School Funding Equalization and Residential Location for the Young and the Elderly

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Abstract

State educational spending policies strongly impact the funding of local schools. While some US states have removed school spending authority from local residents, others continue to encourage local control. In this paper we explore the effects of changes in state educational spending policies on Tiebout sorting by examining the location choice of young and elderly households, both within and across states. We argue 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, non-poor households with children and elderly have fewer incentives to avoid low-income places, leading to less concentration of poor households and a smaller degree of separation of the young and elderly. We present empirical evidence that is consistent with these predictions and show that private school enrollment is less common in places with redistribution mechanisms. We conclude that school services do matter for residential location choices and thus Tiebout sorting may present a partial solution to the potential risk that a growing number of elderly voters pose to continued political support for public schools.

1 Introduction

The share of the elderly households is expected to grow strongly in the United States over the next decades. Conventional wisdom, supported by recent research (e.g., Poterba 1997), suggests that spending on local public schools may decline in real terms as a growing percentage of elderly voters becomes more influential.

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 (Harris et al. 2001). Hilber and Mayer (2002) show that house prices may serve as a mechanism to encourage the elderly to support local spending. They show that the percentage of elderly residents are 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) play a crucial role in determining 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 (summarized in the next section) 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 impact the location decisions of households with children and the elderly.

We use recently enhanced US Census micro data 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 de-concentration of most household groups across places within each state. The extent of de-concentration is strongest for the elderly and non-white populations, but is also strong for households with children and poor households with children (i.e., 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 impacted household location choices. State educational spending policies determine the constraints that local governments face in providing local school services. While some US states have removed school spending authority from local residents, others continue to 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, non-poor 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 matters for residential location choices in a manner consistent with Tiebout sorting.

Our paper is structured as follows. In section 2 we review the literature on household sorting, school finance reforms, and the relationship between school resources and learning outcome measures. We then state the hypotheses in section 3 and present empirical evidence that is consistent with our hypotheses. Section 4 contains a summary of our main findings and discussion of policy implications.

2 Background and Theoretical Predictions

2.1 Tiebout Sorting and Household Location Decisions

The seminal work of Tiebout (1956) serves as a beginning for most papers that examine issues relating to household location. Tiebout points our that individuals should sort themselves across local jurisdictions according to their local public good preferences. Tiebout's controversial hypothesis is that under certain conditions (e.g., free mobility 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 (e.g., Bewley 1981, Epple and Zelenitz 1981, Henderson 1985), common wisdom holds that community selection is driven by the same factors that Tiebout noted in his original papers, including the local public service-tax package and the quality of local public school services (e.g., Epple and Romer 1991, Fernandez and Rogerson 1998, Hoxby 1999 and 2000, Nechyba 1999 and 2000).

Most empirical research has found evidence of at least some degree of Tiebout sorting, but most papers also conclude that Tiebout sorting is not the only factor that explains where households live. Eberts and Gronberg (1981) show that as the number of school districts in metropolitan areas increases, the districts become more homogenous with respect to income, an important prediction of the Tiebout model. Gramlich and Rubinfeld (1982) 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 (1997) argue that if households sort efficiently across locations, then at a given location households receive the same marginal benefit from locational amenities. Testing the latter proposition the authors find empirical evidence that is consistent with Tiebout sorting, but that households do not perfectly efficiently sort across locations on the basis of their preferences for local amenities alone. Finally, Rhode and Strumpf (2003) examine whether local policies are the dominant motive for residential location choices. 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. Looking at across-community heterogeneity between 1850 and 1990, their results 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, households select communities based on employment opportunities (e.g., Topel and Ward 1992). Costa and Kahn (2000) show that college educated couples increasingly locate in large metropolitan areas (MSAs). 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 and/or education. For example, Mincer (1978) demonstrates that the proximity to members of the same ethnic group and to family and friends has a strong impact on residential location decisions. This factor is particularly strong for recent immigrants, who tend to locate in ethnic enclaves within metropolitan areas, possibly due to extensive links that are introduced through family ties and ethnic networks (Massey and Espana 1987). 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 Balisteri (2002) show 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/ethnicity, and language.

