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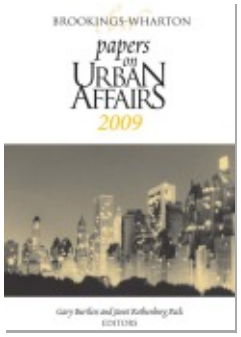

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The share of elderly households is expected to grow strongly in the United States during the next decades. Conventional wisdom, supported by recent research, suggests that spending on local public schools may decline in real terms as a growing percentage of elderly voters becomes more influential.[1]

However, recent research has found that elderly voters are willing to support education spending at the local level but are often opposed to additional state spending on schools.[2] Hilber and Mayer show that house prices may serve as a mechanism to encourage the elderly to support local spending.[3] They show that the percentage of elderly residents is positively associated with additional school spending in certain places where higher school spending raises local house prices. However, the elderly are negatively associated with school spending in places where land is freely available and changes in school spending are likely to have little effect on house prices. These findings imply that the elderly may have a negative effect on public school expenditure levels in locations where state policies (as opposed to local choices) are crucial in determin-

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1. Poterba (1997).
2. Harris and others (2001).
3. Hilber and Mayer (2002).

ing local spending on schools or in places where school spending is not strongly tied to house prices.

A second mechanism through which an increasing elderly population might not lead to drastic cuts in school spending is Tiebout sorting. For example, well-to-do households with children might choose to live in states that encourage local control over school spending. With local control, elderly households can live in communities that spend little on public schools, while households with children can live in places that have higher levels of school spending. In states with little local control of school spending, such sorting might be less effective in allowing households with children to choose communities with high levels of school spending. Thus states with less local control may be less attractive for middle- and high-income households with children. Alternatively, low-income households might choose to live in states with state funding of schools if such funding leads to additional redistribution. Similarly, elderly households would likely prefer to live in places that spend little on public schools.

Of course, much of the recent evidence on Tiebout sorting suggests that Tiebout sorting may not be as powerful a force with the strong rise in two-career couples and the dispersion of employment in rings at the periphery of metro areas. In this context, it is crucial to develop a better understanding of what factors affect the location decisions of households with children and the elderly.

We use recently enhanced U.S. Census microdata on states and census-designated places from the four censuses between 1970 and 2000 to examine changes in the concentration of households with children and the elderly. In the aggregate, the concentration of both groups of households across states has been little changed over the 1970 to 2000 time period. However, these aggregate statistics mask the fact that low-income households have become increasingly concentrated in a small number of states. A very different pattern emerges when one looks at household concentrations within each state. After weighting by the number of households, the data show a strong deconcentration of most household groups across places within each state. The extent of deconcentration is strongest for the elderly and nonwhite populations but is also strong for households with children and poor households with children (that is, households with children that have an income below 100 percent of the

poverty level). Such facts are consistent with the diminished importance of Tiebout sorting at the local level.

Next, we consider how "reforms" in state educational spending policies have affected household location choices. State educational spending policies determine the constraints that local governments face in providing local school services. Although some U.S. states have removed school spending authority from local residents, others encourage local control, potentially leading to Tiebout sorting and maintaining the incentive of residents to support their local schools in order to raise their own house prices. Our results indicate that states with local control and limited redistribution are attractive for middle- and high-income households but not for low-income households. However, in states with significant redistribution mechanisms, nonpoor households with children and elderly have fewer incentives to avoid low-income places and public schools in those places, leading to less concentration of poor households and to less separation of young and elderly. These results indicate that the incidence and overall funding of school services matter for residential location choices in a manner consistent with Tiebout sorting.

Background and Theoretical Predictions

Our analysis is founded on a broad literature that describes the issues that relate household sorting and school finance reforms and also assesses the impact of changes in school funding on performance. This research provides the rationale for our theoretical predictions, which propose that school finances should affect household location choices.

Tiebout Sorting and Household Location Decisions

The seminal work of Tiebout serves as a beginning for most papers that examine issues relating to household location.[4] Tiebout points out that individuals should sort themselves across local jurisdictions according to their local public good preferences. Tiebout's controversial hypothesis is that under certain conditions (for example, free mobility

4. Tiebout (1956).

and a large number of local jurisdictions), voting-with-the-feet leads to an efficient provision of local public goods. While the Tiebout hypothesis has been criticized on theoretical grounds based on the strong assumptions needed to derive his results, common wisdom holds that community selection is driven by the same factors that Tiebout noted in his original paper, including the local package of public services (for example, the quality of local public school services) and taxes.[5]

Most empirical research has found evidence of at least some Tiebout sorting, but most papers also conclude that Tiebout sorting is not the only factor that explains where households live. Eberts and Gronberg show that as the number of school districts in metropolitan areas increases, the districts become more homogenous in income, an important prediction of the Tiebout model**.** Gramlich and Rubinfeld find that the variance in the willingness to pay for local public services is smaller within individual jurisdictions than for state-level populations, another implication from Tiebout. Hoyt and Rosenthal argue that if households sort efficiently across locations, then at a given location households receive the same marginal benefit from locational amenities. In testing the latter proposition, the authors find empirical evidence that is consistent with Tiebout sorting but also that households do not perfectly efficiently sort across locations on the basis of their preferences for local amenities alone. Finally, Rhode and Strumpf examine whether local policies are the dominant motive for residential location choices.[6] They argue that if Tiebout sorting is the dominant motive for residential choice, then the secular decline in mobility costs should lead to greater stratification. Their results, based on across-community heterogeneity between 1850 and 1990, suggest that Tiebout sorting has been historically overwhelmed by forces reducing across-community heterogeneity.

These results imply that factors other than local public services and taxes appear to affect residential location choices. For example, Topel and Ward show that households select communities based on employment opportunities. Costa and Kahn provide evidence that college-educated couples increasingly locate in large metropolitan areas (MSAs).[7]

5. See, for example, Bewley (1981); Epple and Zelenitz (1981); Henderson (1985), for theoretical criticism. See also, for example, Epple and Romer (1991); Fernandez and Rogerson (1998); Hoxby (1999, 2000); Nechyba (1999 and 2000).

6. Rhode and Strumpf (2003); Eberts and Gronberg (1981); Gramlich and Rubinfeld (1982); Hoyt and Rosenthal (1997).

7. Topel and Ward (1992); Costa and Kahn (2000).

They argue that this increase in dual-career households in large MSAs can be explained primarily by collocation problems. More generally, changes in the dispersion of employment affect the extent of sorting.

Evidence also shows that households tend to cluster in social groups with similar ethnicity or education. For example, Mincer demonstrates that the proximity to members of the same ethnic group and to family and friends has a strong impact on residential location decisions. Massey and Espana show that this factor is particularly strong for recent immigrants, who tend to locate in ethnic enclaves within metropolitan areas, possibly because of extensive links that are introduced through family ties and ethnic networks. Thus changes in the inflow of recent immigrants are likely to affect sorting outcomes (that is, measures of concentration or segregation respectively). Van Hook and Balistreri provide evidence for California that changes in the student composition have disproportionately occurred in schools attended by Spanish-speaking limited English-proficient students as a result of district-level patterns of segregation by income, race and ethnicity, and language.[8]

Other papers investigate the effects of Tiebout sorting on redistribution.[9] Utilizing a model that assumes free household mobility, Epple and Romer demonstrate that local redistribution induces household sorting, with the poorest households located in the communities that provide the most redistribution. Although the threat of outmigration affects the potential for redistribution, their results imply that local redistribution is nonetheless feasible. On the empirical side, Kremer examines the claims that Americans are increasingly sorting into internally homogenous neighborhoods and schools, and that this sorting has led to increasing inequality. He finds that neighborhood sorting has been stable or decreasing historically and that sorting has limited effect on inequality. This contrasts to propositions of a couple of theoretical studies, which suggest that America may be caught in a vicious cycle of increasing sorting and inequality.[10]

Finally, a growing literature explores the relationship between household sorting, efficiency, and inequality in the context of the American school finance equalization (SFE) reform. According to Hoxby, SFE has

