessment increase limits, and general expenditure limits -- which might bind district spending decisions. This refinement makes little difference to the school finance reform results even if we control for multiple district limitation laws simultaneously (not shown). The TEL reforms that appear to be the most important are assessment increase limits and general expenditure limits, both of which increase low income sorting and decrease high income sorting. General expenditure increases are potentially binding because of the fixed nature of the expenditure ceiling and therefore it is not surprising to see a decline in high income sorting. Low income sorting may increase because limits on the percentage increase in spending may make low income communities, which already have low spending levels, even less desirable to some households. However, the impact due to assessment limitations is a bit surprising since assessment limit laws can be easily circumvented through an increase in the property tax rate. However, these laws may be binding if coupled with property tax limit laws (ACIR 1995). Of the four states -- California, Iowa, Maryland, and New Mexico -- with assessment limit laws prior to 1979, two have limits on overall property tax rate increases.

The next set of results relax the assumption that school finance reform policies are exogenous. Much of the recent literature on school finance and TEL reform account for the impact of endogenous policy formation on their results. I follow the instrumental variables strategy of Downes and Figlio (1997), who use a set of instruments that combine information on

the constitutional language of education clauses (McUsic 1991) with demographic and political information on state conditions in the early 1970s to predict state adoption of particular school finance and TEL policies. In particular, dummy variables are constructed based on whether the state's constitution includes an education clause that specifies whether equality, uniformity, or efficiency are required in state funding of public education. Alternatively, I employed dummy variables that distinguish whether the state constitution specified significant and explicit, less explicit, lower, or bare minimum standards for the quality of public education. I augmented these education clause variables with whether the state has a ballot law that allows for direct voter initiatives (Matsusaka 1995), regional dummies, an indicator variable for whether the state's governor was a democrat in 1974, the fraction of state senators that are democrats in 1974, the fraction of the population under 18 in 1970, and the fraction of the population over 65 in 1970. Comparing the results in table 6 with table 1, it is evident that the inferences are little changed when accounting for potential endogeneity in the school finance and TEL policies. None of the significant results are altered, although the precision of the estimates do decline. This is in line with other papers, such as Downes and Figlio (1997) and Figlio (1997), that account for endogenous policy initiatives.

The final econometric concern that is explored is that the 'pre-treatment' period is, in some cases, several years after some court decisions have been made, including the precedent-setting Serrano decision in California in 1977. If we allow for some reasonable lag to population movement, it does not seem unreasonable to use 1979 as the starting period since most policy decisions were made in the late 1970s and 1980s. Nevertheless, it is important to test whether this matters. Tables 7 and 8 presents two such tests. In table 7, I reran the equations from table 1

on a subsample of states that experienced no court decisions prior to 1979. Because 16 states are eliminated from the sample, the precision of the estimates decline substantially. But they still seem to suggest very similar effects, especially with regard to low income sorting after courts uphold the constitutionality of local funding systems.

Second, I linked 1980 census tracts to 1970 census tracts using a file that accounts for changes in tract boundaries during the 1980s. As a result, I can link 1970 and 1980 school districts but only for districts that are in tracted areas. Essentially, this restricts the sample to metropolitan areas. Table 8 presents these results. While they are clearly not as strong nor as well estimated as the previous results using the 1980 to 1990 data, some patterns seems to be the same. Low income sorting was significantly higher in states where school funding systems were upheld relative to state with no court action. However, more dramatically, low income communities in Hoxby's anti-spending states are significantly more likely to increase their share of low income households while pro-spending states decrease their share of low income households. The previously significant results on TELs and funding formula changes disappear for low income and high income districts.

**Conclusions**

This paper tests whether school funding reform had an impact on community income homogeneity. It is hypothesized that restricting the latitude that local communities have in making funding decisions will diminish the level of household sorting behavior because equalizing public service funding is tantamount to integrating the tax bases of all communities. Furthermore, if finance reforms lead to an improvement in low tax base neighborhood services, the package of

amenities and housing goods may change enough to encourage higher income families to reside in these communities. This effect is stronger if the reform leads to a simultaneous decline in the level of funding in higher income neighborhoods. However, intervening supply and demand factors could diminish the size or even reverse this prediction. For example, households with high tastes for educational services might find alternative ways to fund schools. Furthermore, there is evidence to suggest that school funding does not matter enough to instigate household movement.