Other papers investigate the effects of Tiebout sorting on redistribution.[1] Utilizing a model that assumes free household mobility, Epple and Romer (1991) demonstrate that local redistribution induces household sorting, with the poorest households located in the communities that provide the most redistribution. While the threat of out-migration affects the potential for redistribution, their results imply that local redistribution is nonetheless feasible. On the empirical side, Kremer (1997) 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 (e.g., Bénabou 1993 and 1996, Fernandez and Rogerson 2001).

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 (2001), SFE has affected American schools more than any other

[1] For an early discussion see Oates (1972).

reform over the last 30 years. 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.[2] 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 (e.g., Downes and Schoenman 1998, Fernandez and Rogerson 1998, Hoxby 2000 and 2001), 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.

2.2 School Spending and Outcomes

Our analysis implicitly assumes that school expenditures are related to learning outcomes of pupils or to provide other benefits that matter to parents and homeowners. If this assumption holds, school financing rules that influence local public school expenditures should therfore 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 pre-school and school aged children. Whether school resources are indeed related to perceived learning outcomes is a disputed research question.[3] 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 (see the meta-analysis by Hanushek 1986). 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 outcomes. 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 factors such as the overall happiness of children, the '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 the quality of sport facilities, or the availability of school dining halls during lunch time. These

[2] 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".

[3] For an excellent review of this research question see Burtless (1996).

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 (e.g., Card and Krueger 1992a and 1992b, 1996a and 1996b) that look at the impact of school inputs/education expenditures on students' earnings *after their formal schooling has ended*. 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 point in 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.

A second way to address the issue as to how school spending might impact residential location decisions is to look at whether school spending impacts house values using evidence from state-level reforms that affect local spending on schools. Barrow and Rouse (2000) provide evidence that, on average, additional state aid is valued by potential residents. Similarly, Bradbury, Mayer, and Case (2001) use evidence from a property tax limit in Massachusetts, Proposition 2 ½, to demonstrate that increases school spending lead to gains in property values, suggesting that additional school spending is valued by marginal homebuyers.

Overall, we view the empirical evidence as supporting the implicit assumption that school resources positively impact the utility of households with children, either 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.

2.3 Theoretical Predictions

In the next section we test three hypotheses. 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, non-poor 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 over-proportional

share of households with children in poverty. The *third hypothesis* is that in states with significant redistribution, non-poor 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 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 (2003a) identifies four factors that complicate the analysis. First, parental choices involve judgments about school production functions. Second, residential location choices often determine the access to primary and secondary schools. Third, private schools provide 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 (see Nechyba 2003a for a detailed discussion of this research area). While 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 particularly relevant to our work. Nechyba (2003b) analyzes the impact of public school financing rules on private school attendance. 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 above) 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 (2003b) differentiates between pure state financing and block grants. On balance, the simulations suggest that private school enrollments fall more 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 (2003b) 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 (i.e., a decrease in the efficiency of resource use), which may in turn increase private school attendance.[4] This example illustrates the inherent difficulty to formulate theoretically unambiguous predictions. With this caveat in mind, our empirical findings, which are consistent with the three hypotheses stated above, are described below.

3 Empirical Analysis

3.1 The Data

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 and Population. The second source is the Tax Foundation's publication *Facts and Figures on Government Finances*. Finally, we use school finance reform data as reported in Table 1 from Hoxby (2001).[5]

The US Census data are compiled on two geographic levels – US 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 US population. In order 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 US population. As a robustness check, we have performed the regressions reported below with the full (unbalanced sample) of all places in each Census year, but find our conclusions are unchanged.

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[4] In fact, a decline in responsiveness to local concerns due 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.

[5] See the next subsection 3.2 for a discussion of the appropriateness of using these measures.

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 above, 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. The revenue data consists 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, both the revenues and expenditure series are discontinued in the latest edition of *Facts and Figures on Government Finances*. However, we are able to extent 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 their 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 (2001), including the minimum/maximum inverted tax price and median foundation tax rate. 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 cut school spending as a percentage of property values below the foundation tax rate.[6]

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 concentrate in places with other immigrants and may also have more children and be poorer relative to the overall US population. Other measures of social similarity either were not available for all four Census years (partly because of definition changes) or turned out to be statistically completely irrelevant (e.g., the percentage of non-whites).

