

MICHIGAN AND OHIO K–12 EDUCATIONAL FINANCING SYSTEMS: EQUALITY AND EFFICIENCY

Michael Conlin

(corresponding author)
Department of Economics
Michigan State University
East Lansing, MI 48824
conlinmi@msu.edu

Paul N. Thompson

Oregon State University
Corvallis, OR 97331
paul.thompson@oregonstate
.edu

Abstract

We consider issues of equality and efficiency in two different school funding systems—a state-level system in Michigan and a foundation system in Ohio. Unlike Ohio, the Michigan system restricts districts from generating property or income tax revenue to fund operating expenditures. In both states, districts fund capital expenditures with local tax revenue. Our results indicate that although average revenue and expenditures per pupil in Michigan and Ohio are almost identical, the distributions of the various revenue sources are quite different. Ohio's funding system has greater equality in terms of total revenue, largely due to Ohio redistributing state funds to the least wealthy districts while Michigan does not. We find relatively wealthy Michigan districts spend more on capital expenditures, whereas relatively wealthy Ohio districts spend more on labor and materials. This suggests that constraints on raising local revenue to fund operating expenditures in Michigan could create efficiency issues.

1. INTRODUCTION

In the current financial climate, reductions in property values and poor state fiscal conditions have led to budgetary issues for local school districts. How districts choose to respond to these financial pressures depends on the level of state funding and the different types of local taxes available to school districts. Districts that receive greater state aid will likely be sensitive to reductions in state budgets, whereas districts with greater ability to raise revenue locally may respond to declining state and local economic conditions through the use of voter-approved tax referenda.¹ In addition, districts with the ability to tax income may be better able to respond to declines in property values by switching their tax mix away from property taxation and toward greater income taxation. Districts that are restricted from collecting local tax revenue for operating expenditures may use other avenues, such as expenditure cuts and alternative revenue sources, to alleviate these financial pressures.² The feasibility of these other avenues will clearly depend on the wealth of the districts. Preventing districts from generating local tax revenue for operating expenditures, but not imposing these restrictions on capital expenditures, may also affect how districts allocate resources across capital and operating (i.e., labor and materials) expenditures. Therefore, in addition to equality considerations, these restrictions may also have efficiency implications.

Much of the previous literature on equality in school funding has focused on law changes, usually as a result of court rulings. As expected, these studies largely find that inequality in revenues and expenditures is reduced as a result of these court-mandated reforms.³ Instead of focusing on law changes, we consider how different funding systems impact inequality.⁴ We assess the degree of inequality in per pupil revenue and expenditures across districts under two distinct funding systems—a state-level system (i.e., minimal local control) in Michigan and a foundation system (i.e., greater local control) in

1. Dye and Reschovsky (2008) find that local school districts increased property taxes by 37 cents for every dollar lost in state aid.
2. Reschovsky (2004) argues that funding constraints limit the ability of districts to respond to reductions in state aid and reductions in taxable values, exacerbating the financial problems facing these districts. Evidence from California suggests these types of restrictions are often circumvented by increases in nonrestricted revenue and nontraditional funding sources, such as private donations (Brunner and Sonstelie 2003; Brunner and Imazeki 2005; Hoene 2004).
3. Murray, Evans, and Schwab (1998) and Corcoran et al. (2004) find that inequality was reduced by 19 to 34 percent following these reforms, relative to nonreform states. Also see Springer, Liu, and Guthrie (2009), Roy (2011), and Berry (2007). For a larger review of the state role on equity and adequacy, see Corcoran and Evans (2008).
4. For an overview of different state aid formulas, see Loeb (2001), Hoxby (2001), Fernandez and Rogerson (2003), and Yinger (2004).