Using a national dataset of school districts, reform is shown to have some impact on the income sorting behavior of households. Among low income communities, there appears to be an increase in the share of low income households in states which uphold the constitutionality of public school financing. Among high income communities, school funding reform matter only in low property value school districts. These result are robust to including other time-varying policy measures, including detailed information on tax and expenditure limitation laws and school funding formula changes, other definitions of school finance reform, the endogeneity of school finance policies, and other specification and data problems. However, the impact of school finance reform is insignificant when looking at measures of income variance by school district and are weaker when 1970 to 1990 changes are explored using a subsample of tracted areas.

These results are only suggestive. In future work, I hope to flesh out some of the econometric concerns with using a reduced form, partial equilibrium model to estimate school finance reform effects. In particular, a next step will be to estimate a model of residential decision making at the household level that accounts for the endogeneity of public school quality, funding availability, and private school options.

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[1] For a full history of school finance reform, see Odden and Picus (1992) and LaMorte (1989). For a detailed discussion of the theoretical implications of equalizing aid, see Ladd and Yinger (1994), Oakland (1994), and Reschovsky (1994). A number of studies have explored the effects of these spending reforms on the level and growth of school funding (Downes and Shah 1995, Silva and Sonstelie 1995, Dye and McGuire 1997), the distribution of funding (Downes 1992, Bradbury 1993, Hoxby 1996, Downes and Figlio 1997, Evans, Murray, and Schwab 1997), private school enrollment (Downes and Schoeman 1998), and the performance of students (Downes 1992, Card and Payne 1997, Downes and Figlio 1997).

Other papers explore a variety of alternative statutory and constitutional limitations on local fiscal policy. These laws were designed to control and reduce property taxes, limit the growth of government and public spending, and improve fiscal accountability. For details on state-specific rules and general policy descriptions, see Mullins and Cox (1995). Preston and Ichniowski (1991), Joyce and Mullins (1991), Poterba and Rueben (1995), Figlio (1997), and Dye and McGuire (1997) study the effectiveness of these laws on government financing.

[2] The theoretical effects of community segregation on welfare and productivity are also discussed in Benabou (1993), Durlauf (1995,1996), Fernandez and Rogerson (1996), and Lundberg and Startz (1994).

[3] For a formal model, see Epple and Romer (1991).

[4] There is very little direct evidence on the impact of school quality on migration decisions. Jud and Bennett (1986) and Bartik, Butler, and Liu (1992) find that changes in local public school quality affect household mobility patterns. Furthermore, recent growth studies, such as (Glaeser et al 1992), argue educational spillovers can influence city formation and growth, suggesting a role for average education levels, and thus probably school quality, as an impetus to migration. Glaeser's model is tested and confirmed in Rauch (1993). In a similar vein, some researchers have tried to confirm the impact of local public service quality on housing prices. For example, Katz and Rosen (1987) find that community growth controls affect housing prices in a sample of San Francisco communities. A number of papers use whether fiscal services are capitalized into housing prices as a test of the Tiebout hypothesis. See Mieszkowski and Zodrow (1989) for a summary of the literature.

[5] See Mieszkowski and Zodrow (1989) for a detailed description and critique of the role of zoning and minimum income requirements in obtaining Tiebout equilibrium in multidistrict models.

[6] See Hanushek (1996), Card and Krueger (1992), Betts (1995a,1995b), and Altonji and Dunn (1996). Likewise, recent evidence on the impact of school finance reforms on student performance is mixed. Figlio (1997) finds that the performance of tenth graders is lower in states with revenue or expenditure limits, but, when controlling for unobserved jurisdictional effects, Downes, Dye, and McGuire (1998) find no decline in student performance. Card and Payne (1997) find a narrowing of test scores in states with successful school finance equalization litigation.

[7] I also combined the 1976 file with the 1970 census through the 1980 MARF3 file and a census file that matches 1970 and 1980 census tract numbers. However, I only have the full 1970 census for census tract areas and therefore must restrict the analysis to metropolitan area school districts. These results are discussed later.

[8] The income distributions are also calculated relative to an SMSA for urban school districts and the state non-SMSA income distribution for rural school districts. This has little effect on the main inferences.

[9] In 1980, the income categories from $0 to 30,000 are delineated by $2,500. Above $30,000, the categories are $30-35,000, $35-40,000, $40-50,000, $50-75,000, and $75,000 plus. In 1990, the categories are $0-5,000, $5-10,000, $10-50,000 delineated by $2,500, $50-55,000, $55-60,000, $60-75,000, $75-100,000, $100-125,000, $125-150,000, and $150,000 plus. The 1980 figures are adjusted to 1990 dollars.

