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Abstract

The educational story in the United States is thoroughly intertwined with residential location. Poverty, race, and schooling are very highly correlated with location, and the institutional structure of public education decision making in the United States leads to a close linkage of location, housing, and education. As a result, residential decisions have added implications for households. Moreover, the reliance on the local tax for a large portion of school funding implies that the governmental grant system has an important effect on both locational decisions and on educational outcomes. This chapter provides a theoretical and empirical discussion of the interaction of location and schooling. In contrast to this discussion that emphasizes the behavior of households in choosing a location, a range of policy decisions have explicitly been based on location but for the most part assuming that households will not react to the policies. These policies aim to alter the attractiveness of a local school district but generally ignore any general equilibrium effects from household behavior. Here we also review some of the more important policies affecting the location-schooling equilibrium.

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The educational story in the United States is thoroughly intertwined with residential location.[1] Poverty, race, and schooling are very highly correlated with location, and the institutional structure of public education decision making in the United States leads to a close linkage of location, housing, and education. As a result, residential decisions have added implications for households. Moreover, the reliance on the local tax for a large portion of school funding implies that the governmental grant system has an important effect on both locational decisions and on educational outcomes. This chapter provides a theoretical and empirical discussion of the interaction of location and schooling.

Education in the United States is provided by local school districts that operate with considerable autonomy. Funding is provided by a combination of local, state, and federal revenues with the level of spending and the performance of schools varying significantly across school districts. Matched against this institutional backdrop are processes of locational decisions by households that have an outcome of residential location (and implicitly school district) being closely related to the race and income of families. While accepting this outcome of individual locational decisions, governments – through financing of districts and other approaches such as providing broadened school choice to families – pursue interventions that at least in part represent an effort to ameliorate the adverse effects of location on minority and low income families. Whether or not these interventions are successful depends partially on whether they correctly anticipate the behavior of individuals, since individuals respond to the incentives set up by governmental policies.

In order to understand the nature of the U.S. locational environment, we begin with an overview of the relevant theoretical arguments on both location and local public good provision. The two primary relevant models involve urban location theory and Tiebout choice of governmental services. While each has strengths, neither provides a clear picture of the underlying individual choice or of the outcomes of policy interventions. Following a discussion of the evidence for these models and of the shortcomings of them, we then discuss several areas of the interaction of policy with locational decisions. In the schooling area, the form of government finance of local schools, the interventions to prevent the segregation of schools, and the movement to consolidate local school districts represent perhaps the largest and most significant governmental interventions that involve the intersection of schools and location.

[1]This chapter updates and extends Hanushek and Yilmaz (2011).

Finally, a different set of governmental interventions – those involved increased school choice – can be thought of as a method of reducing the linkage of location and schooling.

The objective throughout is identifying the state of the art in both theoretical and empirical analyses of schools and location. As part of this explanation, a key element is noting areas where currently relevant modeling and evidence are insufficient.

Residential Location Models

The residential location behavior of households was analyzed in a microeconomic framework in the early models of the literature. Later, the theory was extended to general equilibrium framework. Interestingly, two separate streams of literature have emerged over time: Urban Location Models and Community Choice (Tiebout) Models. This artificial separation has originated from the policy issues that those literatures studied. In Urban Location Models, a household's residential location is determined the trade-off between accessibility (i.e. location) and space. These models examine the equilibrium and optimal patterns of residential land use. In Community Choice Models, the residential location (i.e. community) of a household is determined by public goods along with the price (i.e. taxes) that a community offers. In these models, the public good is usually education, and these models are used to study issues in the financing of schools. Realizing that those two literatures are artificially separated, some scholars provide a joint treatment of those two artificially separated literatures. In the following subsections, we will provide a literature survey of those three literatures as well as a literature survey for the analysis of education finance policies in the last subsection.

A key aspect of the recent literature for residential location models is the general equilibrium nature of residential and school choices. Any government intervention alters the economic incentives for households, so when households respond by changing their residential and school choices, general equilibrium effects occur that might be large in size and may lead to unintended consequences.

Urban Location Models

As urban problems began to rise in 1950s, researchers and policy makers intensified their efforts to develop a comprehensive theory of modern urban systems. Among many urban problems, it was observed that within the U.S. metropolitan areas, poverty was concentrated in central cities as the population suburbanized: the poor lived in central cities while the rich lived in suburban areas.[2] As a result, Urban Location Models came into existence to explain urban land use patterns. The pioneers of modern urban location theory were Alonso (1964), Mills (1967, 1972), Muth (1969), and Kain (1975) with their models of land markets that generalized the 1826 work of Johann Von Thünen on the theory of agricultural land use. In the basic urban location model, all employment opportunities are offered by the firms located at the Central Business District (CBD) and workers commute to their workplaces at the CBD from the surrounding residential areas. The model allows household to differ by income. More importantly, it relies on Von Thünen's concept of bid-rent curves and predicts that households are stratified by distance and income from the CBD and the spatial ordering of households is determined by the relative steepness of the bid-rent curves. Basically, there are two opposing forces that determine the relative steepness of bid-rent curves, and, hence, the location of households: commuting costs and the demand for housing. The farther away a household's residential location from the CBD is, the higher the commuting cost is. More importantly, the locations far away from the CBD are less attractive for the rich because the rich value commuting time more highly than the poor. As a result of higher commuting costs, the housing rent must fall with distance from the CBD. The model also argues that the rich are attracted to residential locations farther away from the CBD because they want to buy more land and the land is cheaper at those locations. Overall, the latter force dominates the former force (i.e. the income elasticity of housing demand exceeds the income elasticity of marginal commuting cost) and the rich live farther away from the CBD (suburbs) while the poor reside at locations around the CBD (central city). This model has become the modern cornerstone of the modern land use theory in Urban Location Models but has been later extended in a variety of dimensions (e.g., see LeRoy and Sonstelie (1983); Straszheim (1987); Brueckner (1987); Fujita (1989); Glaeser and Kahn (2004)).

[2] The suburbanization of population in metropolitan areas has drawn considerable attention from researchers (Mills (1972), Mills and Price (1984), Mills (1992), Margo (1992), Mieszkowski and Mills (1993), and Mills and Lubuele (1997)) .

Although standard urban location models assume that employment is centralized and offered at the CBD, urban employment has been suburbanizing for a long time.[3] One important extension is the incorporation of multiple workplaces into urban location models, which is a fundamental empirical feature of today's urban landscape. There are two main literatures dealing with (i) models with endogenously determined employment location (e.g. Mills (1972); Fujita and Ogawa (1982); Henderson and Slade (1993); Anas and Kim (1996)), and (ii) models that assume an exogenously determined spatial location pattern for employment and explore its effects on other aspects of resource allocation in urban areas (e.g. White (1976, 1999); Sullivan (1986); Sivitanidou and Wheaton (1992); Hotchkiss and White (1993); Ross and Yinger (1995)). The incorporation of decentralized employment into urban modelling is explored in depth in White (1999).

Over the last century, an important change in the U.S. residential pattern is the general suburbanization of population (Boustan and Shertzer (2013)). Urban Location Theory has also produced an interesting series of papers on this issue and provided a number of different explanations for the suburbanization of population in the United States. This change, it has been argued, was driven, in large part, by falling commuting costs (LeRoy and Sonstelie (1983); Baum-Snow (2007); Garcia-López (2010)) and rising incomes (Margo (1992)). Another strand of literature concerns the possible role of the age of the housing stock and the filtering mechanism (Glaeser and Gyourko (2005); Rosenthal (2008); Brueckner and Rosenthal (2009)). Additionally, Boustan (2010b) and Boustan and Margo (2013) argue that suburbanization may also have been motivated by distaste for racial (or income) diversity.

Wheaton (1977) provided early empirical evidence that the standard urban location model cannot explain the concentration of the poverty in central cities: his paper shows that the two opposing forces mentioned above are approximately equal in size, implying an indeterminate pattern of location by income. In a much more recent work, Glaeser, Kahn, and Rappaport (2008) found that the housing-based force is far weaker than the time-cost force, which is just opposite of the crucial assumption standard urban location models. In other words, the urban location model would imply the concentration of the rich around the CBD, in contradiction to the U.S. land use pattern.