The final dataset includes 200 observations, one observation for each of the 50 US 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 $4,200 (in constant, 1992$). While approximately equal amounts of that spending is 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 due to differences in state policies on school funding. The concentration measures show that poor households with children (that is, households with income below 100% 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 (i.e., 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 has an elderly housholder.

Table 2 examines aggregate trends over time in basic demographics, school spending, and private school enrollments. Notice that the percentages of households with children and an elderly householder are calculated based on (un-weighted) averages across states to capture the effect of demographics in the average state. Changing demographics due to the baby boom/bust and the aging population are clear in the data. The percentage of households with children has fallen appreciably since 1970 from 45% to 33 percent of all households. 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 US 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. While 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 over 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 and are distributed around the country, the next two tables 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 (2003). 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 of time. (See Table 4, which computes the Herfindahl measure based on state market shares of various household 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

[6] For the two states excluded from Table 1 in Hoxby (2001), Alaska and Colorado, the minimum/maximum

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 non-white households. These sub-groups have have become much more concentrated in some states relative to others. We explore this trend further in the data, below.

3.2 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 (2001) the maximum and minimum inverted tax price and the median foundation tax rate do not fully describe SFE schemes. That is, these variables do not adequately 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/sales taxes. Furthermore, the utilized SFE measures incorporate the endogenous responses of school districts, an issue that also potentially impacts most other analyses using state-level policies such as SFEs.

An analysis using more dis-aggregated 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.[7]

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

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inverted tax price is set to one and the median foundation tax rate to zero.

[7] We intend to address the above outlined data limitations and endogeneity issues in future research.

3.3 Results

Below, we examine whether trends in school finance equalizations can help explain the patterns described in Section 3.1. 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 relative to states that give local school districts relatively little control over school spending. As noted above, the benefits of sorting may be stonger in states where local communities can appreciably vary the public services tax/expenditure bundle to address the desires on local residents. Table 5 presents regressions that examine the determinants of concentration (Herfindahl indexes) for three types of households: households with children, poor households with children, and elderly households.[8] 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 that 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% of the decline in within-state concentration of households with children that was observed in the US between 1970 and 2000. For states that enacted the highest foundation tax rates (Arizona-47% and New Mexico-48%), 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 serve to equalize spending across districts, so it is easier for households with children to locate in communities based on non-school reasons, including proximity to employment or locational amenities such as lakes, theaters, museums, or good restaurants.

[8] Data on high-income households is not available for all four Census years, thus, unfortunately, we cannot examine the determinants of concentration for this particular household type.

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 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 due to 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 impacted 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 (Table 6) are consistent with our previous findings and the predictions in Nechyba's work, described above. 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 level of school spending in a state, and the percentage of foreign-born individuals in column (2). The

quantitative effects are quite significant. Using the 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 points (0.53 percentage points) or by about 4.4 percent (4.7 percent). The same one-standard deviation increase in the median foundation tax rate (+11/1000ths) reduces private school enrollment by 0.58 percentage points (0.73 percentage points) or about 5.2 percent (6.6 percent).

Our findings so far have examined the extent to which SFEs impact 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 impact 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 household 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 7 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 amounts of funding than locations that rely on funding that comes from higher levels of government (see Fischel 2001 and Hilber and Mayer 2002, for example). 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.[9] Unfortunately, the 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 appear 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 (i.e., 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 inividual point estimates rise so that the coefficient is no longer statistically different from zero.

Our final examination in Table 8 conducts the same regressions as in Table 7, 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 play a role in explaining the sharp rise in the state-level concentration of poor households with children (see Table 4). These regressions provide some additional insights into the factors that impact 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

[9] Of course, we would prefer to directly control for the current amount of per-pupil spending, but current per-pupil

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 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.

4 Conclusion

In this paper, we present empirical evidence showing that state imposed redistribution via 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 also impact 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 states where more of the funding comes from local (versus 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.

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spending is likely endogenous and our data does not provide any effective instrument.