8. Mincer (1978); Massey and Espana (1987); Van Hook and Balistreri (2002).

9. For an early discussion see Oates (1972).

10. Epple and Romer (1991); Kremer (1997). For theroretical studies on sorting and inequality see Bénabou (1993, 1996); Fernandez and Rogerson (2001).

affected American schools more than any other reform during the past thirty years.[11] Not only does SFE affect the efficiency of the provision of public school services, it also determines how school spending and taxes are distributed across students.[12] Importantly, the redistribution characteristic of the SFE may also affect migration patterns and the extent of segregation of low- and high-income households or the segregation of young and elderly. While the impact of SFE on school choice, per pupil spending, property prices, efficiency, school productivity, and inequality has recently been studied more widely, to our knowledge there is no empirical study of the effects of SFE on actual sorting outcomes, in particular, on sorting of different income and age groups.[13]

School Spending and Outcomes

Our analysis implicitly assumes that school expenditures are related to learning outcomes of pupils or provide other benefits that matter to parents and homeowners. If this assumption holds, school financing rules that influence local public school expenditures should therefore have an effect on the quality of local public school services. School financing rules would also matter for residential location choices, in particular, for location choices of parents of preschool and school-aged children. Whether school resources are indeed related to perceived learning outcomes is a disputed research question.[14] The disagreement arises in large part because researchers focus on different measures of school performance.

Studies that focus on achievements of children *while they are in school* generally find no powerful evidence that school spending is closely linked to student progress.[15] This puzzling finding may be due to wasteful spending. However, measurement issues provide a plausible alternative explanation. Test scores—the key measure of student achievement—are indeed a quite imperfect measure of effective student out-

11. Hoxby (2001).

12. Hoxby (2001) notes that SFE "differs from conventional redistribution because it is based on property values, which are endogenous to the school's productivity, taste for education, and the school finance system itself."

13. Downes and Schoenman (1998); Fernandez and Rogerson (1998); Hoxby (2000, 2001).

14. For an excellent review of this research question see Burtless (1996).

15. See the metaanalysis by Hanushek (1986).

comes. This is partly because of the "teaching to the test problematic" and partly because test scores do not capture many factors that are most relevant to parents. Examples are the overall happiness of children, their "preparedness for life," the long-term success of the youngsters in the professional world, the provision of arts and music classes, the range of sporting events and quality of sport facilities, or the availability of school dining halls during lunch time. These factors may be more closely linked to school expenditures than are test scores, which may be influenced by parental education and social factors.

Problems with test scores as a measure of school value-added are illustrated by more recent studies that look at the impact of school inputs and education expenditures on students' earnings *after their formal schooling has ended*.[16] While wages of graduates are also imperfect measures of student outcomes (for example, they do not capture the happiness of children while they are in school), they at least measure the market value of the accumulated human capital investment. This is arguably a more inclusive measure than test scores, which merely measure the ability to perform well in a standardized test at a given time during school life. The above mentioned studies that look at graduates' earnings generally find a much stronger link between school resources and schooling outcomes.

Another way to discern how school spending might influence the location decisions of potential residents is to look at whether school spending affects house values using evidence from state-level reforms that affect local spending on schools. Barrow and Rouse show that, on average, additional state aid is valued by potential residents. Similarly, Bradbury, Mayer, and Case use evidence from a property tax limit in Massachusetts, Proposition 2½, to demonstrate that increases in school spending lead to gains in property values, suggesting that additional school spending is valued by marginal homebuyers.[17]

Overall, we view the empirical evidence as supporting the implicit assumption that school resources have a positive impact on the utility of households with children, by improving the quality of local school services or providing other services that parents value. Thus school finance rules may potentially also be important for household location choices.

16. For example, Card and Krueger (1992a ,1992b,1996a ,1996b).
17. Barrow and Rouse (2004); Bradbury, Mayer, and Case (2001).

Theoretical Predictions

Our *first hypothesis* is that states with local control and limited redistribution are attractive for middle- and high-income households but not for low-income households. The *second hypothesis* is that in states with significant redistribution mechanisms, nonpoor households with children and elderly have fewer incentives to avoid low-income places, leading to less concentration of poor households and to less separation of young and elderly. The justification for this hypothesis is that redistribution is borne by all residents of the state and not only by the residents of the local jurisdictions that have an overproportional share of households with children in poverty. The *third hypothesis* is that in states with significant redistribution, nonpoor households with children have fewer incentives to avoid public schools. While these three hypotheses are suggested by some theoretical work, we should note that theory does not necessarily generate unambiguous predictions.

The theoretical analysis of parental school choices is complex because several decision processes are involved and because of interdependencies between individual choices and the overall economic and institutional setting. Nechyba identifies four factors that complicate the analysis. First, parental choices involve judgments about school production functions. Second, choices of residential location often determine the access to primary and secondary schools.[18] Third, private schools offer an alternative to public schools that are linked to the housing markets. And fourth, households may face credit constraints that may not permit them to borrow against human capital investment.

Recently, computer simulation analysis has emerged to help deal with the complexity of general equilibrium models of school finance.[19] Although simulation models are helpful in clarifying important theoretical and quantitative issues, they depend critically on the appropriate assumptions, and different simulations therefore often have diverging outcomes.

One result is especially relevant to our work. Nechyba analyzes the impact of public school financing rules on private school attendance.[20]

18. Nechyba (2003a).
19. See Nechyba (2003a) for a detailed discussion of this research area.
20. Nechyba (2003b).

The theoretical framework points to two distinct effects when pure local and pure state financing are compared. First, state funding has a "direct" (or partial equilibrium) effect on private school attendance; it leads to lower private school attendance in poorer districts where school resources increase (hypothesis 3) and to higher private school attendance in wealthier districts where school resources decrease. Second, an "indirect" (general equilibrium) effect emerges as state financing leads to an increase in the opportunity cost of private school attendees choosing to locate in poor communities in order to take advantage of low-cost housing and low property taxes. Nechyba differentiates between pure state financing and block grants.[21] On balance, the simulations suggest that private school enrollments fall more steeply under block grants (which allow local discretion to spend beyond the grant) than under pure state financing. However, that result is sensitive to particular assumptions. If centralization involves matching grants, then a price subsidy effect emerges, which leads to a further decline in private school attendance.

Overall, Nechyba's simulations suggest that centralization leads to a decrease in private school attendance as stated in hypothesis 3. However, these simulations do not take into account that school finance equalization leads to a decrease in Tiebout choice and therefore may lead to a decrease in the responsiveness to local concerns (that is, a decrease in the efficiency of resource use), which may in turn increase private school attendance.[22] This example illustrates the inherent difficulty of formulating theoretically unambiguous predictions. With this caveat in mind, we describe our empirical findings, which are consistent with the three hypotheses just stated.

Empirical Analysis

Our data are derived from three major sources. The first source is a package of CD-ROMs, compiled by GeoLytics, with long-form data from the 1970, 1980, 1990, and 2000 Decennial Censuses of Housing

21. Nechyba (2003b).

22. Nechyba (2003b). In fact, a decline in responsiveness to local concerns owing to state equalization may explain the empirically documented increase in private school attendance in California after its school finance reform. Downes and Greenstein (1996) and Downes and Schoenman (1998) provide empirical evidence that California's school finance equalization reform was followed by an increase in private school attendance.

and Population. The second source is the Tax Foundation's publication *Facts and Figures on Government Finances*.[23] Finally, we use school finance reform data as reported in table 1 from Hoxby.[24]

The U.S. Census data are compiled on two geographic levels—U.S. states and places. The GeoLytics CD-ROMs have data for all places for the census years 1980, 1990, and 2000. For the census year 1970, the CD-ROMs only include 6,963 (out of 20,768) places. However, these 6,963 places account for more than 95 percent of the U.S. population. To achieve comparability across the years, we limit the sample to the 5,939 places that have data from each of the four censuses. One can assess how representative this sample is by considering that in 2000 there are 161 million people living in those places, 206 million people in all the places, and 281 million people in the entire United States. In earlier years, these places represent a much higher percentage of the U.S. population. As a robustness check, we have performed the regressions reported with the full (unbalanced) sample of all places in each census year but find our conclusions are unchanged.