[3] See Glaeser and Kahn (2001, 2004) for a discussion of patterns of American cities.

One solution to this puzzle has been offered by LeRoy and Sonstelie (1983): the role of public transportation as an alternative transport mode choice. They extend the Alonso-Muth model to incorporate two competing modes of commuting: automobile and bus. They show that when the fast automobile was introduced, it was adopted by the rich, and the poor relied on slow, cheap buses. This choice lessens the commuting cost for the rich, resulting in the movement of the rich to the suburbs. The empirical support for their argument later comes from Glaeser, Kahn, and Rappaport (2008), who found that the income elasticity for land is too low to explain much of the "poor in cities, rich in suburbs" equilibrium in the US. Their explanation revolves around better access to public transportation. Central cities have high population densities required for convenient, frequent public-transit service, so those cities naturally attract the poor population, which must rely on this transit mode. Their inclusion of public transportation mode as an alternative to the automobile is innovative because their extended urban location model also addresses the problem of central city decline and resurgence. First detected in the late 1960s, regentrification described the return of some affluent households to cities, causing an increase in housing prices and property tax revenue. Although regentrification occurred on a far smaller scale in comparison to the pre-1970s suburbanization trend that has shaped today's residential patterns in the MSAs, regentrification has kept pace and had its own effect on the spatial distribution of households across metropolitan areas. As the "back-to-city" trend continues in many US cities, regentrification has received greater attention from both scholars and policymakers. One possible explanation for regentrifaction is offered by LeRoy and Sonstelie (1983) as mentioned above: access to public transportation as an alternative means of commuting to the workplace, with some rich suburbanites moving downtown and making use of public transportation. Other explanations given in the literature are (i) Brueckner, Thisse, and Zenou (1999) and Couture and Handbury (2019), who argued that the presence of non-tradable service amenities (e.g. restaurants and nightlife), topographical, and historical amenities (such as an attractive river or beautiful buildings) in the city center may attract the rich more strongly than the poor; (ii) Brueckner and Rosenthal (2009), who argued that the age of housing stock affects patterns of location by income, and regentrification is ultimately driven by the passage of time and the associated aging and obsolescence of housing stock; (iii) racial differences in amenity valuations of downtown neighborhoods and improvements in suburban labor market opportunities for unskilled workers (Baum-Snow and Hartley (2020)); and (iv) policies of urban

renewal and of environmental regulations (Gamper-Rabindran and Timmins (2011); González-Pampillón, Jofre-Monseny, and Viladecans-Marsal (2019)).

After the 2008 crisis, declining cities such as Detroit have led to an interesting series of work from urban economists. Rosenthal and Ross (2015) reviews recent literature that considers and explains the tendency for neighborhood and city-level economic status to rise and fall. Their main message is that many locations exhibit extreme persistence in economic status. Moreover, Brooks and Lutz (2016) confirm this finding, and their evidence suggests that both public forces (zoning) and private forces (agglomeration) generate self-reinforcing effects that lead to this persistence. Owens, Rossi-Hansberg, and Sarte (2020) present a model with residential externalities to study the urban structure of Detroit and conclude that neighborhood development requires the coordination of developers and residents, without which it may remain vacant even with sound fundamentals.

Community Choice Models

To explain the flight of the rich from central cities, some others pointed a finger at urban social problems such as low-quality public schools, racial preferences, crime, and fiscal amenities[4] (see Mieszkowski and Mills (1993); Katz, Kling, and Liebman (2001); Mills and Lubuele (1997); Cullen and Levitt (1999); Boustan (2010b); Baum-Snow and Lutz (2011)). The role of local public goods, especially education, in residential choice has received a great deal of attention from researchers (see, for example, Oates (1969); Fischel (2006b); Nechyba (2006)). A separate line of residential location models has emerged from the central insight of Tiebout (1956) and builds upon the analytical framework developed in Ellickson (1971). In these models, households vote with their feet to shop for the community that best satisfies their preferences for local public good where the provision of local public good becomes efficient. These models predict the sorting of households by income into communities.[5]

[4] Nechyba and Walsh (2004) argue that homogeneous suburban communities allow high-income households to escape redistributive central-city taxation while improving the quality of public goods.

[5] Black (1999), Bayer, Ferreira, and McMillan (2007b), Calabrese, Epple, Romer, and Sieg (2006) find that the driving force for sorting in the U.S. metropolitan areas rests in the differences in public good provision and demographic characteristics.

In the school finance literature, Inman (1978) was among the first to carry out a quantitative comparison of education finance systems in the context of an explicit model. In a series of papers, Fernández and Rogerson (1995, 1996, 1998, 2003) later contrast education finance systems by using a political economy approach: the tax rate and amount of public good provided in a community are determined by the vote of residents in a community. By using such a political economy approach, Epple, Filimon, and Romer (1983, 1984, 1993), Epple and Romer (1991), and Epple and Sieg (1999) also analyze the properties of multi-community models, where taxation of housing is used to finance a local public good, education. In addition to these, Glomm and Ravikumar (1992) and Silva and Sonstelie (1995) compare various state and local finance systems, whereas Nechyba (1996) and de Bartolome (1997) examine foundation systems in the finance of schools.

Even though the incorporation of political economy into these models is innovative, it comes at a cost: the existence of equilibrium becomes problematic. Epple, Filimon, and Romer (1983, 1984, 1993) develop conditions that involve restrictions on preferences and the technology of public good supply, under which equilibrium exists, and provide some computational examples to illustrate the way those conditions guarantee the existence of an equilibrium. Reviews of residential sorting models are provided by Boadway and Tremblay (2012) and Brulhart, Bucovetsky, and Schmidheiny (2015).

Epple and Platt (1998) estimate a model with idiosyncratic preferences for locations and find that idiosyncratic preferences explain most of the location decisions of households. Considering explicitly job accessibility as in Epple and Platt (1998), Bayer and McMillan (2012) finds that the dispersion of jobs and the heterogeneity of the housing stock act as strong brakes on the tendency for households to segregate by race, education, and income.

In many countries, private schools are offered as an alternative to public education.[6] Rangazas (1995), Nechyba (2000), and Ferreyra (2007) introduce private schools into Community Choice Models and study the effect of vouchers. Moreover, Nechyba (2003) extends his general equilibrium model in Nechyba (1999) to investigate the impact of school finance policies on mobility and quality and enrollment in private and public schools.

[6] There are studies about how private education affects spending on public education (e.g. Epple and Romano (1996); Glomm and Ravikumar (1998); Alesina, Glaeser, and Sacerdote (2001)). This literature is based on political economy models and also needs to overcome the problem of multi-peaked preferences over school funding levels.

Hybrid Residential Choice Models

One important prediction of Community Choice Models is that households sort themselves into communities by their income and tastes and that identical households would live in the same community.[7] This is an important shortcoming of these models, given that communities are empirically heterogenous.[8] One reason for this counterfactual result in these models is that they are essentially designed to deal with spaceless economies, ignoring spatial problems such as land use, geographical allocation of households, etc. This omission raises questions about whether the models can support analyses of issues in educational finance policy. In the U.S., education is financed significantly through property taxes on housing. Thus, Community Choice Models need to model households' decision making on housing. However, housing is different from other goods: it has an important attribute, namely accessibility that is explicitly modelled and studied in Urban Location Models.[9] de Bartolome and Ross (2003) and Hanushek and Yilmaz (2007b) offer early papers attempting to combine those two artificially separated modelling perspectives to provide a more realistic modelling of residential location decision.[10]

Hanushek and Yilmaz (2007b, 2013) develop a model that incorporates both locational motivations—accessibility (Urban Location Models) and public goods (Community Choice Models)— simultaneously and find an equilibrium with outcomes more consistent with empirical observation. Their models yield an equilibrium that differs sharply from those found in either Urban Location Models or Community Choice Models. Communities in fact have a

[7] Fernández and Rogerson (1996) find an equilibrium in which the middle-income households live in both communities while the rich and the poor reside exclusively in the community with high- and low-quality local public education, respectively.

[8] In his paper, Davidoff (2005) reports that the sorting by income, generated by the differences in tax and spending policies, into communities is far from complete. These differences account for only approximately 2% of the variation in household income.