Similar to Rhode and Strumpf (2003), we show that Tiebout sorting by many household characteristics has been decreasing over time. 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.[10] The fact that public school funding plays a role in household location decisions may help explain the reduced Tiebout sorting that has taken place over the last 3 decades. After all, many states have passed school finance equalization packages, which according to our results, lead to reduced concentration among elderly households, households with children, and poor households with children.

The finding that local public school services—and more specifically school funding equalization—matters 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 which 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 et. al. (2001) and Hilber and Mayer (2002) show that while elderly voters are often opposed to state expenditures on schools, they are willing to support local expenditures in some circumstances.

Consider some of the policy options for maintaining or increasing financial support (and redistribution) for public schools. While some of the SFE reforms undertaken in the last 30 years have been successful in increasing spending (see Hoxby 2001), many of these reforms were passed by legislatures and thus could be repealed by voters. Economists often propose school vouchers as a solution to the inequality problem. However, vouchers also suffer from the drawback that the funding for vouchers typically comes from state government. Fischel (2002) describes another potential drawback of school vouchers, arguing that the public benefit of local schools accrues to the parents and not the children. 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 SFE's also produce a deconcentration of certain groups of households, leaving communities with fewer common bonds.

[10] While Rhode and Strumpf (2003) document this trend for a very long time period from 1850 to 1990, we look at a much shorter time period (from 1970 to 2000) and find that the trend has continued during the last decade. Also, 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.

A final factor to consider is the extent to which mobility and competition across states might impact household locations and state policies. While the concentration of households with children across states has changed little in the last 30 years, we show that such households do consider school funding issues when choosing where to live. While the estimated coefficients suggest the school funding plays a relatively small role right now, the role of state policies might become more important if states further differentiated themselves in terms of 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.

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Table 1

Variable List and Means, All 50 US States, 1970-2000
N=200

Variable	Mean	Standard Deviation	Minimum	Maximum
Percentage of school funding from state sources	0.443	0.173	0.053	0.887
Percentage 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 non-white 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	4199	1628	1708	9392
Percentage private school enrollment (among school aged children)	0.117	0.043	0.031	0.208
Percentage foreign-born population (among all households)	0.049	0.045	0.005	0.262
Percentage households with children (among all households)	0.389	0.058	0.281	0.574
Percentage poor households with children (among all households)	0.053	0.021	0.023	0.158
Percentage households with an elderly householder (among all households)	0.205	0.035	0.052	0.289

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 and Weighted Averages across States

Census Year	Averages Across States			Weighted Averages Across States		
	Percentage Households with Children	Percentage Poor Households with Children	Percentage Households with Elderly Householder	Per-pupil School Spending	Percentage Private School Enrollment	Percentage of school funding from local sources
1970	0.446	0.055	0.195	2781	0.123	0.507
1980	0.401	0.052	0.201	3492	0.133	0.422
1990	0.341	0.054	0.218	5250	0.128	0.323
2000	0.334	0.049	0.211	6022	0.137	0.530

Note: The weight used is the number of children (0-17 years old).

Table 3
Concentration of Household Types within States, Weighted Herfindahl Index Averages across States

Census Year	Households with Children	Poor Households with Children	Households with Elderly Householder	Non-white 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

Notes: The weight used is the number of households.

Table 4
Concentration of Household Types across States (Herfindahl Index)

Census Year	Households with Children	Poor Households with Children	Households with Elderly Householder	Non-white 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

Table 5
Do States with Greater Local Choice Have More Within-State Sorting?

Dependent Variables: Herfindahl Concentration Measures for Households with Children, Poor Households with Children, and Households with Elderly Householder

Explanatory Variable	Weighted Regressions with Year and State Fixed Effects		
	(1) Concentration of Households with Children	(2) Concentration of Poor Households with Children	(3) Concentration of Households with Elderly Householder
Percentage of school funding from local sources	-0.00037 (0.0055)	0.011 (0.0099)	0.0055 (0.0082)
Maximum inverted tax price	0.0032 (0.0067)	-0.013 ** (0.0063)	-0.021 ** (0.0087)
Median foundation tax rate	-0.00054 ** (0.00026)	-0.000021 (0.00048)	-0.00091 ** (0.00041)
Percentage foreign-born population	0.053 (0.060)	0.012 (0.067)	-0.099 (0.085)
Dummy Year=1980	-0.0068 ** (0.0030)	-0.00071 (0.0049)	-0.020 ** (0.0054)
Dummy Year=1990	-0.012 ** (0.0027)	-0.014 ** (0.0040)	-0.029 ** (0.0050)
Dummy Year=2000	-0.013 ** (0.0032)	-0.020 ** (0.0056)	-0.035 ** (0.0059)
State fixed effects	Yes	Yes	Yes
Constant	0.086 ** (0.011)	0.16 ** (0.014)	0.14 ** (0.017)
Adjusted R^2	0.98	0.98	0.96
Number of Observations	200	200	200