We examine two different types of household sorting: net flows of various types of households across states and the concentration of households within states. As noted, educational funding reforms may cause households to move to different states or to concentrate in a few places within a state. To measure the state-level concentration of households, we compute Herfindahl indexes from the places dataset. For example, the concentration of elderly in a state is derived by summing across all places in each state the squared market share of elderly households in each place. The market share of elderly households is the percentage of the state's total elderly households living in each place. The Herfindahl index has the advantage of being invariant to changes in the actual number of elderly households in a state over time. So if the number of elderly households in a state doubles, but each place gets its proportional share of the new elderly households, then the Herfindahl index will remain unchanged.

The Tax Foundation publication is used to obtain data on public elementary and secondary school revenues and expenditure for each state.

23. The Tax Foundation publishes this unique one-volume resource on government taxing and spending regularly since 1941. We use several editions to derive data on public elementary and secondary school revenues and expenditure for each state and for the school years that come closest to the 1970, 1980, and 1990 census years.

24. Hoxby (2001). See "Limitations to the Analysis" for a discussion of the appropriateness of using these measures.

The revenue data consist of series for federal, state, and local funding sources, and those are for the 1971–72, 1980–81, and 1991–92 school years. The expenditure data include current spending, capital outlay, and interest payments for the 1969–70, 1980–81, and 1990–91 school years. We use current spending to compute per pupil spending, recognizing the lumpiness of capital spending over time and across places. Unfortunately, the revenues and the expenditure series are discontinued in the latest edition of *Facts and Figures on Government Finances*. However, we are able to extend the series to the 2000–01 school year by including data available on the Census Bureau website. The Census Bureau is the original source of information for the Tax Foundation's publication, and we have verified consistency by comparing data in both sources from the early 1990s.

We also use various school funding equalization (SFE) measures from table 1 in Hoxby including the minimum and maximum inverted tax price and median foundation tax rate.[25] The inverted tax price is defined as the amount that actual school spending increases for the marginal dollar of revenue raised. For example, a value less than one implies that if a school district raises one dollar, it gets to spend less than a dollar because the state government taxes some of the revenue raised, while a value greater than one suggests that the state subsidizes local expenditures by providing a partial matching of revenues raised. The minimum value is the lowest value of the inverted tax price among all districts in the state, while the maximum is the largest value. Note that the actual values reflect endogenous responses by districts that face sometimes complicated formulas that determine state funding or taxation of local budgets. Nonetheless, there is substantial variation in these inverted tax prices; some states such as California, Hawaii, and New Mexico enact reforms that essentially tax all revenues raised by districts that exceed the state-mandated floor. Other states provide large matching subsidies for the poorer districts.

The median foundation tax rate is a state-mandated floor to the property tax rate that all districts must follow. A higher value of the foundation tax rate implies that all districts must provide relatively large amounts of funds for local schools and limits the gains from Tiebout sorting. That is, even if the elderly concentrate in a few districts, they cannot

25. Hoxby (2001).

cut school spending as a percentage of property values below the foundation tax rate.[26]

Nominal values for all variables are converted into constant 1992 dollars by using the implicit price deflator for state and local government purchases, as reported in the 1996 and 2003 *Economic Report of the President*.

Finally, we use the percentage of a state's residents that are foreign born from the U.S. Census. This measure proxies for immigrants who may be more likely to be concentrated in places with other immigrants and may also have more children and be poorer relative to the overall U.S. population. Other measures of social similarity were not available for all four census years (partly because of definition changes) or turned out to be statistically completely irrelevant (for example, the percentage of nonwhites).

The final dataset includes 200 observations, one observation for each of the 50 U.S. states and one for each of the four census years 1970, 1980, 1990, and 2000. Summary statistics are presented in table 1. Overall, the average district spends about $4,200 (constant 1992 dollars). While approximately equal amounts of that spending are funded from state and local sources, there is appreciable variation, so some districts receive virtually all of their revenue from state sources, while other districts receive almost all funding from local taxes and fees. Much of that variation across districts is because of differences in state policies on school funding. The concentration measures show that poor households with children (that is, households with income below 100 percent of the poverty line that have at least one child under 18 years) are relatively more concentrated within states than all households with children or elderly households (that is, households with at least one householder older than 64 years). Nearly 40 percent of all households have at least one child under 18 years old, and about one in eight households with children is below the poverty line. Nearly 12 percent of all children attend private schools. About 20 percent of all households have an elderly householder.

Table 2 examines aggregate trends over time in basic demographics, school spending, and private school enrollments. Notice that the percent-

26. For the two states excluded from table 1 in Hoxby (2001), Alaska and Colorado, the minimum/maximum inverted tax price is set to one and the median foundation tax rate to zero.

Table 1. Variable List and Means, All 50 U.S. States, 1970–2000
$N = 200$

Variable	*Mean*	*Standard deviation*	*Minimum*	*Maximum*
Share of school funding from state sources	0.443	0.173	0.053	0.887
Share of school funding from local sources	0.472	0.199	0.001	0.939
Concentration of households with children	0.096	0.086	0.014	0.520
Concentration of poor households with children (household income <100% of poverty level)	0.138	0.119	0.025	0.552
Concentration of households with an elderly householder	0.106	0.097	0.011	0.491
Concentration of nonwhite population	0.216	0.160	0.021	0.738
Concentration of foreign-born population	0.151	0.121	0.025	0.657
Minimum inverted tax price	0.921	0.240	0	1
Maximum inverted tax price	1.028	0.328	0	1.96
Median foundation tax rate, in 1/1000ths	11.99	10.85	0	48
Per pupil school spending	4,199	1,628	1,708	9,392
Share of private school enrollment (among school-aged children)	0.117	0.043	0.031	0.208
Share of foreign-born population (among all households)	0.049	0.045	0.005	0.262
Share of households with children (among all households)	0.389	0.058	0.281	0.574
Share of poor households with children (among all households)	0.053	0.021	0.023	0.158
Share of households with an elderly householder (among all households)	0.205	0.035	0.052	0.289

Source: For all tables in this chapter see text and notes 23 and 24.

Notes: Monetary values are reported in 1992 dollars by using the National Income and Product Accounts deflator for government purchases of goods and services. The sample consists of all the states for the years 1970, 1980, 1990, and 2000.

Table 2. Aggregate Trends

	Averages across states			*Weighted averages across states*		
Census year	*Share of households with children*	*Share of poor households with children*	*Share of households with elderly householder*	*Per pupil school spending (dollars)*	*Share of private school enrollment*	*Share of school funding from local sources*
1970	0.446	0.055	0.195	2,781	0.123	0.507
1980	0.401	0.052	0.201	3,492	0.133	0.422
1990	0.341	0.054	0.218	5,250	0.128	0.323
2000	0.334	0.049	0.211	6,022	0.137	0.530

Note: Averages and weighted averages across states. The weight used is the number of children (0–17 years old).

ages of households with children and an elderly householder are calculated based on (unweighted) averages across states to capture the effect of demographics in the average state. Changing demographics owing to the baby boom or bust and the aging population are clear in the data. The percentage of households with children has fallen appreciably since 1970 from 45 percent to 33 percent of all households in 2000. Yet the percentage of poor households with children has fallen only slightly. However, the data show only modest growth in the percentage of households with an elderly householder. The next three columns are weighted by the number of children to represent aggregate U.S. trends in schooling. Despite the fact that real per pupil spending has more than doubled, the percentage of private school enrollment is rising over time, suggesting some dissatisfaction with public schools for some parents. Of additional interest is the strong time-series variation in the sources of local school funding. Although the percentage of funds coming from local sources fell from 1970 to 1990, it grew appreciably between 1990 and 2000, possibly caused by the strong across-the-board increase in house prices during the most recent decade, leading to a rise in property tax collections in many local communities.

To get a sense of how the number of elderly households and the shrinking number of households with children are distributed around the country, tables 3 and 4 examine time trends in sorting within and across states. Of particular interest, table 3 shows that the concentration of all household types within states has fallen appreciably between 1970 and 2000, suggesting that Tiebout sorting has become much less important for both elderly households and households with children. This observation is consistent with long-run trends in Tiebout sorting as documented by Rhode and Strumpf.[27] However, the data show that the within-state concentrations have fallen fastest for elderly households, suggesting that employment-based explanations like increasing dispersion of jobs across the MSA and the growth of dual-career couples are not the only factors that are driving reduced Tiebout sorting.