[9] Epple, Gordon, and Sieg (2010) provide sufficiency conditions under which models that assume a single housing price in each community continue to apply in the presence of location-specific amenities that vary both within and across communities.

[10] A review of alternative modelling approaches is provided by Epple and Nechyba (2004), Nechyba (2006), and Hanushek and Yilmaz (2011). This literature ignores any of the short run dynamics or of the interactions with the macroeconomy (e.g. Leung (2004), Leung and Ng (2019)).

mixture of people with different incomes and people with different preferences for schools. They develop both monocentric city and polycentric city models with two school districts. Households, differing in their incomes as well as the valuation they place on education, choose a school district (a quality of education and property tax package), a location in that school district, the consumption of a composite commodity, housing size[11] and leisure. Households commute to their workplaces, and commuting has both time and pecuniary costs.[12] Land is assumed to be owned by absentee landlords whose sole objective is to maximize their revenue from the land. As for education, school districts use local property taxes to finance schools. The property tax rate in each school district is assumed to be determined by majority voting. An education production function that includes both peer effects and expenditure per pupil as inputs is introduced into the model. In their model, housing prices are a function of location and community characteristics among other things, and endogenously determined. Their model is complex and rich. As a result, they need to rely on computational techniques to find the equilibrium. They later use this model to study the impact of school finance policy on the quality of education that communities provide along with tax price, welfare of households, and spatial distribution of households across metropolitan areas. Their model is interesting in the sense that households are mobile and respond to altered incentives.

By extending a hybrid model with the introduction of private schools, Hanushek, Sarpça, and Yilmaz (2011) study how a private school option affects school quality, housing prices, and the spatial distribution of households in metropolitan areas. The paper finds that private schools and district autonomy may benefit public schoolers and poorer communities, and monetary inputs may fail to increase quality of public schools. The paper recommends that policymakers extend choices for households, rather than restrict them.

Analytical Approaches

[11] Suburban communities also use land-use controls to exclude the poor from rich communities. See Hanushek and Yilmaz (2015) for a study of land use controls in a general equilibrium setup.

[12] For a model with public transportation as alternative mode of commuting, see Yilmaz (2019, 2020): households can commute to their workplaces by either an automobile or a bus, and the choice of the mode of transportation is endogeneous in the model.

The Urban Location Models that are used to explain the concentration of poverty around central cities and spatial distribution of population across metropolitan areas have a fairly simple structure and are tractable from modelling perspective. Similarly, the Community Choice Models that are mainly used for studying school finance policies have a simple structure as well. The models that provide a unified treatment of those two separated streams of literature have a much more realistic set up and better prediction that both Urban Location Models and Community Choice Models: they consider households' joint choice of a place to reside along with other dimensions such as the size of the dwelling, accessibility, local public goods (e.g. education), and a set of taxes to finance local public goods. Moreover, those models also consider peer effects that result from social interaction with other households in their community. Every good thing comes at a cost, and, in this case, the cost is that the model becomes highly complicated and researchers need to use computational methods to solve their highly complex models. As the simulation-based model becomes more complicated, researchers need to impose more specific parametrization to be able to solve the model.

In the case of assessing school finance policies, it is difficult to ignore the interplay between household location decisions and the quality of schooling they obtain. Residential location choices are influenced by public school considerations, and schooling outcomes are determined by the composition of households in the school district, the boundaries of which are geographically defined. Community Choice Models are thought to be a good representation of metropolitan areas in the U.S., most of which have many school districts or local governments differentiated by public goods and taxes. Households vote with their feet, picking the community that best provides public good of their preferences. The major implication of households' mobility and fragmented government structures is that they increase the efficiency in the production of public good (education). In reality, communities are typically more limited; households have preferences for multiple goods that are related to location (e.g. the proximity to workplace); and schooling itself may not be efficiently provided. Simulation models[13] seem to be one step in the right direction because they permit multiple jurisdictions with a range of attributes. Epple and Nechyba (2004) summarize much of the progress that has been made in

[13] A thorough review of theoretical and simulation-based model literature is provided by Nechyba (2006).

both empirical and theoretical fiscal federalism literature and provide an overview of stylized facts regarding fiscal decentralization around the world.

Education occupies a central position in the policies of governments, and it is being heavily subsidized around the world. Glomm, Ravikumar, and Schiopu (2011) review the literature on the models of public funding for education. This literature is interesting in the sense that there is a political economy side where households with conflicting interests vote and determine the level of public spending on education. Another important aspect of the models they discuss is the availability of private education as an alternative, which generates non-single-peaked preferences over school funding levels for voters. These models are later used to study school finance policies. Even though their objective is to provide a review of theoretical models, they also include simulation-based models and empirical literature that is relevant to the theoretical models they discuss in their review.

An alternative promising area of research, structural estimation, estimates theoretical models in which household optimizing behavior is included directly into the estimation of household preferences for school quality. Based on a vertical sorting model, Epple and Sieg (1999) use observed differences in the distribution of income within and across neighborhoods to identify the marginal willingness to pay for a public good. Others (e.g. Bayer, Ferreira, and McMillan (2007a)) have used horizontal sorting models to value school qualities across neighborhoods. In a general equilibrium model, Ferreyra (2007) studies private school vouchers and residential choices. The decision making process is static in these models, and some researchers have attempted to make it dynamic. Bayer, McMillan, Murphy, and Timmins (2016) propose a model that employs a panel of micro-data to estimate willingness to pay for neighborhood amenities. Relying on the synthetic cohort assumption, Caetano (2019) estimates a dynamic model of school quality valuation. Both models, however, use partial equilibrium models to estimate. In a recent paper, Mastromonaco (2014) builds a dynamic general equilibrium model of residential location choice and uses it to find the equilibrium consequences of changes in public school quality.

Evidence on the Outcomes of School Choice

So far, our discussion emphasized the residential decision making of households. However, many policy discussions revolve around the outcomes of residential choice. There are two major research lines, each of which has received a great deal of attention from both policy makers and researchers: (i) the capitalization of school quality and taxes into housing prices and (ii) the impact of extended choice on school quality. We will review each one in return.

The Capitalization of School Quality into Housing Prices

In the U.S., the K-12 system is highly decentralized and local property taxes are the main source of funding for public schools.[14] School quality is an important factor in residential location choice of households. As predicted by both Urban Location Models and Community Choice Models, the advantages of a residential location are capitalized into housing prices. For instance, school quality and taxes are capitalized into house prices in line with the predictions of Community Choice Models. Therefore, house prices provide a window for the demand for school quality. Beginning with Oates (1969), scholars have tried find the value households place on school quality and property taxes by using a wide range of methods and data sets.

In the early years, researchers relied on per-pupil spending as a measure of school quality (e.g. Oates (1969); Pollakowski (1973); McMillan and Carlson (1977); Brueckner (1979)).[15] Moreover, they mainly use aggregate data, and their dependent variable is average housing prices. Later studies include various school quality measures in their regressions. In the literature, there is no consensus so as to whether output-based school qualities perform better than input-based quality measures (e.g. Seo and Simons (2009); Clark and Herrin (2000)). Other branches of this literature try to distinguish the effect of school quality effect from the effects of other neighborhood amenities influencing house prices by adding neighborhood variables to regression models (e.g. Pollakowski (1973); Bayer, Ferreira, and McMillan (2007a)), and by controlling for location and using instrumental variables methods (e.g. Downes and Zabel

[14] The share of school district revenues that state and local governments provide for K-12 has changed significantly over the last century. Today, states play a large and increasing role in school funding. See Yilmaz (2019) for a study of this policy shift.

[15] Unfortunately, the literature on expenditure as a measure of quality is inconclusive and fails to find a relationship between school inputs and outputs (Hanushek (2003)).

(2002)). With respect to location controls, one particular line of research includes school boundary fixed effects by considering houses located on attendance district boundaries (e.g., Black (1999); Kane, Staiger, and Samms (2003); Weimer and Wolkoff (2001); Gibbons and Machin (2008); Zahirovic-Herbert and Turnbull (2008); Dhar and Ross (2012); Imberman and Lovenheim (2016)). Even though the size of the capitalization of better schools is subject to debate, this literature finds that better schools raise housing prices.