Notes: Numbers in parentheses are standard errors. * Significantly different from zero with 90 percent confidence. ** Significantly different from zero with 95 percent confidence. The weight used is the number of households.

Table 6
Do More Children Go to Private Schools in States with Greater Local Control?

Dependent Variable: Percentage Private School Enrollment

Explanatory Variable	Weighted Regressions with Year and State Fixed Effects	
	(1) Percentage Private School Enrollment	(2) Percentage Private School Enrollment
Percentage of school funding from local sources	0.0028 (0.0060)	-0.0016 (0.0060)
Maximum inverted tax price	-0.015 ** (0.0062)	-0.0159 * (0.0084)
Median foundation tax rate	-0.00053 ** (0.00024)	-0.00066 ** (0.00024)
Per-pupil spending $\left(\cdot 10^{-3}\right)$		-0.0052 * (0.0026)
Percentage foreign-born population		-0.0997 (0.0768)
Dummy Year=1980	0.013 ** (0.0042)	0.019 ** (0.0044)
Dummy Year=1990	0.011 ** (0.0035)	0.026 ** (0.0069)
Dummy Year=2000	0.020 ** (0.0042)	0.044 ** (0.0093)
State fixed effects	Yes	Yes
Constant	0.1384 ** (0.0093)	0.162 ** (0.015)
Adjusted R^2	0.89	0.89
Number of Observations	200	200

Notes: Numbers in parentheses are standard errors. * Significantly different from zero with 90 percent confidence. ** Significantly different from zero with 95 percent confidence. The weight used is the number of children (0-17 years).

Table 7
Do More Households with Children Move to States with Greater Local Control?

Dependent Variables: Percentage Change in Number of Households with Children

Explanatory Variable	Percentage Change in Number of Households with Children		
	(1)	(2)	(3)
Change in percentage of school funding from local sources	0.030 **	-0.077 *	0.025
	(0.013)	(0.043)	(0.022)
Interaction of change in % of school funding from local sources * Lagged per-pupil spending $\left(\cdot 10^{-3}\right)$		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 $\left(\cdot 10^{-3}\right)$		-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 $\left(\cdot 10^{-3}\right)$		0.00025	
		(0.00094)	
Lagged per-pupil spending $\left(\cdot 10^{-3}\right)$	0.0066 *	0.0033	0.025 **
	(0.0036)	(0.0038)	(0.011)
Percentage 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)
	0.91	0.91	0.75
Number of Observations	150	150	150

Notes: Numbers in parentheses are standard errors. * Significantly different from zero with 90 percent confidence. ** Significantly different from zero with 95 percent confidence.

Table 8
Do More Poor Households with Children Move to States with Greater Local Control?

Dependent Variable: Percentage Change in Number of Poor Households with Children

Explanatory Variable	Percentage Change in Number of Poor Households with Children		
	(1)	(2)	(3)
Change in percentage of school funding from local sources	0.015 (0.056)	0.10 (0.19)	0.030 (0.060)
Interaction of change in % of school funding from local sources * Lagged per-pupil spending $\left(\cdot 10^{-3}\right)$		-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 $\left(\cdot 10^{-3}\right)$		-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 $\left(\cdot 10^{-3}\right)$		-0.00064 (0.0042)	
Lagged per-pupil spending $\left(\cdot 10^{-3}\right)$	0.043 ** (0.015)	0.046 ** (0.017)	0.058 * (0.032)
Percentage 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

Notes: Numbers in parentheses are standard errors. * Significantly different from zero with 90 percent confidence. ** Significantly different from zero with 95 percent confidence.