While sorting within states has been falling, sorting across states has remained relatively unchanged for households with children and elderly households over the same period. (See table 4, which computes the Herfindahl measure based on state market shares of various household

27. Rhode and Strumpf (2003).

Table 3. Concentration of Household Types within States

Census year	*Households with children*	*Poor households with children*	*Households with elderly householder*	*Nonwhite population*	*Foreign-born population*
1970	0.090	0.162	0.116	0.305	0.179
1980	0.080	0.153	0.091	0.237	0.152
1990	0.075	0.133	0.077	0.203	0.150
2000	0.074	0.127	0.069	0.166	0.140

Note: Concentration measure is weighted Herfindahl index averages across states. The weight used is the number of households.

Table 4. Concentration of Household Types across States

Census year	*Households with children*	*Poor households with children*	*Households with elderly householder*	*Nonwhite population*	*Foreign-born population*
1970	0.042	0.039	0.042	0.045	0.159
1980	0.040	0.042	0.041	0.056	0.143
1990	0.042	0.045	0.041	0.068	0.149
2000	0.043	0.051	0.041	0.069	0.154

Note: Concentration measure is Herfindahl index.

groups using the national total of each group by year.) Note that these numbers mask significant variation in overall population growth rates, which vary widely across states. The data indicate that growing states appear to have proportional increases (or decreases) in households with children and elderly households relative to national percentages of each of these groups. However, the aggregate stability in sorting across states does not hold for poor households with children and nonwhite households. These subgroups have become much more concentrated in some states relative to others.

Limitations to the Analysis

A limitation to our analysis is based on the fact that we rely on aggregate data. In this context, we want to clarify that our state equalization variables are quite imperfect measures of the impact of school finance equalization on location choices. As noted by Hoxby, the maximum and minimum inverted tax price and the median foundation tax rate do not fully describe SFE schemes.[28] That is, these variables do not adequately

28. Hoxby (2001).

describe the variation in how tax prices and foundation tax rates are distributed within each state. The utilized SFE measures also do not reveal information about flat grants and school-related income and sales taxes. Furthermore, the utilized SFE measures incorporate the endogenous responses of school districts, an issue that also potentially affects most other analyses using state-level policies such as SFEs.

An analysis using more disaggregated data (including school finance variables measured at the school district level rather than at the state level) might be more revealing and would likely generate more robust results. This is partly because of more precise measurement of SFE schemes and partly because it would provide greater degrees of freedom to carry out more specific empirical tests. For example, a much larger sample size might provide enough degrees of freedom to address the policy endogeneity issue by comparing court-ordered versus legislative SFE reforms or by applying an instrumental variable strategy.[29]

However, it is important to note that—as our empirical analysis reveals—even these rough measures of state-level SFE schemes have an economically and statistically significant effect on residential location outcomes within and between states. Data limitations may mitigate the estimated effects of SFE on residential location choices, but they do not eliminate them.

Results

In examining whether trends in school finance equalizations can help explain the patterns described earlier we begin by considering whether states that enact SFEs that allow for more local control over school spending have a greater degree of within-state sorting compared with states that give local school districts relatively little control over school spending. As noted, the benefits of sorting may be stronger in states where local communities can appreciably vary the public services tax and expenditure bundle to address the desires of local residents. Table A-1 in the appendix to this chapter presents regressions that examine the determinants of concentration (Herfindahl indexes) for three types of households: households with children, poor households with children,

29. We intend to address the outlined data limitations and endogeneity issues in future research.

and elderly households.[30] All regressions are at the state level and include state and year fixed effects. We include three measures of local control, along with the percentage of a state's residents who are foreign born. The latter variable serves as a proxy for the location decisions of immigrants, who may be more likely to concentrate in places with other immigrants.

Our results are consistent with the view that less local control leads to a smaller degree of Tiebout sorting. The first column presents results for the concentration of households with children. States that enacted SFEs with high foundation tax rates, which set a floor on the amount of money districts must spend on schools, have much lower concentrations of households with children. The magnitudes of the effects are fairly large. A state that increased its foundation tax rate from 0 to the sample average of 12 would have seen a decrease in concentration of about 0.0065, or more than 40 percent of the decline in within-state concentration of households with children that was observed in the United States between 1970 and 2000. For states that enacted the highest foundation tax rates (Arizona, 47 percent, and New Mexico, 48 percent), these results suggest very high deconcentrations of households with children. These results are intuitively appealing. Suppose a household with children was considering where to live within a metro area. In many cases, households face a trade-off between being closer to work or living in a school district that provides strong support for schools. A high foundation tax rate will equalize spending across districts, so it is easier for households with children to locate in communities based on nonschool reasons, including proximity to employment or locational amenities such as lakes, theaters, museums, or good restaurants.

For poor households with children, redistribution appears more important than a floor on the overall property tax rate. In states with a higher maximum inverted tax price, which is an indicator of redistribution inherent in the SFE, poorer households are less concentrated. To understand this behavior, one might think about the location decisions of middle- or upper-income households. These well-to-do households are more likely to avoid living in communities where there are poor households if the local taxes of the wealthier households effectively subsidize the school services

30. Data on high-income households are not available for all four census years. Thus, unfortunately, we cannot examine the determinants of concentration for this particular household type.

utilized by the children of poor households. However, if the state government provides subsidies to schools based on the number or percentage of poor households, wealthier households—that for some reason have chosen to live in a state with equalization mechanisms in the first place—may not have the same strong economic incentives to avoid locations where poor households locate, at least not because of any fiscal externality.

Finally, for elderly households, concentration is negatively related to both the maximum inverted tax price and the minimum foundation tax rate. As with other households, the benefits from Tiebout sorting are reduced if the state requires all school districts to substantially fund public schools and provides state funds to subsidize school districts with many poor households. One might easily interpret this finding to suggest that elderly households have greater incentive to sort when communities have more flexibility to reduce school spending or when redistribution is greater so that local residents face less of a burden to fund schools for poor households with children.

Next we examine a second margin that might be affected by SFEs: the percentage of a state's school-aged children that attend private schools. Private schools are, after all, an alternative to Tiebout sorting. We regress the percentage of private school enrollment on our three SFE variables and year and state fixed effects. The results, shown in table A-2, are consistent with our previous findings and the predictions in Nechyba's work. Private school attendance is negatively related to the maximum inverted tax price and the minimum foundation tax rate in regressions that include state and year fixed effects. These results suggest that SFEs that ensure adequate local school funding and have an element of redistribution can result in a lower concentration of households with children, especially poor households, and also result in an increased attendance in public schools relative to private schools. These findings get even stronger when we control for the level of real per pupil spending, an attempt to control for the possibility that private school attendance might also be related to the overall school spending in a state, and the percentage of foreign-born individuals in column 2. The quantitative effects are significant. Based on more conservative estimates in column 1, an increase in the maximum inverted tax price of one standard deviation (0.33) reduces private school enrollment by about 0.5 percentage point (0.53 percentage point based on estimates in column 1) or by about 4.4 percent (4.7 percent). The same one-standard deviation increase in the median founda-

tion tax rate (11/1000ths) reduces private school enrollment by 0.58 percentage point (0.73 percentage point) or about 5.2 percent (6.6 percent).

Our findings so far have examined the extent to which SFEs have an impact on the concentration of various types of households within states. We also consider whether SFEs result in net flows on households between states. To do this, we regress the percentage change in the number of households with children on the change in variables related to SFEs, the lagged amount of per pupil spending, and the percentage change in all households. The latter variable controls for non-school-related factors that can influence mobility decisions. For example, we know that strong employment growth, climate, concentrations of immigrants, and land availability lead southern and western states to have strong growth in population. Effectively, we want to examine how SFEs impact the location decisions of households with children, holding the movements of all households constant. In all of our regressions, the coefficient on percentage change in all households is very close to one (we cannot reject that the coefficient is different from one), as one might expect if the baseline impact of mobility is the same for households with children as for all households. This coefficient is not surprising given that aggregate concentrations of households with children across states are virtually unchanged over the 1970–2000 time period.