[10] I thank Lew Segal for providing the maximum likelihood program used to compute log normal variances from the census income brackets. Alternative variance measures were also computed assuming uniform distribution within brackets and using the population mass directly above and below each income bracket as a weighting scheme.

[11] The estimating equation is obtained from a simple model of neighborhood demand. A household chooses a neighborhood that maximizes utility. The utility value is a function of neighborhood characteristics, the package of public services and taxes, and individual characteristics. The individual moves if utility in the new location exceeds utility in the old location plus the cost of moving. One can derive a model of the probability of choosing a particular community, conditional on the income of the household. In this paper, we use data on the fraction of individuals of each household income type that chooses each community. A model of aggregate demand can be developed by assuming demand in each community corresponds to a representative household. Although this is a common assumption, it is not innocuous if tastes are heterogeneous within communities. See Downes and Schoeman (1998) for a critique.

[12] The first stage regression results are reported for a few of these specifications in appendix 1. Comparable regressions have also been run on the top and bottom income decile of households. The results are similar although less precisely estimated.

[13] These data are taken from the 1982 and 1992 Statistical Abstracts.

[14] I also substituted the state dummy indicators for a measure of the change in the share of local revenues that are used to fund public school education. The inferences from this specification are similar to those in table 1. Decreasing local revenue share by ten percent increases the fraction of low income households in low income communities by 3.1 percent (standard error of 1.3 percent) and decreases the share of high income households in high income communities by 9.9 (2.4) percent.

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Table 1

Effect of State Reforms on School District Income Distributions [1]

Fraction Poor and Median Income in Poorer School Districts and Fraction Wealthy and Median Income in Wealthier School Districts

| | Growth in share of low income households who live in low income school districts [2] | | | | Growth in share of high income households who live in high income school districts [2] | | | | Growth in median household income | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lower half of school districts | | Lower quintile of school districts | | Upper half of school districts | | Upper quintile of school districts | | Lower half of school districts | | Upper half of school districts | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (14) |
| Court rulings: | | | | | | | | | | | | |
| Unconstitutional | 0.036 | 0.051 | 0.042 | 0.050 | -0.054 | -0.095 | -0.011 | -0.041 | -0.025 | -0.022 | -0.051 | -0.044 |
| | (0.056) | (0.055) | (0.064) | (0.064) | (0.071) | (0.074) | (0.082) | (0.083) | (0.062) | (0.059) | (0.062) | (0.062) |
| Upheld | 0.127 | 0.146 | 0.164 | 0.178 | -0.060 | -0.093 | 0.026 | -0.006 | -0.071 | -0.087 | 0.007 | -0.005 |
| | (0.053) | (0.051) | (0.061) | (0.058) | (0.067) | (0.068) | (0.077) | (0.076) | (0.059) | (0.054) | (0.060) | (0.057) |
| TEL | 0.030 | | 0.007 | | -0.125 | | -0.103 | | -0.009 | | -0.027 | |
| | (0.047) | | (0.054) | | (0.060) | | (0.068) | | (0.052) | | (0.053) | |
| Funding formula change increased equality | | -0.053 | | -0.058 | | -0.017 | | -0.039 | | 0.063 | | 0.003 |
| | | (0.035) | | (0.040) | | (0.047) | | (0.052) | | (0.037) | | (0.039) |
| Funding formula change effect is unknown | | -0.009 | | -0.047 | | -0.149 | | -0.137 | | 0.144 | | 0.120 |
| | | (0.078) | | (0.088) | | (0.104) | | (0.114) | | (0.084) | | (0.088) |

Notes:

[1] Parameters are derived from the two-stage estimator described in the text. The results reported are from a regression of the state dummy coefficients from a first stage regression on the reform indicators. All estimates follow the GLS method outlined in Borjas (1987).

[2] Share of low (high) income households are the fraction of households within a school district that are in the bottom (top) quintile of the state income distribution. Lower (upper) half and quintile of school districts are computed from a state's income distribution.