The empirical literature on the capitalization of school quality into house prices is reviewed in various places (Machin (2011), Black and Machin (2011), and Nguyen-Hoang and Yinger (2011). Since there are so many measures of school quality available, there nonetheless remains some uncertainty about exactly how consumers get their information about schools (see Downes and Zabel (2002)). Figlio and Lucas (2004) find that state school grade reports affect households' residential locations and house prices. Even with information about state school grade reports or test scores at a school, the household would have trouble sorting out the "value-added" of schools, since test scores are affected by families and peers in addition to schools. From the Norwegian data to examine whether access to school choice affect housing prices, Machin and Salvanes (2016) utilize the policy change of removing catchment areas and find housing valuation sensitivity is reduced, which proves parents value better performing schools.

The disagreements and open questions in this literature highlight the empirical relevance of the theoretical models' building on location and school quality. The variation in results appears partly related to methodology, but full reconciliation has yet to occur.

The Impact of Tiebout Choice on School Efficiency

In Community Choice Models, households vote with their feet and pick the best community that satisfies their preferences for education. A household's ability to participate in school choice introduces pressure on public schools (Tiebout Competition), and Tiebout competition leads to the efficient provision of education. From studies across different metropolitan areas, it appears that competition among school districts is an important contributor to the quality of public schools. Borland and Howsen (1992) found that competition has positive effects on student achievement in the state of Kentucky. Hoxby (2000) extends this literature by considering the possibility that school district performance could influence the number of school districts in metropolitan areas. To address the potential endogeneity problem due to endogenous

district formation, she builds instruments from the natural boundaries (streams and rivers) of metropolitan areas. Her paper finds that Tiebout choice produces more productive schools. This issue is not without its controversy, however, as different interpretations have been presented by Rothstein (2005), and the analytical methods of Hoxby have been debated (Rothstein (2007); Hoxby (2007)).

Community Choice Models have strong assumptions, and, in reality, some of those assumptions do not necessarily hold. For instance, the decision to move for a household is a complex decision and based on many factors such as accessibility to workplace, pollution levels, safety, and natural surroundings. Additonally, moving to change their school district is very costly for a household. As a result, school districts exert monopoly power (Merrifield (2001)). School choice programs such as charter schools (Cordes (2018); Baude et al. (2020)) or school vouchers (Friedman (1962)) diminish monopoly power held by public schools and, therefore, lead to better and cost-efficient schools (Chubb and Moe (1990); Friedman and Friedman (1980)). Recently, Urquiola (2016) reviews the literature on school competition.

Interaction of Policy and Locational Decisions

The previous sections have described key elements of the interaction of location and schooling, both from a theoretical and an empirical viewpoint. In contrast to this discussion that emphasizes the behavior of households in choosing a location, a range of policy decisions have explicitly been based on location but for the most part assuming that households will not react to the policies. These policies aim to alter the attractiveness of a local school district but generally ignore any general equilibrium effects from household behavior. Here we review some of the more important policies affecting the location-schooling equilibrium.

State Funding of Schools and School Finance Court Cases

The funding of schools has been jointly determined by federal, state, and local decision making. We begin with an overall description of the funding of schools. There are some generalizations across states, even though there are in fact large variations across states in the pattern of funding of schools.

While most governmental appropriation decisions are made by the relevant executive and legislative branches of government, school funding is one area where the courts have also been heavily involved. This court involvement has frequently called for a redistribution of the

funding of schools across districts within a state and as such has altered the fiscal (and possibly educational) attractiveness of districts.

The federal funding of schools has been relatively small and has focused on extra funds for disadvantaged children or for special education. Federal support of schools has increased in recent years, partially linked to greater funding under school accountability. Nonetheless, ignoring the recessionary uptick, federal funds remain less than ten percent of total revenues (see Figure 1). Because they vary with the characteristics of students, they have much of the character of funding that follows the child, regardless of locational choice.

The U.S. education system is unique around the world in the degree of local control that has been granted to local governments. This local control is seen in a variety of dimensions, but perhaps the most important is the ability of local school districts to raise funds for schools. As seen in Figure 1, in recent decades the funding from state sources and from local sources has been roughly equal. In most states, local districts are given the ability to use of the property tax, and thus the local property tax is a major source of funding for education. Not surprisingly, property tax bases vary from one district to another, and this variation has contributed to an educational system characterized by enormous total spending variation across states and districts in spending levels.

The results of these law suits, which sometimes require changes in funding and other times do not, has been a general increase in the state share of spending. The pattern of school revenues does, however, differ noticeably across states. As Table 1 shows, while in the extreme (in Illinois) two-thirds of revenues come from localities, only four percent do at the minimum (in Vermont). Federal revenues also vary noticeably, depending on the overall level of spending in each state and on the proportion of students from poor families.

The character of state funding is, however, pivotal in determining the distribution of educational spending across districts. All states distribute state revenue for education to local school districts, both as basic support and, almost universally, as categorical grants for specific funding needs. An important element of state aid is helping to narrow the gaps in education spending across school districts. Flat grants are the oldest and simplest form of aid that provides a uniform amount of aid per student or teacher. As opposed to its objective to provide some minimum level of education expenditure, historically the grants were ineffective at reducing the variance in funding due to their small amounts. The most common scheme, foundation grants,

were aimed at guaranteeing a minimum level of spending: it does so by providing larger state funding to districts with less fiscal capacity as identified by lower tax bases. The exact formula and level of funding differs significantly across states, but the formulae typically require local districts to contribute the foundation spending level based in varying amounts depending on their capacity as measured by property tax base. Districts can then generally further supplement the basic funding with their own property tax receipts. District power equalization programs are matching grant programs with the aim that the program makes it possible for any district, whatever its tax base, to spend the same amount of money from the same tax effort identified by the property tax rate. The final grant scheme, categorical aid is given for specific expenditure categories such as special education, transportation, buildings, textbooks, and equipment.

Clearly the state funding program has direct implications for the geography of funding – and changes in state policies (that occur rather frequently) have immediate ramifications for the tax and spending polices of individual districts. Implicitly this means that state policies directly impact the fiscal and educational attractiveness of districts leading, among other things, to changes in housing values through differential capitalization. While these general equilibrium effects are almost certainly substantial in the case of major funding decisions, there has been limited analysis of them.[16]

But, as suggested, the courts have also been significant actors in the determination of the level and distribution of school funding across districts. A variety of parties have instituted court proceedings claiming that the legislated funding formula violate constitutional requirements for funding schools. While the division is sometimes fuzzy, these court cases fall into two major groupings: equity cases and adequacy cases. In simplest terms, equity cases are focused on the distribution of funding across districts, while adequacy cases are focused on the level of funding. (Some existing cases have, however, had elements of both).

Equity Cases

In the early 1970s, parents began to file lawsuits against state governments to require states to equalize spending per pupil among districts, reasoning that the quality of education a child receives should not be a function of the wealth of the community in which he or she resides

[16] Early analysis by Murray, Evans, and Schwab (1998) showed that court cases raised the level of state spending. Subsequent analyses have used these spending increases to consider the impact of spending on outcomes; see, for example, Jackson, Johnson, and Persico (2016).

(the principle of wealth neutrality).[17] *Serrano v. Priest* (1974) was the first successful court case related to state school finance equity.[18] John Serrano complained about the low quality of the local high school's education program. Serrano cited the very large difference between two school districts in Los Angeles area, Beverly Hills and Baldwin Park. Beverly Hills used its large property tax base to spend more per student while charging a lower property tax rate than Baldwin Park. In ruling in favor of Serrano, state court judges in California overturned the state's existing system of school finance. The court ruled that the existing property tax system violated the equal-protection clause of the state's constitution.

San Antonio School District v. Rodriguez (1973), filed on behalf of some children living in districts with low per pupil property valuations in Texas, was a similar case to Serrano.[19] It differed, however, in that the case was brought in a federal court and relied on the equal protection clause of the U.S. constitution alone. The U.S. Supreme Court ruled that education is not a fundamental right guaranteed to U.S. citizens by the federal constitution. There are two major implications from the Rodriguez decision. First, the federal courts would do nothing to promote equalization of spending across states. Secondly, any fiscal reform of school finance system must come from state governments and state courts.