Ohio.⁵ Both states use different mechanisms to adjust for inequality resulting from differences in tax base size. Michigan keeps state aid roughly the same for all districts regardless of tax base size but attempts to minimize inequality in revenue by restricting the collection of local revenue to fund operating expenditures for general education students. The Michigan system does allow residents to vote for property tax millages that finance capital projects and expenditures on special and vocational education. Ohio allows districts to raise unrestricted funds for operating expenditures through local property and income taxes, but accounts for the large inequality this creates by giving a disproportionately large amount of state aid to districts with the smallest tax bases. This paper assesses whether the degree of inequality in revenues and expenditures varies across these two states. We also examine whether the allocation of resources between capital and operating expenditures varies across the different funding systems.

Section 2 provides an overview of the Michigan and Ohio K–12 education financing systems. Section 3 first describes the data and contains descriptive statistics on tax rates, taxable values, and district demographics. It then provides a comparison across different revenue sources and notes whether this varies across districts based on property values per pupil. Finally, section 3 also compares expenditures across districts and discusses whether the composition of these expenditures varies across the states. Section 4 concludes.

2. INSTITUTIONAL DETAILS

The Michigan and Ohio K–12 education financing systems are quite complicated and differ along several significant dimensions. Perhaps the most important difference is the restriction on local tax revenue collection for operating expenditures in Michigan. This section provides an overview of the Michigan and Ohio funding systems and discusses the differences and similarities of the two systems.

Michigan K–12 Finance

In response to high property taxes and an unequal distribution of school funding across districts, the Michigan K–12 finance system changed dramatically with the implementation of Proposal A in 1996. Proposal A changed the power equalization finance system to a state level system and reduced the funding obtained from local property taxes while increasing the funding from state income and sales taxes. School districts with a millage rate over 18 in fiscal year 1993 had their millage rate reduced to 18 and the new law stipulated that

5. Theoretical work by Fernandez and Rogerson (2003) suggests the foundation system dominates the state-level system in terms of total welfare.

districts only impose this millage on non-homestead properties.^{6,7} In addition to this non-homestead millage, the state allowed 32 of the highest-spending school districts to levy a “hold harmless” millage. The state also imposed a state level property tax of six mills along with increases in the sales, tobacco product, and real estate transfer taxes. Proceeds from these taxes are deposited in the Michigan School Aid Fund and distributed to the school districts through a per pupil grant. This grant varies depending on which school district the student resides in, but does not depend on the amount of local property taxes collected. The amount of the per pupil grant is the difference between the amount of local revenue that would be collected if the non-homestead millage is at its cap, usually 18 mills, and the amount required to achieve the school district’s per pupil grant allocation. The funds from the grant are deposited into the school district’s general fund to pay for labor, material, utilities, and maintenance costs. Along with property tax millages to finance capital projects, local school districts can propose a “sinking fund” property tax millage, the revenues of which fund certain capital expenditures and repairs.⁸ Local school districts can also generate funds using voter-approved referenda for a recreational millage, which provide revenue for the operation of public recreation facilities and playgrounds.

Each of the 552 local school districts in Michigan belongs to one of 57 intermediate school districts (ISDs) that provide special and vocational education. Funding of ISDs did not appreciably change due to Proposal A and a significant portion of ISD funding comes from local property taxes. The variation across ISDs with regard to property tax revenue results in vastly different services being offered across the ISDs. Some of these services are offered directly by the ISD, and others are provided by the local school districts using ISD funds. An ISD can levy three types of property tax millage: operational, special education, and vocational education. Voters must pass a referendum to change any of these millage rates and there are caps associated with all three tax millages.⁹ The amount of revenue that is passed on to the local school districts varies across ISDs.¹⁰ Along with these property taxes, voters may approve referenda