The results in table A-3 show that households with children tend to locate in states where local revenues fund a greater percentage of total school spending (relative to federal and state sources of revenue). At first these results might be surprising in that one might have expected that households with children would have preferred states that provided much of the funding at the state level, effectively reducing the incidence of school spending on local communities. However, these findings are consistent with previous research showing that places that rely on local funding may provide greater funding than locations that rely on funding that comes from higher levels of government.[31] We include the lagged real per pupil spending as an indicator of overall support for education so that we do not confuse the ability of communities to vary the local level of spending with the amount of aggregate spending.[32] Unfortunately, the

31. See Fischel (2001) and Hilber and Mayer (2002), for example.

32. Of course, we would prefer to directly control for the current amount of per pupil spending, but current per pupil spending is likely endogenous, and our data do not provide any effective instrument.

overall level of school spending in a state is likely to be endogenously determined with the relative numbers of households with children that move into the state, so we cannot include the current level of spending. The results show that a one-standard-deviation increase in the percentage of school funding that comes from local sources (20 percent) would result in an increase in net migration of households with children relative to all households of about 0.6 percent, which is equivalent to the estimated effect of an additional $909 of lagged per pupil school spending, a relatively large number. SFE indicators such as maximum inverted tax price and minimum foundation tax rate seem to have little impact on the relative locations of households with children across states.

Next we examine whether the impact of SFE variables is stronger when overall school spending is higher. In column 2, we interact the SFE and percentage of local funding variables with the lagged level of per pupil spending. The results suggest that the estimated impact of greater local control is much larger in states where per pupil spending is high (that is, the interaction between change in percentage of school funding from local sources and lagged per pupil spending is positive). Other interactions with SFE variables are not close to being significantly different from zero.

In column 3, we conduct a robustness check by including state fixed effects in place of the variable for percentage change in all households out of concern for possible endogeneity in the flow of all households. The results are reassuring. While this regression has a much worse fit (lower R^2) than the equivalent regression in column 1, the coefficient on percentage change in local funding is nearly unchanged. However, the standard errors of the individual point estimates rise so that the coefficient is no longer statistically different from zero.

Our final examination in table A-4 conducts the same regressions as in table A-3, except that we replace the dependent variable with the percentage change in poor households with children. Our hope is to see if SFEs or sources of school funding help explain the sharp rise in the state-level concentration of poor households with children (table 4). These regressions give some additional insights into the factors that affect the net flows of poor households with children and suggest that SFEs have had a modest impact on the relative household location decisions of poor households with children. As with all households with children, poor households with children tend to migrate to states with higher levels of

lagged real school spending, although the coefficient is lower for poor households with children than for all households with children. In addition, households with children appear to favor states with a relatively high minimum foundation tax rate. The estimated impact of a one-standard-deviation increase in the minimum foundation tax rate is about the same as a $1,000 increase in lagged real per pupil spending. Given that a high minimum foundation tax rate leads to a lower concentration of poor households with children within a state, we should not be surprised that poor households with children find states with a high minimum foundation tax rate relatively attractive when they are choosing where to live.

The additional regressions in the next two columns provide few new insights. The interactions of SFE variables with lagged real per pupil spending do not provide additional insights for poor households with children in column 2. In column 3, the coefficients on other variables again are smaller but relatively stable when we use state fixed effects instead of the percentage change in all households to control for other factors affecting migration across states.

Conclusion

Our empirical evidence shows that state-imposed redistribution through school funding equalization affects the location choices of households, consistent with the Tiebout model. States with policies that place a high floor on the spending of local schools—a high foundation tax rate—have less sorting of households with children. States that provide redistribution in the form of tax-subsidized inducements to districts with poorer students—a high maximum inverted tax price for expenditures—have less sorting of poor households with children. Both redistribution and a floor on spending reduce the sorting of the elderly. We also show that the same factors that reduce sorting are also associated with decreased private school enrollments.

Next we examine mobility across states and demonstrate that school funding policies have an impact on the net migration of households with children relative to all households. Not surprisingly, households with children are attracted to states with higher spending levels and also to states where more of the funding comes from local (rather than state or federal) sources. Poor households with children also move to states with

high per pupil expenditures and to states that have a high foundation tax rate. The latter may well be attractive to poor households with children because it is associated with reduced sorting of poor households at the local level.

Similar to Rhode and Strumpf, we show that Tiebout sorting by many household characteristics has been decreasing over time.[33] However, our results differ in emphasis from those in Rhode and Strumpf in that we find that local public schools are an important factor in determining the residential location choice.[34] The fact that public school funding plays a role in household location decisions may help explain the reduced Tiebout sorting that has taken place during the past three decades. After all, many states have passed school finance equalization packages, which, according to our results, lead to reduced concentration of elderly households, households with children, and poor households with children.

The finding that local public school services—and more specifically school funding equalization—matter for the residential location choice has broader policy implications when we consider the impact of a growing elderly population. Tiebout sorting provides a mechanism through which households with children can choose to live in communities that specialize in providing the services that they prefer, such as good quality and well-funded local schools. However, school funding decisions are often made by state governments. Harris and others and Hilber and Mayer show that while elderly voters are often opposed to state expenditures on schools, they are willing to support local expenditures in some circumstances.[35]

Consider some of the policy options for maintaining or increasing financial support (and redistribution) for public schools. While, according to Hoxby, some of the SFE reforms undertaken in the past thirty years have been successful in increasing spending, many of these reforms were passed by legislatures and thus could be repealed by voters.[36] Economists often propose school vouchers as a solution to the inequality prob-

33. Rhode and Strumpf (2003).

34. While Rhode and Strumpf (2003) document this trend for a very long time period, from 1850 to 1990, we look at a much shorter period (1970 to 2000) and find that the trend has continued during the past decade. The authors are careful to point out that their results do not imply that public goods have no impact on location, only that other factors are more important.

35. Harris and others (2001); Hilber and Mayer (2002).

36. Hoxby (2001).

lem. However, vouchers also suffer from the drawback that the funding for vouchers typically comes from state government. Fischel describes another potential drawback of school vouchers, arguing that the public benefit of local schools accrues to the parents and not the children.[37] Having children in local public schools enables adults to get to know other adults better, reducing the transaction costs of citizen provision of true local public goods. In other words, vouchers disperse students from their communities and thereby reduce the communal social capital of adults. Our results provide partial support for Fischel's view in that many SFEs also produce a deconcentration of certain groups of households, leaving communities with fewer common bonds.

A final factor to consider is the extent to which mobility and competition across states might affect household locations and state policies. While the concentration of households with children across states has changed little in the past thirty years, we show that such households do consider school funding issues in their choices of where to live. While the estimated coefficients suggest that school funding plays a relatively small role right now, the influence of state policies might become more important if states further differentiated themselves according to their educational policies. Evidence from the location of poor households with children and welfare recipients suggests that state policies can have an important impact on location decisions.

37. Fischel (2002).

Appendix

Table A-1. Do States with Greater Local Choice Have More Within-State Sorting?[a]

	Weighted regressions with year and state fixed effects		
Explanatory variable	*1 Concentration of households with children*	*2 Concentration of poor households with children*	*3 Concentration of households with elderly householder*
Share of school funding from local sources	–0.00037	0.011	0.0055
	(0.0055)	(0.0099)	(0.0082)
Maximum inverted tax price	0.0032	–0.013**	–0.021**
	(0.0067)	(0.0063)	(0.0087)
Median foundation tax rate	–0.00054**	–0.000021	–0.00091**
	(0.00026)	(0.00048)	(0.00041)
Share of foreign-born population	0.053	0.012	–0.099
	(0.060)	(0.067)	(0.085)
Dummy year, 1980	–0.0068**	–0.00071	–0.020**
	(0.0030)	(0.0049)	(0.0054)
Dummy year, 1990	–0.012**	–0.014**	–0.029**
	(0.0027)	(0.0040)	(0.0050)
Dummy year, 2000	–0.013**	–0.020**	–0.035**
	(0.0032)	(0.0056)	(0.0059)
State fixed effects	Yes	Yes	Yes
Constant	0.086**	0.16**	0.14**
	(0.011)	(0.014)	(0.017)
Adjusted R^2	0.98	0.98	0.96
Number of observations	200	200	200

Note: Numbers in parentheses are standard errors. The weight used is the number of households.
*Significantly different from zero with 90 percent confidence.
**Significantly different from zero with 95 percent confidence.
a. Dependent variables: Herfindahl concentration measures for households with children, poor households with children, and households with elderly householder.