The state court cases frequently led to dramatic changes in the distribution of funding across local districts. While changing the funding going to individual districts, these court rulings also changed the fiscal attractiveness of individual districts by changing the benefits and tax costs of individual districts. As a result, these court cases also had direct implications of the capitalization of schooling into the housing prices of districts. Nonetheless, this impact on housing prices has not been adequately researched.

Adequacy Cases

A different kind of court case followed the "equity" cases epitomized by *Serrano*. The Kentucky Supreme Court took the dramatic and unprecedented step in 1989 of declaring the

[17] The initial legal arguments were presented in Coons, Clune, and Sugarman (1970). A history and interpretation of the many legal cases can be found in Hanushek and Lindseth (2009).
[18] *Serrano v. Priest*, 557 P.2d 929 (Calif. 1976).
[19] *San Antonio Independent School District v. Rodriguez*, 411 U.S. 1 (1973).

entire state system of elementary and secondary school education was unconstitutional under the state constitution for failing to provide all children with an adequate education.[20] Adequacy, as defined in Kentucky and a large number of subsequent court cases, involves both identifying desired educational outcomes required by a state constitution and setting a path to meet the standard. The typical court remedy for a finding that the state financing was inadequate was to require states to increase their funding of schools, sometimes very dramatically. These court cases proved to be very successful with a string of victories for plaintiffs between 1989 and 2005 in many state courts including New York, New Jersey, and Wyoming.

Interestingly, after 2005, the pattern of state court rulings completely reversed, leading to significant numbers of plaintiff losses.[21] Thus, there appears to be a recent reluctance of the courts to intervene in school funding.

For our purposes, it is clear that these cases had a very different impact on location and schooling. Unlike the equity cases that were designed to change the geographic pattern of funding of schools, these cases were more aimed at the level of funding rather than the distribution. Nonetheless, in re-writing finance laws, the distribution of funding is invariably affected along with the level of funding.

Table 2 summarizes the court cases decided through 2018.[22] All cases are separate actions in state courts. With 117 total cases, it is clear that some states have had multiple court cases. Before 1989, all cases involved equity – the distribution of funds across districts. After 1989, some involved just adequacy – the overall level of spending – and some were a mixture of equity and adequacy. As seen, decisions have been almost evenly split between those for the plaintiffs that found the school finance system to violate the state constitution and those for the defendants that found no constitutional violation.

There is a large body of research that investigates the impact of school finance reforms on the distribution of school resources. In his work, Fischel (1989, 2006a) finds that California's Serrano decision equalizing school spending contributed to the property tax limitation of Proposition 13 and subsequently to relative declines in California spending on education (compared to other states). Later, Murray, Evans, and Schwab (1998) find that successful

[20] *Rose v. Council for Better Education,* 790 S.W.2d 186 (Ky. 1989). The details and issues of these decisions is discussed in Hanushek and Lindseth (2009).
[21] As these court cases are on-going, it is difficult to predict the future path. See Hanushek and Lindseth (2009).
[22] This tabulation updates and extends the information in Hanushek and Lindseth (2009) to 2018.

litigation reduced inequality in the amount spent per student by raising spending in the poorest districts while leaving spending in the richest districts unchanged. It thereby increased aggregate spending on education. States accomplished this by providing less state funds to property-rich districts and more funds to property-poor districts, while allowing property-rich districts to increase their local contributions. Moreover, reform led states to fund additional spending through higher state taxes. More generally, Hoxby (2001) demonstrates that school finance equalization schemes can level spending up or down, depending on the price and income effects they impose. Strikingly, it appears some students from poor households in states such as California or New Mexico would actually have better funded schools if their states did not attempt such complete equalization.

The relationship of court actions and student outcomes is generally different. Early investigations of the effects of expenditure equalization from the courts generally do not find implications for the equalization of outcomes.[23] Clark (2003) finds that, while Kentucky's Education Reform Act did have a significant equalizing effect on school spending, it did not have an equalizing effect on student achievement between rich and poor school districts. Card and Payne (2002), on the other hand, find evidence that the equalization of educational expenditures across school districts narrows the distribution of education spending and correspondingly narrows the distribution of SAT scores among children of diverse socioeconomic backgrounds. More recently, Jackson, Johnson, and Persico (2016) use decisions in court cases as a source of exogenous variation in school spending and then examine how funding affects longer term outcomes. In a similar type approach, Lafortune, Rothstein, and Schanzenbach (2018) investigate how both court decisions and legislative changes in funding alter the relative funding of poor districts and in turn how that affects achievement. Nonetheless, the impact of school finance court cases on student performance remains unclear.

An alternative approach to studying the impact of these fiscal changes is the general equilibrium simulation modeling in Hanushek and Yilmaz (2007a, 2007b). They consider how households respond to various funding policies including both funding equalization across districts and district power equalization and find that welfare and achievement is generally

[23] Downes (1992), Hanushek and Somers (2001), Flanagan and Murray (2004), Downes (2004), Cullen and Loeb (2004), Duncombe and Johnston (2004). See also Greene and Trivitt (2008).

reduced by these policies. After governmental involvement, the rich are pushed to subsidize more households and the marginal price for a better education rises. Moreover, due to the redistribution of school resources, the quality of education in the community with a better education goes down and the gap with the other community becomes smaller. The rich end up getting a relatively lower quality of education, even though they have a demand for a community with a better education. As a result, they are worse off. The poor side of the story is interesting and actually justifies why a general equilibrium model provides a better framework to study issues in educational finance. Due to the higher marginal price for a better education, some richer households move to the poorer community, causing an increase in rents. The poor are worse off due to higher rents and the fact that their preferred level of quality of education would be less than what they have after the policy. Individual incentives respond to the policies set up by the government, and the distortion created by incentives cannot be ignored.

School Desegregation

Perhaps the largest social policy of the U.S. in the second half of the 20th Century was the racial desegregation of schools. This policy had direct ramifications for both urban location and schools. In *Brown v. Board of Education of Topeka* (1954), the U.S. Supreme Court declared that legally-enforced (*de jure*) racial segregation was unconstitutional.[24] Before then, a number of states maintained legal segregation of schools by race. But, over the late 1950s and early 1960s, the progress to desegregate schools was not substantial. Empowered by the Civil Rights Act of 1964, the Department of Health, Education and Welfare had the power to withhold federal funding from school districts that discriminated on the basis of race. The following year, with the passage of the Elementary and Secondary Education Act of 1965, the department issued its first desegregation guidelines for receipt of federal funds, requiring school districts to submit a court order or a voluntary desegregation plan as evidence of nondiscrimination.[25] The federal courts also became more active in desegregation in 1968, when the U.S. Supreme Court decision in *Green* v. *County School Board of New Kent County* finally called for dismantling the dual school system. This supreme court ruling set desegregation guideline for voluntary desegregation and

[24] *Brown v. Board of Education*, 347 U.S. 483 (1954).
[25] See Cascio, Gordon, Lewis, and Reber (2009) on the impact.

for court-ordered plans.[26] The decisions required the desegregation of schools in areas where local governments pursued a policy of explicit segregation. Court cases also moved from areas that had segregation laws (*de jure* segregation) to ones where the existing patterns of housing and schools led to segregation (*de facto* segregation). In 1973 *Keyes v. School District No. 1* (Denver), the US Supreme court extended the obligation to desegregate to school districts with *de facto* rather than *de jure* segregation. The policies of courts toward desegregation clearly affect the interaction of housing and schools (e.g. see Boustan (2010b) and Baum-Snow and Lutz (2008)).

The policies toward desegregation have actually changed dramatically over time. While the courts were expansive in their rulings through the 1970s, they began to retreat on requiring added desegregation after that.[27] At the height of court involvement, hundreds of districts in the U.S. were under court orders or had a voluntary agreement on various actions to reduce racial segregation, and these often required extra funding of districts under desegregation orders.