Table 2
Effect of State Reforms on School District Income Distributions [1]
Fraction Poor and Median Income in Poorer School Districts and Fraction Wealthy and Median Income in Wealthier School Districts
By Average House Value in School District

| | Growth in share of low income households who live in low income school districts [2] | | | | Growth in share of high income households who live in high income school districts [2] | | | |
|---|---|---|---|---|---|---|---|---|
| District income: | lower half | | lower half | | upper half | | upper half | |
| District house value: | lower half | | upper half | | lower half | | upper half | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Court rulings: | | | | | | | | |
| Unconstitutional | 0.029 | 0.044 | 0.070 | 0.086 | -0.007 | -0.041 | -0.047 | -0.086 |
| | (0.056) | (0.056) | (0.056) | (0.058) | (0.064) | (0.063) | (0.064) | (0.069) |
| Upheld | 0.131 | 0.147 | 0.097 | 0.117 | -0.128 | -0.144 | -0.023 | -0.058 |
| | (0.054) | (0.051) | (0.052) | (0.053) | (0.059) | (0.058) | (0.061) | (0.063) |
| TEL | 0.021 | | 0.047 | | -0.030 | | -0.134 | |
| | (0.048) | | (0.048) | | (0.055) | | (0.054) | |
| Funding formula change increased equality | | -0.057 | | -0.020 | | 0.042 | | -0.017 |
| | | (0.035) | | (0.037) | | (0.040) | | (0.043) |
| Funding formula change effect is unknown | | 0.005 | | -0.003 | | -0.135 | | -0.128 |
| | | (0.078) | | (0.076) | | (0.079) | | (0.095) |

Notes:
[1] Parameters are derived from the two-stage estimator described in the text. The results reported are from a regression of the state dummy coefficients from a first stage regression on the reform indicators. All estimates follow the GLS method outlined in Borjas (1987).
[2] Share of low (high) income households are the fraction of households within a school district that are in the bottom (top) quintile of the state income distribution. Lower (upper) half of school districts are computed from a state's income and housing value distribution.

Table 3
Effect of State Reforms on School District Income Distributions [1]
Household Income Variance

| | Growth in household income variance | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All school districts | | Lower half of school districts [2] | | Lower quintile of school districts [2] | | Upper half of school districts [2] | | Upper quintile of school districts [2] | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Court rulings: | | | | | | | | | | |
| Unconstitutional | -0.002 | -0.001 | -0.006 | -0.004 | -0.010 | -0.011 | -0.005 | -0.005 | 0.002 | 0.006 |
| | (0.016) | (0.017) | (0.019) | (0.019) | (0.026) | (0.026) | (0.018) | (0.018) | (0.020) | (0.020) |
| Upheld | -0.006 | -0.003 | 0.004 | 0.008 | 0.011 | 0.012 | -0.017 | -0.016 | -0.011 | -0.009 |
| | (0.016) | (0.015) | (0.018) | (0.017) | (0.024) | (0.024) | (0.017) | (0.016) | (0.019) | (0.019) |
| TEL | 0.009 | | 0.006 | | 0.000 | | 0.010 | | 0.010 | |
| | (0.014) | | (0.016) | | (0.022) | | (0.015) | | (0.017) | |
| Funding formula change increased equality | | 0.001 | | -0.008 | | -0.006 | | 0.011 | | 0.005 |
| | | (0.011) | | (0.012) | | (0.016) | | (0.011) | | (0.013) |
| Funding formula change effect is unknown | | -0.002 | | -0.010 | | -0.018 | | 0.004 | | 0.018 |
| | | (0.024) | | (0.026) | | (0.036) | | (0.025) | | (0.028) |

Notes:
[1] Parameters are derived from the two-stage estimator described in the text. The results reported are from a regression of the state dummy coefficients from a first stage regression on the reform indicators. All estimates follow the GLS method outlined in Borjas (1987).
[2] Share of low (high) income households are the fraction of households within a school district that are in the bottom (top) quintile of the state income distribution. Lower (upper) half and quintile of school districts are computed from a state's income distribution.

Table 4

Effect of State Reforms on School District Income Distributions [1]

Alternative School Finance Reform Categorizations

| | Low income sorting [2] | | High income sorting [2] | |
|---|---|---|---|---|
| | Lower half district | Lower quintile district | Upper half district | Upper quintile district |
| | (1) | (2) | (3) | (4) |
| 1. Downes and Shah (1995): | | | | |
| Court-mandated | -0.023 | -0.039 | -0.025 | -0.062 |
| | (0.058) | (0.068) | (0.073) | (0.079) |
| Legislature-mandated | 0.050 | 0.034 | -0.092 | -0.087 |
| | (0.051) | (0.059) | (0.064) | (0.069) |
| 2. Hoxby (1996): | | | | |
| Pro-spending | 0.067 | 0.014 | -0.102 | -0.050 |
| | (0.065) | (0.088) | (0.084) | (0.095) |
| Anti-spending | 0.185 | 0.164 | -0.165 | -0.093 |
| | (0.064) | (0.081) | (0.084) | (0.096) |

Notes:

[1] Parameters are derived from the two-stage estimator described in the text. The results reported are from a regression of the state dummy coefficients from a first stage regression on the reform indicators. All estimates follow the GLS method outlined in Borjas (1987).