Table A-2. Do More Children Go to Private Schools in States with Greater Local Control?[a]

	Weighted regressions with year and state fixed effects	
Explanatory variable	*1* *Percent private school enrollment*	*2* *Percent private school enrollment*
Share of school funding from local sources	0.0028	–0.0016
	(0.0060)	(0.0060)
Maximum inverted tax price	–0.015**	–0.0159*
	(0.0062)	(0.0084)
Median foundation tax rate	–0.00053**	–0.00066**
	(0.00024)	(0.00024)
Per pupil spending ($\times 10^{-3}$)		–0.0052*
		(0.0026)
Share of foreign-born population		–0.0997
		(0.0768)
Dummy year, 1980	0.013**	0.019**
	(0.0042)	(0.0044)
Dummy year, 1990	0.011**	0.026**
	(0.0035)	(0.0069)
Dummy year, 2000	0.020**	0.044**
	(0.0042)	(0.0093)
State fixed effects	Yes	Yes
Constant	0.1384**	0.162**
	(0.0093)	(0.015)
Adjusted R^2	0.89	0.89
Number of observations	200	200

Note: Numbers in parentheses are standard errors. The weight used is the number of children (0–17 years).
*Significantly different from zero with 90 percent confidence.
**Significantly different from zero with 95 percent confidence.
a. Dependent variable: share of private school enrollment.

Table A-3. Do More Households with Children Move to States with Greater Local Control?[a]

	Percent change in number of households with children		
Explanatory variable	*1*	*2*	*3*
Change in percent of school funding from local sources	0.030**	–0.077*	0.025
	(0.013)	(0.043)	(0.022)
Interaction of change in percent of school funding from local sources * Lagged per pupil spending ($\times 10^{-3}$)		0.025**	
		(0.0097)	
Change in maximum inverted tax price	–0.021	0.0047	–0.024
	(0.016)	(0.084)	(0.032)
Interaction of change in maximum inverted tax price * Lagged per pupil spending ($\times 10^{-3}$)		–0.0076	
		(0.027)	
Change in median foundation tax rate	0.00064	–0.00012	0.00026
	(0.00053)	(0.0025)	(0.0011)
Interaction of change in median foundation tax rate * Lagged per pupil spending ($\times 10^{-3}$)		0.00025	
		(0.00094)	
Lagged per pupil spending ($\times 10^{-3}$)	0.0066*	0.0033	0.025**
	(0.0036)	(0.0038)	(0.011)
Percent change in number of households	1.01**	1.01**	
	(0.035)	(0.035)	
Dummy year,1990	–0.064**	–0.055**	–0.22**
	(0.010)	(0.010)	(0.017)
Dummy year, 2000	0.041**	0.049**	–0.13**
	(0.012)	(0.013)	(0.031)
State fixed effects	No	No	Yes
Constant	–0.12**	–0.12**	0.11**
	(0.016)	(0.016)	(0.032)
Adjusted R^2	0.91	0.91	0.75
Number of observations	150	150	150

Note: Numbers in parentheses are standard errors.
*Significantly different from zero with 90 percent confidence.
**Significantly different from zero with 95 percent confidence.
a.. Dependent variables: percentage change in number of households with children.

Table A-4. Do More Poor Households with Children Move to States with Greater Local Control?[a]

	Percent change in number of households with children		
Explanatory variable	*1*	*2*	*3*
Change in percent of school funding from local sources	0.015 (0.056)	0.10 (0.19)	0.030 (0.060)
Interaction of change in percent of school funding from local sources * Lagged per pupil spending ($\times 10^{-3}$)		–0.021 (0.043)	
Change in maximum inverted tax price	0.0014 (0.070)	0.087 (0.37)	0.068 (0.090)
Interaction of change in maximum inverted tax price * Lagged per pupil spending ($\times 10^{-3}$)		–0.029 (0.12)	
Change in median foundation tax rate	0.0039* (0.0023)	0.0056 (0.011)	0.0022 (0.0029)
Interaction of change in median foundation tax rate * Lagged per pupil spending ($\times 10^{-3}$)		–0.00064 (0.0042)	
Lagged per pupil spending ($\times 10^{-3}$)	0.043** (0.015)	0.046** (0.017)	0.058* (0.032)
Percent change in number of households	0.45** (0.15)	0.44** (0.16)	
Dummy year, 1990	–0.020 (0.043)	–0.027 (0.046)	–0.10** (0.046)
Dummy year, 2000	–0.22** (0.053)	–0.23** (0.056)	–0.32** (0.085)
State fixed effects	No	No	Yes
Constant	–0.045 (0.068)	–0.049 (0.070)	0.044 (0.087)
Adjusted R^2	0.21	0.19	0.15
Number of observations	150	150	150

Note: Numbers in parentheses are standard errors.
*Significantly different from zero with 90 percent confidence.
**Significantly different from zero with 95 percent confidence.
a. Dependent variable: percentage change in number of poor households with children.

Comments

Caroline Hoxby: Christian A. L. Hilber and Christopher J. Mayer ask an important question: Do school finance laws affect where people live? In other words, if we pass a new school finance law in our state, should we expect a reshuffling of the population so that we will all have new neighbors? Will our state draw in certain people from other states or make certain people depart for other states? The answers to these questions are important because American states regularly revise their school finance laws and sometimes revise them in dramatic ways that might trigger sizable reshuffling. States' school finance formulas allocate $370 billion a year. To see how large an amount this is, compare Medicare at only $245 billion, all federal income support programs combined at only $330 billion, and national defense at a similar $376 billion. The amount of money affected by school finance laws is so large and the laws vary so widely, over time and among states, that school finance could easily be *the* government policy that affects where people live. This is not to say, of course, that other factors do not affect where people live. It is just that most of those other factors are not in policymakers' control.

Lurking in the background of this research is the implicit assertion that where people live *matters*. If neighbors do not have a causal effect on a person's outcomes, then it is unclear why we should care who is the neighbor of whom. Here it is important to distinguish between neighbors' correlations and neighbors' causal effects. We have a lot of evidence that there are correlations among neighbors; the evidence on neighbors' causal effects is limited. Indeed, some of the best research, based on the Moving to Opportunity experiment, suggests that neighbors' causal

effects are very small.[38] The question of neighbor effects is beyond the scope of Hilber and Mayer's study or this comment, but it is important to flag the issue. We know that we care about whether someone is richer or poorer. It is not so obvious that we care about how people reshuffle themselves if there are no causal effects of sorting. After all, John Smith or Jane Doe is always *someone's* neighbor.

Hilber and Mayer test three hypotheses. First, do middle- and upper-income families prefer to live in states where school districts are relatively independent fiscally? The logic is that fiscally independent districts' resources tend to reflect the resources and tastes of the people who live in them. Therefore, an affluent, well-educated person living in a district with affluent, well-educated neighbors can probably obtain public schools that suit his desires. Conversely, if his district cannot spend money on its schools without giving the state a commensurate amount for other districts' schools, or if his district is forced by the state to spend the same amount as every other district, an affluent, well-educated person's local public schools may fall short of his desires. Indeed, he may abandon the expensive and frustrating task of trying to obtain public schools that suit him and may use private schools or move to another state instead.