Two trends, however, directly impacted the force of these orders. First, in a series of U.S. Supreme Court rulings (notably *Milliken* and *Jenkins*), it became established that desegregation orders applied within districts but not across them.[28] Second, some of the court decisions accelerated the suburbanization of the white population – a situation often dubbed "white flight."[29] Thus some of the suburbanization trends identified previously were actually reinforced by court actions.

Finally, the federal courts moved away from desegregation orders. Perhaps the end of the era of court involvement was the decision of the U.S. Supreme Court decisions in 2007 that banned voluntary race-based policies.[30] At the same time remaining aspects of prior agreements and court orders have also been disappearing. In his work, Lutz (2005) finds that dismissal of a court-ordered desegregation plan results in a gradual, moderate increase in racial segregation and an increase in black dropout rates and black private school attendance.

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[26] For a history and analysis of court interventions to desegregate schools, see Armor (1995).
[27] See the history of court involvement in desegregation through the mid1990s in Armor (1995).
[28] The *Miliken* decision in Michigan restricted interdistrict remedies to situations where the surrounding districts were parties to the segregative acts (*Milliken v. Bradley*, 418 U.S. 717, 744–46 (1974)). This was extended in *Jenkins (Missouri v. Jenkins*, 515 U.S. 70 (1995)*)* where interdistrict funding in the case of Kansas City, Missouri, was eliminated because the other districts and the state were not party to the segregation itself. See Hanushek and Lindseth (2009).
[29] See Coleman, Kelley, and Moore (1975), Clotfelter (1976, 2001), Fairlie and Resch (2002), Boustan (2010a), Cascio and Lewis (2012), Rivkin (2016).
[30] See Linn and Welner (2007) for a discussion of various aspects of this.

Court orders clearly had a big impact on the character of schools after *Brown* in 1954. Schools became substantially less segregated (Welch and Light (1987), Clotfelter (2004), Reber (2005), Baum-Snow and Lutz (2008)). Almost all of the school segregation in the most recent period has come from residential segregation across districts (as discussed above); see Rivkin and Welch (2006). Because of demographic changes, racial exposure (say, blacks to whites) has decreased even though measures of concentration have not (Rivkin (2016)).

The larger question is the educational impact of school segregation. A mounting body of evidence suggests that school segregation has negative impacts on black achievement (Guryan (2004), Angrist and Lang (2004), Hanushek and Raymond (2005), Hanushek, Kain, and Rivkin (2009), Hanushek and Rivkin (2009)).

School District Consolidation

The 20th century saw a dramatic consolidation of school districts. In 1937 there were 119,000 separate public school districts. Today there are less than 14,000.[31] There has been some work considering the reasons for consolidation (e.g., Kenny and Schmidt (1994), Brasington (1999), Gordon and Knight (2009)) and the impact of consolidation on costs (Duncombe and Yinger (2005)). On the benefit side of consolidation, large districts have economies of scale because they can provide libraries, sport facilities, administration, and so forth on a district wide basis. On the cost side, large districts combine different individuals with different preferences (heterogeneity) who must compromise to share a school district and agree on common educational policies. Specifically, Tiebout sorting is based on the notion that individuals prefer to interact people with similar like themselves in tastes for public goods. Now, they must interact with people different from themselves. A tradeoff between economies of scale and heterogeneity helps to explain the consolidation pattern of local jurisdictions in the United States.

For our purposes, however, it is important to point out the implications of this and other trends for the operations of schools and for the interaction with families. Over the same period, funding of education also changed dramatically, as described previously. In 1930 less than one-half percent of revenues for elementary and secondary schools came from the federal

[31] U.S. Department of Education (2019)

government, and less than one-fifth came from states, leaving over 80 percent to be raised locally. Some in fact view this finding in earlier periods as benefit taxation, where residents pay varying taxes in accordance with the perceived performance of schools (Fischel (2006a)). As noted previously, local share has fallen to roughly 45 percent – the same as state share.

Taking those trends together, it is reasonable to assume that parents were much closer to what was going on in the schools 75 years ago than they are today. Likewise, school administrators in the small districts of the past, supported largely by local funds, almost certainly paid closer attention to the needs and desires of the families they served. School district consolidation has effectively moved decision making and management of education away from the local population. Moreover, larger districts with larger populations mean that there are more diverse preferences among parents for what they want in their schools. Thus, the administration of any district necessarily requires compromises among the various interests.

The influence of parents and local administrators has also changed because of the overall centralization of decision making that has been occurring over the past century. As states have become more prominent in the funding of schools, they have also moved toward more centralized decision making about the operations of schools. That is understandable because, if states are going to fund schools, they have responsibilities not to waste their (or the federal government's) funds. The overall result of the trends in government revenue and administration of education is that school decisions have migrated away from parents and local voters and toward state bureaucracies.

Tiebout suggested that parents could satisfy their desires for local governmental services by shopping for the jurisdiction that provided the services that best met their individual desires.[32] Thus, by living in the same area, parents with similar desires could group together to ensure more homogeneous demands. Moreover, since one aspect of schools involves how effectively they use their resources, competition for consumers could put competitive pressures on school districts to improve their performance and efficiency. The idea of shopping across alternative jurisdictions does, however, require that there be a large number of districts so that there is a sufficient range of choice. It also becomes very complicated when parents have multiple interests. For example, some parents may, in addition to schools, have desires with respect to

[32] Internationally, there is evidence that school performance is greater when local schools are given more autonomy in decision making (Hanushek, Link, and Woessmann (2013)).

welfare payments, hospital coverage, police, and safety or with respect to accessibility to jobs. Selection of place of residence on the basis of school districts may compete with or fail to satisfy the other interests of the family. Particularly, much of the consolidation of districts occurs across relatively rural districts, where the range of choice is limited by population density.

A significant percentage of housing decisions involves finding a location that meets demands for commuting to work, the standard location model. With decentralized workplaces, different jurisdictions become more or less attractive, and that makes parents' choices much more complicated than simply choosing a school (Hanushek and Yilmaz (2007b)).

Finally, for a variety of reasons, the public schools in adjacent jurisdictions may not look too different from one another. Central state restrictions; the limited viewpoints of school personnel in terms of curricula, pedagogy, and effective administration; and other things could lead schools to be quite similar in approach, curricula, and goals. The contraction of choices of different school districts when subsumed by the other choice aspects of residential location thus puts natural limits on how widespread any version of school choice such as Tiebout's might be.

School Choice Options

A final element of location and schools is the availability of school choice options. One of the direct implications of allowing broader selection among schools by families is that the closeness of the relationship of location and school quality is reduced. Choice options follow the ideas originally set out by Friedman (1962) when he argued for using vouchers to fund schools. Individuals would have the ability to shop among schools using a government voucher.

One thing that has been happening over time is substantial changes in the percentage of students actively choosing what kind of school they attend. As recently as 2000, 85 percent of students went to the traditional public school to which they were assigned (Fig. 2).[33] By 2016, one-quarter of students made choices of the sector of instruction. Private schooling has been constant at roughly 10 percent, with the vast majority being religiously based. But charter schools – public schools that are not controlled by the local districts – have grown significantly

[33] Note that these shares of students with choice do not include a number of districts that allow or require students to choose among the traditional public schools. Because all students stay within the traditional public schools, there is no pressure on the school district to try to keep the students. This feature differs from the other forms of choice with the exception of magnet schools. Magnet schools offer specialty curricula (academic, the arts, or other vocational focus), and they offer an alternative to the traditional schools.

(Baude et al. (2020)). Perhaps most surprising has been a rising share of students who are home-schooled.

Recent U.S. experiences with school choice include the introduction of a limited voucher program in Milwaukee, the introduction of a more broadly accessible program in Cleveland, the U.S. Supreme Court's affirmation of such policies, the use of vouchers in Washington, DC, and the introduction of a variety of private voucher programs. These experiences have been discussed and analyzed in a variety of different places and are under fairly constant revision.[34] While these voucher programs have generally found positive achievement effects and have been very popular with parents, they have not greatly expanded over time.

Other forms of choice have, however, been much more significant.

Homeschooling

There has been a considerable surge in homeschooling. A significant number of parents have simply withdrawn their children from the regular public schools and taken personal responsibility for their education. Estimates put the number of homeschoolers at 1.7 million children or over three percent of all school children in 2016, although there is some uncertainty about the numbers involved.[35] Unfortunately, however, little is known about this in terms of movements of children in and out of homeschool environments or of their performance trends.