[2] Share of low (high) income households are the fraction of households within a school district that are in the bottom (top) quintile of the state income distribution. Lower (upper) half and quintile of school districts are computed from a state's income distribution.

Table 5
Effect of State Reforms on School District Income Distributions [1]
Alternative TEL categorizations

| | Low income households in lower half of school districts [2] | | | | | High income households in upper half of school districts [2] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Court rulings: | | | | | | | | | | |
| Unconstitutional | 0.057 | 0.041 | 0.049 | 0.047 | 0.019 | -0.074 | -0.081 | -0.089 | -0.085 | -0.050 |
| | (0.056) | (0.054) | (0.055) | (0.052) | (0.055) | (0.075) | (0.073) | (0.074) | (0.072) | (0.073) |
| Upheld | 0.163 | 0.136 | 0.139 | 0.147 | 0.120 | -0.085 | -0.099 | -0.103 | -0.108 | -0.077 |
| | (0.054) | (0.050) | (0.051) | (0.048) | (0.050) | (0.074) | (0.068) | (0.068) | (0.068) | (0.067) |
| Overall property tax rate limits | -0.074 | | | | | -0.042 | | | | |
| | (0.056) | | | | | (0.077) | | | | |
| Specific property tax rate limits | | -0.050 | | | | | 0.025 | | | |
| | | (0.044) | | | | | (0.060) | | | |
| Property tax revenue limits | | | -0.045 | | | | | 0.054 | | |
| | | | (0.050) | | | | | (0.066) | | |
| Assessment increase limits | | | | 0.171 | | | | | -0.133 | |
| | | | | (0.074) | | | | | (0.104) | |
| General expenditure limits | | | | | 0.113 | | | | | -0.148 |
| | | | | | (0.060) | | | | | (0.080) |

Notes:
[1] Parameters are derived from the two-stage estimator described in the text. The results reported are from a regression of the state dummy coefficients from a first stage regression on the reform indicators. All estimates follow the GLS method outlined in Borjas (1987).
[2] Share of low (high) income households are the fraction of households within a school district that are in the bottom (top) quintile of the state income distribution. Lower (upper) half of school districts are computed from a state's income distribution.

Table 6

Effect of State Reforms on School District Income Distributions [1]

Fraction Poor and Median Income in Poorer School Districts and Fraction Wealthy and Median Income in Wealthier School Districts

IV Estimates [2]

| | Growth in share of low income households who live in low income school districts [3] | | | | Growth in share of high income households who live in high income school districts [3] | | | |
|---|---|---|---|---|---|---|---|---|
| | Lower half of school districts | | Lower quintile of school districts | | Upper half of school districts | | Upper quintile of school districts | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Court rulings: | | | | | | | | |
| Unconstitutional | 0.037 | 0.048 | 0.035 | 0.042 | -0.059 | -0.093 | -0.036 | -0.064 |
| | (0.060) | (0.059) | (0.067) | (0.066) | (0.077) | (0.079) | (0.083) | (0.085) |
| Upheld | 0.187 | 0.214 | 0.273 | 0.288 | 0.015 | -0.068 | 0.134 | 0.058 |
| | (0.086) | (0.076) | (0.095) | (0.085) | (0.110) | (0.103) | (0.119) | (0.111) |
| TEL | 0.012 | | -0.016 | | -0.168 | | -0.173 | |
| | (0.063) | | (0.071) | | (0.081) | | (0.087) | |
| Funding formula change increased equality | | -0.057 | | -0.064 | | -0.019 | | -0.042 |
| | | (0.036) | | (0.040) | | (0.048) | | (0.052) |
| Funding formula change effect is unknown | | -0.018 | | -0.063 | | -0.152 | | -0.148 |
| | | (0.079) | | (0.086) | | (0.106) | | (0.112) |

Notes:

[1] Parameters are derived from the two-stage estimator described in the text. The results reported are from a regression of the state dummy coefficients from a first stage regression on the reform indicators. All estimates follow the GLS method outlined in Borjas (1987).

[2] Court rulings and TEL variables are instrumented with the following variables: Three dummies corresponding to whether the state's constitution includes an education clause requiring equality, uniformity, or efficiency; regional dummies, the fraction of the state's population under 18 in 1970, the fraction of the state's population over 65 in 1970, whether the governor was a democrat in 1974, and the fraction of state senators that are democrats in 1974.