The second hypothesis is that, in states that aggressively redistribute funds among their school districts, middle- and upper-income families and the elderly need not avoid living in districts with poor school-aged children as they might in states with financially independent districts. The logic behind this hypothesis is not so clear. If states that equalized school finance always "leveled up," then districts that served poor children would usually (though not always) look more attractive to middle- and upper-income families than they did before equalization.[39] However, more than half of school finance equalizations "level down" because their formulas contain parameters that implicitly penalize districts for higher spending.[40] After a leveling-down equalization such as the Serrano II equalization in California, well-off families have *more,* not less, reason

38. See Kling and Liebman (2004) and Katz, Liebman, Kling, and Sanbonmatsu (2004) for work based on the Moving to Opportunity experiments, in which poor households were given an incentive to move outside of poor neighborhoods.

39. Even this mild statement does not always hold for reasons described in the next paragraph.

40. See Hoxby (2001).

to avoid districts with poor children. Well-off parents do not think, "Our current school will spend less, but it will spend about the same as the school serving the poor children, so I am indifferent about which school my children attend." Instead, they think, "Our current school will spend less and have fewer resources to counteract deficiencies that children bring from home. Therefore, I am even more keen to have my child in a classroom with other children from affluent, well-educated parents." Essentially, when better-off families cannot get resources into their schools, they substitute good peers (which they still can get) for resources.

The logic behind the second hypothesis does not always work for another reason. In many school finance equalizations, the formula forces property tax rates to rise dramatically in property-poor districts.[41] Rising property tax rates tend to drive away, not attract, the elderly because they do not have schoolchildren who benefit from the higher spending that accompanies the higher tax rates. With rising property tax rates in property-poor districts, even better-off families with children may have more, not less, incentive to avoid property-poor districts. If better-off families would want to live in unusually nice houses in property-poor districts, then rising tax rates in those districts could easily mean that they would pay *more* for living there. We can only assert that better-off families with children will be more willing to live in property-poor districts after school finance equalization if they (the better-off families) were glad to live in houses that are typical of those districts.

Hilber and Mayer's third hypothesis is that, after a school finance equalization, fewer better-off families will want to send their children to private schools. This hypothesis is simply wrong for the vast majority of actual school equalizations, which nearly always raise the "price" that well-off families face for obtaining a resource-rich school. With the exception of a handful of equalizations in which the state depends exclusively on income and sales taxes for revenue, even leveling-up equalizations make richer families pay more for each dollar of public school spending relative to a dollar of private school spending. That is, school finance equalization nearly always lowers the relative price of private schools for the well-off population.

41. For instance, the so-called Robin Hood formula in Texas and New Jersey's most aggressive school finance formula both drove up property tax rates dramatically in property-poor districts. See Hoxby (2001, 2004).

After this review of the three hypotheses, it is easy for me to make the first of my comments about Hilber and Mayer's study. Their predictions are mainly right, which is good, but they are wrong for some outcomes and wrong for some families in some states. The reason that Hilber and Mayer sometimes make the wrong predictions is that they are trying to describe equalizations at the state level, when equalizations actually work at the district level. There is just no substitute for figuring out what incentives an equalization gives to each district. To do this, one needs to think about how the formulas' parameters apply at the district level. Probably the best way to generate predictions is to do as Nechyba does.[42] His basic method is to invent simple school finance formulas; make some assumptions about how people react to school spending, property tax, house prices, and peers; and use computable general equilibrium methods to simulate the effects of the invented formulas under a range of plausible assumptions. The alternative procedure is to be purely empirical: use real school finance formulas (not invented ones) and see how families, house prices, and districts react to them.

This brings me to the second of my comments. The district is the natural level of aggregation for a study of school finance. The outcomes that interest us are mainly at the district level. For instance, "How mixed, in terms of household income, is this school district following the school finance equalization?" The data that we need in order to create variables that describe the school finance formula are all district level data: property value per student, the local property tax rate, and so on. Hilber and Mayer make extra work for themselves by starting with data collected at the Census of Population and Housing place level (hereafter the census). I worry a fair amount about the representativeness of their sample. Since their balanced panel focuses exclusively on places that were populated enough in 1970 to have made it into the census summaries, one worries that their data underrepresent areas that were exurbia in 1970 but that are metropolitan now. What if inner-ring suburbs that have become more heterogeneous in income are overrepresented, while outer-ring suburbs that have been more affluent and homogeneous are underrepresented? The data could present an unbalanced picture of actual trends.

However, concerns about the representativeness of the sample are not my primary objection to place level data. My primary objection is simply

42. Nechyba (2002).

that place level data make it hard to answer interesting questions and make it impossible to describe school finance formulas accurately. For instance, if I wanted to know whether affluent families move away from districts that have their spending capped, place data could not give me the answer because spending caps apply at the district level. If I wanted to know how property-rich but income-poor elderly people (who are quite common) react to a school finance formula that raises property tax rates in their district, place data could not give me the answer because property tax rates apply at the district level. Overall, Hilber and Mayer have done a great job with data on places. They describe them accurately and use them well. However, next time it would be easier to start with the four datasets that summarize the census at the school district level.[43]

Hilber and Mayer describe outcomes and predictions in terms of data "cells" at the state-year-affluence-elderliness level. On the whole, this is an excellent way to summarize the effects of school finance on how people locate. They have found a few, concise dimensions on which to measure sorting, and others should follow them in this approach, even if they use district data for its myriad advantages.

Because of problems with the predictions and the data, I am hesitant about some of Hilber and Mayer's results. The result that is probably most sound, because the hypothesis has the strongest logical underpinnings and is simplest to test, is that states that allow districts more fiscal independence have more middle- and upper-income households. The causality is probably in the direction Hilber and Mayer describe (taking away independence drives out better-off families), but the evidence on timing is too weak to rule out reverse causality (states with lots of better-off families make political decisions that keep local districts fiscally independent). If the causality runs from school finance to location decisions, then courts contemplating school finance need to be cautious about driving out the tax base on which the state depends. If the causality runs from location decisions through politics to school finance, then courts' interventions may be very helpful. The direction of causality is another item for Hilber and Mayer's future "to do" list.

School finance *is* complicated. The formulas can be difficult to understand. It is the nature of the formulas to have different effects on different districts. This makes them hard to summarize. One has always to remem-

43. See U.S. Department of Education (1994, 2003a, b, c).

ber that the formulas are largely about property values, *not* households' income. Households' incomes are easy because they are mainly exogenous, but property values react significantly when households move or when a state changes its school finance formula. Complicated or not, school finance is important. Economists really cannot let courts play with $370 billion a year and move households around without having any notion of what the consequences are. Ultimately, the data are so good and the variation in formulas is so great that research on school finance will deliver rich rewards. Hilber and Mayer have begun down a research path that will undoubtedly produce important results over the course of several studies.

Julie Berry Cullen: The authors provide an empirical exploration of issues that are at the heart of state and local public finance. They ask how two related but distinct factors—the degree of local control over spending and the extent of redistribution across localities—affect how individuals sort both across and within states. They use the school finance equalization movement as the source of variation in these two factors across places and time. This movement began in the 1970s and was a reaction to the striking disparities in per pupil expenditures and property tax burdens across high- and low-wealth communities under predominantly local finance. School finance became more centralized as states reduced inequities directly by imposing spending ceilings and floors and/or indirectly through tax and subsidy schemes.

The role of the two factors in determining *within-state* sorting derives from the Tiebout model. If individuals choose communities according to their tastes for local public goods, then factors that facilitate such sorting should lead to more complete sorting. Conversely, restrictions on local discretion, such as tax or spending limits, reduce the gains from conglomerating with others who have like tastes. Concentration according to willingness to pay will also fall if the form of implicit redistribution through state aid weakens the link between where one lives and how much one pays in taxes or receives in benefits. From these perspectives, the empirical analysis of changes in within-state concentration of various groups in response to changes in the net benefits of concentrating tests the basic force underlying the Tiebout model.

The companion analysis of *cross-state* migration patterns can be thought of as a test of one of the principles of optimal fiscal federalism.

The premise is that there are limits to the amount of redistribution that can be done at subnational levels of government. The simple reason is that individuals who are transferring resources to others on net can move away. States that implement school finance equalization that involves aggressive redistribution across individuals should experience outmigration among the cross-subsidizers.