Intradistrict Open Enrollment

A particularly popular version of public school choice involves an open-enrollment plan, under which, for example, students could apply to go to a different school in their district rather than the one to which they are originally assigned. In a more expansive version, no initial assignment is made at all, and students apply to an ordered set of district schools. A common version of this has been the use of magnet schools that offer a specialized focus such as college preparatory or the arts. Forms of open-enrollment plans were the response of a number of districts in southern states to the desegregation orders flowing from *Brown v. Board of Education*. In general, simple open-enrollment plans were not found to satisfy the court

[34] Evaluations of Milwaukee vouchers and others can be found in Rouse (1998) and Peterson, Howell, Wolf, and Campbell (2002). The DC voucher program in particular has been the subject of considerable political turmoil since in comes under the jurisdiction of the U.S. Congress. The most recent evaluation of DC vouchers finds improvements in student reading achievement but not math achievement through the introduction of vouchers; see Wolf et al. (2009) and Wolf et al. (2013). For more general evidence on choice, see Egalite and Wolf (2016).
[35] U.S. Department of Education (2019)

requirements for desegregation of districts, but magnet schools (with racial balance restrictions) became a reasonably common policy approach.[36] In 2016, 5 percent of all students attended magnet schools.[37]

These programs do not, however, offer much school competition. First, the flow of students is heavily controlled. For example, the first caveat is always "if there is space at the school," but the desirable public schools virtually never have space. Second, large urban school systems where there is a natural range of options frequently face other restrictions, such as racial balance concerns, that severely constrain the outcomes that are permitted. Third, and most important, these plans seldom have much effect on incentives in the schools. The competitive model of vouchers envisions that schools that are unable to attract students will improve or shut down. That threat provides an incentive to people in the schools to perform well or to potentially lose their jobs. In a district with open enrollment, personnel in undersubscribed schools generally still have employment rights and simply move to another school with more students, diminishing the effect of competitive incentives.

Interdistrict Open Enrollment

Another variant of open-enrollment plans permits students in a city to attend any public school in the state. Conceptually, this could offer some competitive incentives. If a district lost sufficient students through out-migration, it could be left with less funding and could be forced to reduce its workforce. Again, however, the reality does not bring to bear many of the potentially positive effects of competition. In the first instance, voluntary interdistrict enrollment typically requires the approval of the boards of the schools a student is exiting and entering, meaning that the parents can face significant hurdles in making choices. The "if there is space at the school" clause generally stops all but some token movement. In addition, because of complicated formulas for school funding that mix federal, state, and local dollars, the funding following the choice student is typically less than the full funding for a student in the receiving district, meaning that any district accepting students is asking its residents to subsidize the education of students whose families reside and thus pay school taxes outside the district. The funding of transfers is also complicated by the common practice of basing current-year funding on prior-year enrollment or attendance figures, or both.

[36] Armor (1995)
[37] U.S. Department of Education (2019)

Charter Schools

The rise of charter schools has introduced an element of choice in schooling that promises to better mimic a genuine voucher program. Because they are creatures of the separate states and operate in different ways according to state rules, there is no common model of a charter school. The essential features are that they are public schools but ones that are allowed to operate to varying degrees outside of the normal public school administrative structures. To the extent that they survive through their ability to attract sufficient numbers of students, they are schools of choice. They differ widely, however, in the rules for their establishment, in the regulations that apply to them, in the financing that goes with the students, and in a host of other potentially important dimensions.[38] Some states, for example, impose a variety of requirements about teacher certification, curriculum, acceptance of special education students, and the like—advertised as "leveling the playing field"—in order to ensure that charter schools do not offer any true innovation and competition. Other states, however, remove a substantial amount of regulation and truly solicit innovation and competition.[39]

Despite the regulatory diversity surrounding them, charter schools can nonetheless offer true competition to the traditional government schools, because they can draw students away from poorly performing schools. Employment rights typically do not transfer between charters and existing school districts so there is potentially pressure on school personnel to attract students. Moreover, we see that charters are truly susceptible to the necessary downside of competition in that a substantial number of attempted charters do not succeed in the marketplace.[40]

Since the nation's first charter school legislation was enacted into law in Minnesota in 1991, some 45 states and the U. S. Congress, on behalf of the District of Columbia, have enacted legislation that provides for charter schools. In the nation as a whole, charter schools increased from a handful in 1991 to more than 7,000 schools serving 3 million students, or approximately 5.6 percent of the public school population, in 2016.[41]

In some places, charters have become quite significant. For example, in the 2017-2018 school year, 45 percent in students in the District of Columbia, 17 percent of students in Arizona,

[38] See Finn, Manno, and Vanourek (2000) on the early history. A description along with current data can be found at https://charterschoolcenter.ed.gov/what-charter-school#history [accessed July 3, 2020].
[39] Center for Education Reform (2003)
[40] Center for Education Reform (2002)
[41] U.S. Department of Education (2019)

13 percent of students in Colorado, and 10 percent of students in California attended charter schools.[42]

What do we know about the performance of charter schools? In an study of assessing the quality of charter schools, Hanushek, Kain, Rivkin, and Branch (2007) find that the average quality in the charter sector is not significantly different from that in regular public schools but there is considerable heterogeneity in terms of performance. This overall performance has, however, improved as the market for charter schools becomes more established (Baude et al. (2020)). The heterogeneity of achievement impact across states is readily seen with a national study, the largest to date of charter schools (CREDO (2013)). That study finds that overall charter schools have improved compared to their earlier study (CREDO (2009)).[43] The improvement is not uniform, however, and the states and locals differ significantly. Importantly, charter schools are most prevalent in urban centers,[44] and they also appear most effective in urban settings (CREDO (2015)).

Conclusions

The study of location and schooling has been a vibrant area of research. The institutional structure of U.S. schools – where local districts have considerable fiscal and policy autonomy – highlights the importance of the joint consideration of location and education.

On the theoretical side, the area has been marked by the historic development of distinct treatments of household decisions. Urban locational models focus on household choices that are driven by accessibility and housing prices. Tiebout models of public good choice, on the other hand, have households focusing exclusively on the public services offered by different jurisdictions. The separation of these models is in part the result of a desire to have models that yield analytical solutions. But recent advances in more complex models solved by simulation techniques have expanded this work to incorporate more realistic household behavior.

Two of the strong lines of empirical analyses growing out of this locational modeling are the investigation of how the attractiveness of different locations is capitalized into housing prices

[42] U.S. Department of Education (2019).
[43] Some locations do, however, develop much better performing charter schools. More specific analyses of New York City charter schools find consistently better performance of students in charter schools (CREDO (2010), Hoxby, Murarka, and Kang (2009)). Importantly, because these studies use different methodologies while finding very similar results, the reliability of the findings is enhanced.
[44] U.S. Department of Education (2019)

and how the competition among districts affects the efficiency of school provision. There are natural and productive extensions that exist for both lines of research.

With the overview of models that link location and schooling, it is possible to consider some of the major policy changes that have occurred over the past half century. First, state governments – often driven by the courts – have made some dramatic changes in the financing of local schools. These changes alter the fiscal attractiveness of different areas, which the previous locational models suggest will lead to individual behavioral changes. Unfortunately, the existing literature on the impacts of these policy changes has seldom considered these behavioral changes and the resulting impact of them. Second, perhaps the largest policy change in U.S. schools has been the desegregation of the schools. These actions, largely driven by the federal courts, have distinct locational impacts. The existing empirical work focuses on family movements, largely "white flight" from central cities. The impact on the subsequent patterns of education has been much less studied. Indeed, the theoretical models discussed here focus almost exclusively on income and do not adequately treat race and location. Third, the U.S. has seen the dramatic consolidation of local school districts over the 20th Century. While work has helped to understand the forces behind this consolidation, there is virtually no existing work on the educational impacts.

Finally, within the context of how schools and locations are determined, a number of policy actions have been aimed directly at lessening the impact of residential location. These actions generally fall under the heading of school choice, where expanded options of choosing specific schools helps to break the link between residential location and schooling opportunities. In this area, our knowledge is rapidly expanding in large part because the policies have been moving quickly.