[3] Share of low (high) income households are the fraction of households within a school district that are in the bottom (top) quintile of the state income distribution. Lower (upper) half and quintile of school districts are computed from a state's income distribution.

Table 7
Effect of State Reforms on School District Income Distributions [1]
States with no court action prior to 1979 [2]

| | Growth in share of low income households who live in low income school districts [3] | | | | Growth in share of high income households who live in high income school districts [3] | | | |
|---|---|---|---|---|---|---|---|---|
| | Lower half of school districts | | Lower quintile of school districts | | Upper half of school districts | | Upper quintile of school districts | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Court rulings: | | | | | | | | |
| Unconstitutional | 0.031 | 0.059 | -0.014 | 0.008 | -0.068 | -0.118 | -0.149 | -0.180 |
| | (0.081) | (0.080) | (0.097) | (0.095) | (0.115) | (0.117) | (0.126) | (0.119) |
| Upheld | 0.098 | 0.146 | 0.147 | 0.190 | -0.041 | -0.065 | 0.015 | 0.031 |
| | (0.074) | (0.074) | (0.086) | (0.085) | (0.105) | (0.109) | (0.114) | (0.110) |
| TEL | 0.055 | | 0.009 | | -0.136 | | -0.067 | |
| | (0.064) | | (0.075) | | (0.091) | | (0.098) | |
| Funding formula change increased equality | | -0.082 | | -0.097 | | -0.005 | | -0.047 |
| | | (0.049) | | (0.057) | | (0.072) | | (0.073) |
| Funding formula change effect is unknown | | -0.003 | | -0.051 | | -0.203 | | -0.263 |
| | | (0.095) | | (0.108) | | (0.139) | | (0.139) |

Notes:

[1] Parameters are derived from the two-stage estimator described in the text. The results reported are from a regression of the state dummy coefficients from a first stage regression on the reform indicators. All estimates follow the GLS method outlined in Borjas (1987).

[2] This sample excludes 16 states (Arizona, California, Connecticut, Idaho, Kansas, Louisiana, Maryland, Michigan, Minnesota, New York, Oregon, Pennsylvania, Washington, West Virginia, and Wisconsin) because court decisions were reached prior to 1979.

[3] Share of low (high) income households are the fraction of households within a school district that are in the bottom (top) quintile of the state income distribution. Lower (upper) half and quintile of school districts are computed from a state's income distribution.

Table 8
Effect of State Reforms on School District Income Distributions [1]
1970 to 1990 Change in Income Homogeneity
Census Tract Sample

| | Growth in share of low income households who live in poorer half of school districts [2] | | | | Growth in share of high income households who live in wealthier half of school districts [2] | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Court rulings: | | | | | | | | |
| Unconstitutional | 0.064 | 0.062 | | | 0.035 | 0.041 | | |
| | (0.046) | (0.047) | | | (0.058) | (0.057) | | |
| Upheld | 0.085 | 0.097 | | | -0.002 | -0.013 | | |
| | (0.043) | (0.043) | | | (0.052) | (0.051) | | |
| Pro-Spending (Hoxby 96) | | | -0.091 | -0.102 | | | 0.111 | 0.105 |
| | | | (0.043) | (0.046) | | | (0.064) | (0.067) |
| Anti-Spending (Hoxby 96) | | | 0.151 | 0.151 | | | -0.025 | -0.022 |
| | | | (0.049) | (0.050) | | | (0.064) | (0.064) |
| TEL | 0.009 | | 0.013 | | -0.006 | | 0.008 | |
| | (0.037) | | (0.033) | | (0.046) | | (0.044) | |
| Funding formula change increased equality | | -0.013 | | 0.026 | | 0.003 | | -0.011 |
| | | (0.028) | | (0.025) | | (0.033) | | (0.034) |
| Funding formula change effect is unknown | | -0.086 | | -0.018 | | 0.123 | | 0.076 |
| | | (0.063) | | (0.056) | | (0.084) | | (0.082) |

Notes:

[1] Parameters are derived from the two-stage estimator described in the text. The results reported are from a regression of the state dummy coefficients from a first stage regression on the reform indicators. All estimates follow the GLS method outlined in Borjas (1987).

[2] Share of low (high) income households are the fraction of households within a school district that are in the bottom (top) quintile of the state income distribution. Lower (upper) half and quintile of school districts are computed from a state's income distribution.