Besides contributing to the broader literature on local public finance, this paper fits into a growing literature about general equilibrium responses to alternate school funding mechanisms. Although prior theoretical work has considered the relationship between school finance and household location choice, this is one of the first empirical studies to focus on this relationship. It makes a significant contribution as far as the scope of the question, and the primary weakness is the lack of attention to heterogeneity in the structure and content of the various school finance formulas. This inattention leads to hypotheses that are less refined and empirical constructs that are less meaningful than they could otherwise be.

Theoretical Issues

The main difficulty with the three hypotheses presented is that they are unlikely to generally hold across the wide variety of state school finance contexts. I focus on ambiguities within the two hypotheses regarding within-state mobility.

The first within-state hypothesis states that "in states with significant redistribution mechanisms, nonpoor households with children and elderly have fewer incentives to avoid low-income places." The authors do not provide a framework for readers to allow them to characterize more and less significant redistribution in ways that would be relevant for the mobility of these groups. I could imagine a school finance program that transferred more resources from high- to low-wealth districts than another but that provided greater incentives for individuals to sort according to income. It is not just the quantity of redistribution that matters, but the means by which this redistribution is undertaken (for example, by means of a state sales or income tax or by redirecting locally raised property tax revenues).

Besides the structure of the finance program mattering, the environment within which that program operates could be important. As an example, consider that state school finance policies target resources to

communities with low property wealth rather than communities with low family income. The authors presume, as many proponents of school finance equalization (and theorists) have, that low-income individuals are disproportionately located in areas with low assessed property value per pupil. However, a large fraction of property wealth is commercial property, which tends to be located in urban areas. In a comprehensive evaluation of California's history with school finance equalization, Sonstelie and others discover that families from different places in the income distribution were relatively evenly distributed across localities of varying property wealth.[44] The disparities in per pupil spending by district wealth were not matched by disparities according to family income. If income and property wealth are not closely correlated, then interventions that redistribute resources according to property wealth should have little effect on the incentives for families to sort according to income. If income and property wealth are negatively correlated, school finance equalization policies could lead to *increased* sorting by income. Clearly, the initial conditions in a given state would determine the sign of the impact of a redistributive reform.

The second within-state hypothesis is that "in states with significant redistribution, nonpoor households with children have fewer incentives to avoid public schools." If Tiebout sorting and private schooling are substitutes and school finance equalization restricts Tiebout sorting, one would expect the opposite prediction. Yet, as the authors concede, there are several conflicting factors at play.

Those families that choose to send their children to private schools should locate in places where the tax burden is lowest. That means that changes in the level of spending at their neighborhood public school will affect a private school family's choice of sector only indirectly through the implications for the tax payments associated with living there—not directly through changes in the quality of *that* public school. To determine who might be drawn into the public sector, one would have to know how a school finance equalization policy affects the distribution of public school quality at next-best alternatives, wherever they may be, as well as the degree of double taxation associated with attending private school.

44. Sonstelie and others (2000).

Knowledge of the means through which equalization is achieved can provide useful information about likely private school enrollment responses. If equalization occurs primarily by lowering expenditures in previously high-spending districts, then presumably families in those districts could face both lower-quality public schooling alternatives and reduced opportunity costs to attending private school. This is exactly what happened in California, where the gap in per pupil expenditures across localities was virtually eliminated along with an overall decline in resources, and is a more natural explanation of the increase in private school enrollments than the one the authors provide (see note 22). In contrast, Michigan's recent school finance reform infused new resources into previously low-spending districts while leaving spending at other districts largely unaffected. Leveling-up reforms like this are more likely to lead to the reduced private school enrollment rates the authors expect. Although hypotheses about the average impact of heterogeneous redistributive policies are not particularly meaningful, less ambiguous predictions could be generated given a careful classification of equalization policies.

Empirical Issues

The main empirical results are based on regressions relating statewide concentration indexes for three types of households to three state school finance policy measures for the years 1970, 1980, 1990, and 2000. From specifications that include state and year effects, the authors uncover statistically significant relationships between relative changes in concentration and their measures of local control and redistribution. While the empirical results are intriguing, it is difficult to assign the desired interpretation to them.

Starting with the left-hand side of the equation, the dependent variables are not sufficient statistics for the kind of mobility the authors predict should be happening. For one, the Herfindahl indexes are defined based on underlying data for places and not school districts. They, therefore, incorporate deconcentration that takes place *within* the relevant jurisdictions while only deconcentration *across* these jurisdictions is of interest. And school districts can become more deconcentrated even if the underlying flows are completely inconsistent with changes in fiscal incentives. In the absence of disaggregated data, the authors could

attempt to characterize the changes in the allocation of individuals across communities according to initial community characteristics to ensure that the flows are in the direction anticipated. For example, if school districts are ranked according to property wealth in the initial period, then Gini indexes derived from the fraction of each type of household in communities of ascending initial wealth could be calculated in subsequent years.[45]

The weakness with the key right-hand side variables is that they are not adequate to summarize the incentives for concentration across the demographic groups. Rather than simply being noisy indicators, these indicators could conceivably be even negatively correlated with the incentives they are meant to capture. To illustrate some of the key omissions, I outline the two main methods of state finance of elementary and secondary schools: foundation programs and guaranteed tax base programs. Foundation programs in their purest form guarantee a fixed amount of revenue per pupil (g) in return for a district levying a required minimum tax rate (t_f), so that per pupil aid is equal to: $a_i = g - t_f v_i$, where v_i is the district's per pupil property wealth. Guaranteed tax base (GTB) programs provide a guaranteed yield for each unit of local tax effort, so that per pupil aid is equal to: $t_i (v_m - v_i)$, where t_i is the local property tax rate and v_m is the guaranteed per pupil tax base. Each of these programs may or may not involve *recapture*, so that districts that would receive negative aid may or may not participate at all, and may or may not allow *local leeway* to set property tax rates without limit.

One of the three measures the authors include is the maximum inverted tax price, which is the maximum subsidy from a GTB program. This basically reflects the ratio of the guaranteed wealth level to the wealth of the poorest district. It is possible that a GTB with recapture could lead to a greater compression in tax burdens across communities than a GTB with a higher guaranteed tax base (and higher associated maximum subsidy) and no recapture. Not only would low-wealth districts be able to both spend more per pupil and reduce their tax rates, but high-wealth districts might also have to raise taxes to maintain spending.

45. Farnham and Sevak (2004) are conducting related work that looks directly at migration flows of the elderly. Using the University of Michigan's Health and Retirement Survey**,** they find that empty-nest movers who relocate within the same state are less able to reduce their exposure to local school taxes when strong equalization policies are in place.

Although the authors' measure captures how much less onerous living in a low-wealth district is, it misses how much less beneficial it is to live in a high-wealth district.

Ignoring the presence of local leeway leads to similar slippage between the underlying incentives and the measures included. A state with a lower foundation tax rate that also does not permit localities to raise revenue above that rate could be associated with fewer incentives for sorting than one that has a higher foundation rate but permits districts to tax themselves above that rate. The inclusion of the third measure, the fraction of revenues raised locally, helps to make these dissimilar district schemes somewhat more comparable. While these omitted variables and others (such as the existence of property tax circuit breakers for the elderly) are likely to be correlated with the included variables and currently confound the interpretation of the results, these program features could be incorporated in the authors' future work as a source of useful variation across states and demographic groups in the incentives to sort.

A final concern with the empirical analysis is that policy endogeneity makes it hard to tell whether state aid policies are determining residential location patterns or vice versa. As work by Loeb and Fernandez and Rogerson demonstrates, whether a state's median voter would prefer to finance local public schools through local or more centralized finance schemes depends on the distribution of income and property wealth across communities.[46] Thus changes in the concentration of groups across a state could change the identity or the preferred policy of the median voter. That the timing of the analysis is fairly crude, so that ten-year changes in school finance policy may reflect recently enacted or stale policy changes, heightens the possibility that the observed changes in concentration are driving the changes in school finance policy through public choice mechanisms, rather than the policy changes driving mobility as individuals "vote with their feet." Focusing on court-mandated reforms, instead of all movements in state school finance, could help the authors to get around this problem.

46. Loeb (2001); Fernandez and Rogerson (1999).

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