In sum, recent work has greatly expanded our understanding of how household locational choices impact the educational opportunities that are available. At the same time, this work has also highlighted a variety of areas where research is missing but vital to policy decisions that are currently being made.

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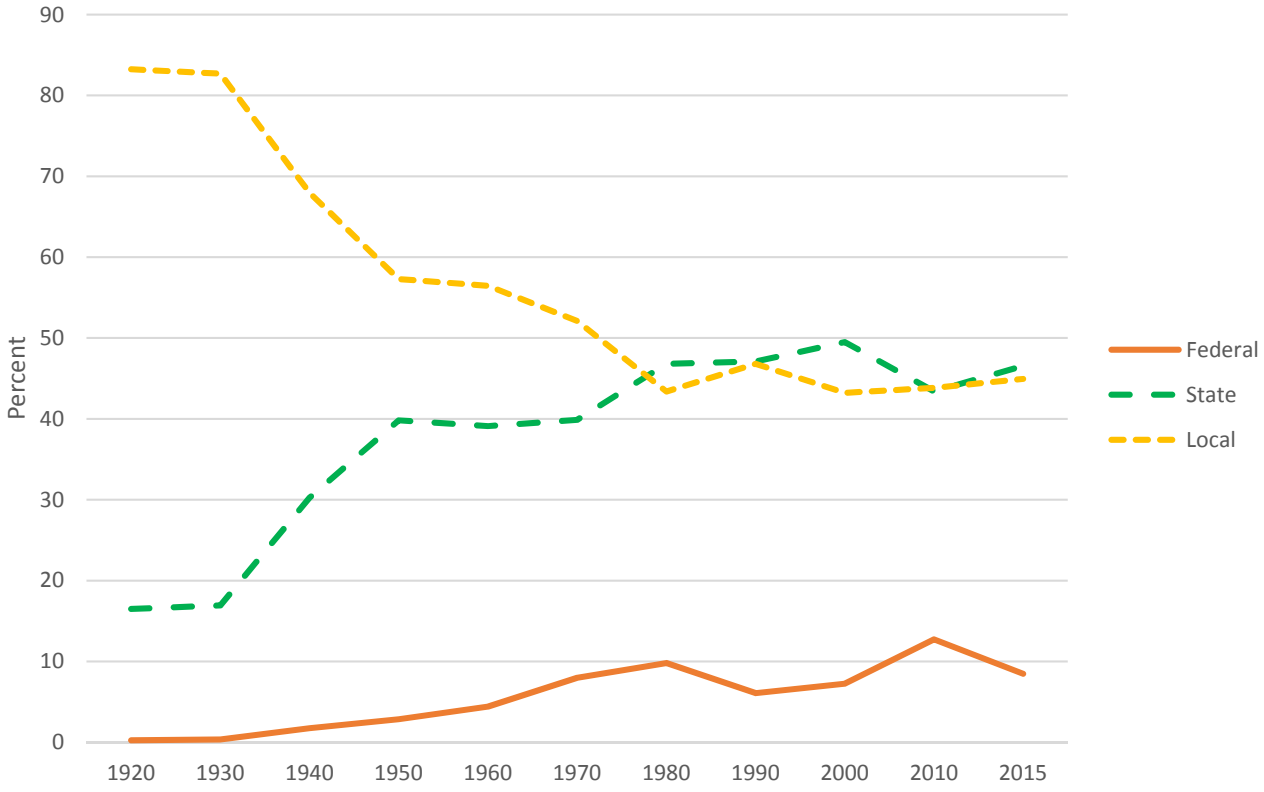
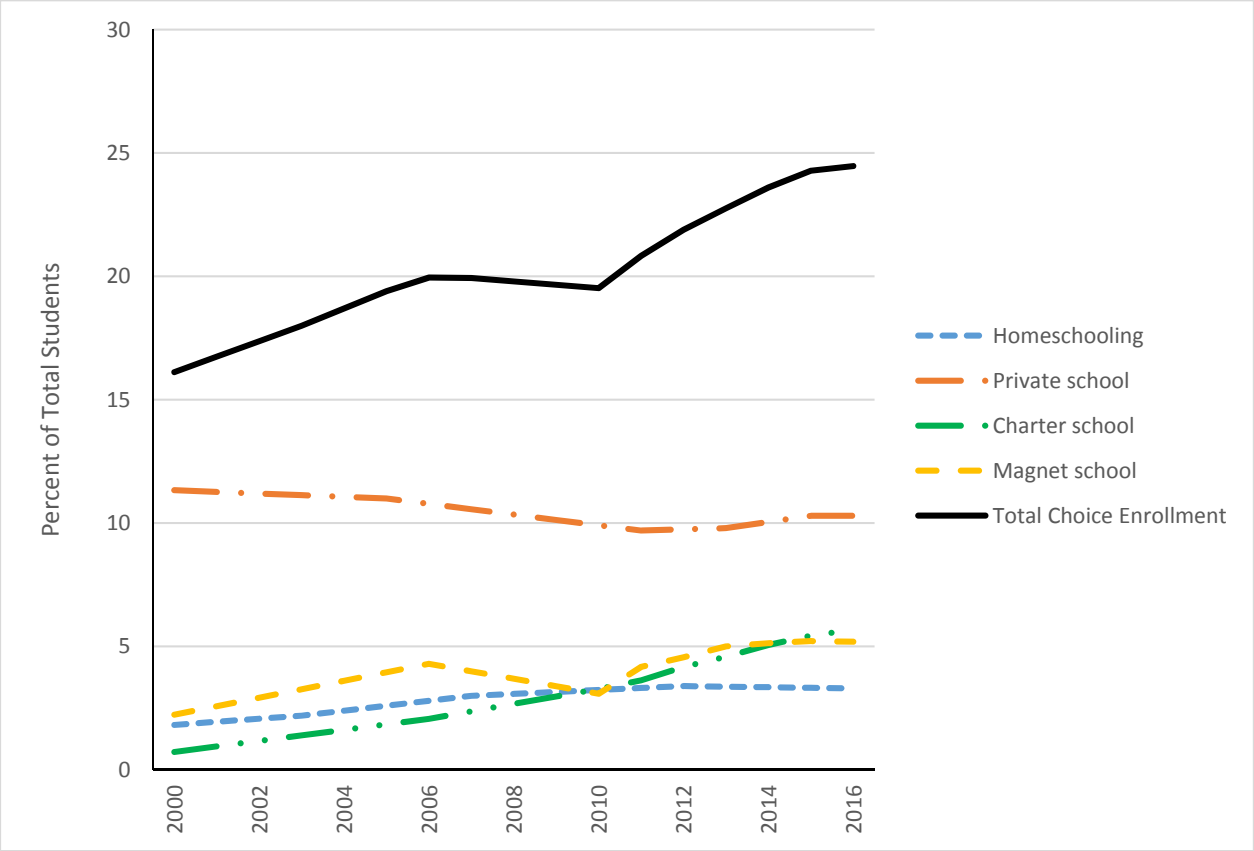
Figure 1. Sources of U.S. School Revenue



Note: Percentage shares of revenues for U.S. public schools.
Source: U.S. Department of Education (2018)

Figure 2. Students Attending Schools of Choice



Source: U.S. Department of Education (2018)

Table 1. Sources of State School Revenue in 2015

	Federal	State	Local
Average	8.5%	46.5%	45.0%
Minimum	4.2	24.9	3.9
Maximum	14.9	90.1	66.8

Note: This table reflects the range of revenue sources across states in 2015.
Source: U.S. Department of Education (2019)

Table 2. School Finance Court Cases and Supreme Court Decisions through 2018

Type of Case	Supreme Court Decision	
	For plaintiffs	For defendents
Equity	21	24
Adequacy	20	18
Both	18	15

Notes: Decisions for the plaintiffs call for state changes in school finance funding statutes; decisions of the defendants leave school finance funding statutes unchanged. An additional 12 cases were heard by the relevant state supreme court but remanded to a lower court for further consideration.

Source: Hanushek and Lindseth (2009) updated by author.