-
6. Homestead properties are primary resident homes and non-homestead properties are mainly businesses and rental properties.
 7. Only 13 of the 552 school districts imposed a millage of less than 18 in fiscal year 1993. For these districts, the non-homestead millage is capped at the 1993 rate.
 8. The maximum sinking fund millage is five mills for twenty years.
 9. The operating millage rate cannot exceed 1.5 times the number of mills allocated to the ISD in 1993. The special education millage rate cannot exceed 1.75 times the number of mills allocated to the ISD in 1993. The vocational education millage rate is capped at 1 mill for those ISDs that did not levy this tax in 1993 and is capped at 1.5 times the number of mills allocated to the ISD in 1993 for all other ISDs.
 10. The majority of ISDs base the distribution of the revenue from the special education millage on the difference between the special education costs of the district and the amount received in state aid.

for enhancement millages, the proceeds of which are distributed by the ISD to their local school districts on a per student basis.¹¹

There have been a few post-2002 changes to the Michigan K–12 education financing system. One noteworthy change occurred in 2008, when industrial personal property was exempted from both the non-homestead property tax millage (which is usually 18 mills) and the state-level property tax of six mills. During the same time commercial personal property was exempted from 12 of the 18 non-homestead property tax mills.¹² Since 2002, the number of students attending charter schools has increased substantially in Michigan. Charter schools are operated as nonprofit corporations that, like public schools, are provided with the state per pupil foundation allowance but are prohibited from levying taxes, which results in capital expenses being paid for by the foundation allowance or independent contributions.

Ohio K–12 Finance

The 613 public school districts and 49 joint vocational school districts¹³ in Ohio are primarily funded through state aid and local property or income taxation. The role of the state in financing education is to ensure that each district receives the necessary funds to provide an “adequate” level of educational services to the students of the district. To do this, the state first determines the amount of per pupil expenditures that are necessary to achieve this adequacy education level.¹⁴ School districts are required to raise at least 20 mills of property tax revenue in order to cover some (or all) of this adequacy amount. Currently, the state calculates the local share of the adequacy amount by assuming school districts levy 23 mills of property taxes.¹⁵ After netting out this local “charge-off,” the state provides districts with the remaining revenue needed to achieve the adequacy amount.

Ohio school districts also have the option to supplement state aid through additional property and income taxation, subject to voter approval. Districts

Other ISDs base the distribution on average cost measures and the number of special education students.

11. The maximum enhancement millage is three mills for twenty years.
12. Personal property is tangible assets of a business such as computers, machinery, and equipment. Real property refers to land and buildings.
13. These vocational schools span one or more counties within the state. They provide vocational training to students from public school districts within the counties the vocational school operates. High school students from these public school districts can opt to pursue this vocational training in place of a traditional public high school education, if accepted into the vocational program.
14. For documentation on the adequacy formula, see the Ohio Legislative Service Commission’s *School Funding Complete Resource* (www.lsc.state.oh.us/schoolfunding/edufeb2011.pdf).
15. There are a few districts that impose less than 23 mills. The state supplements these districts with enough funds to meet the revenue that would have been received had the district levied 23 mills. This additional state supplement is called gap aid.

are able to tax both real and tangible personal property.¹⁶ Similar to Michigan, districts can issue debt through bonds for capital projects and improvements to classroom facilities. In addition to debt issuances, permanent improvement property tax levies fund short-term, at most five-year, capital improvements. In contrast to Michigan, Ohio districts also have the option to propose additional taxes financing operating expenditures. Revenue for operating expenditures is generated through either current expense millages or emergency operating levies. These current expense taxes can either be property or income taxes that raise revenue over a period of five or more years.¹⁷ Emergency operating taxes collect a district-specified amount of revenue for a period of at most five years. In addition to taxes approved by voters, each district is allocated a set amount of property tax millage that is levied without voter approval. Districts primarily allocate the revenue from this “inside millage” toward either current expenses or permanent improvements.

There have been a few significant policy changes since 2002 that have changed the way schools are funded. In 2010, Ohio adopted an evidence-based funding formula that determined the adequacy amount based on the number and type of staff needed to provide a basic level of education. This funding formula also changed how the local share of funding is calculated. Prior to 2010, the local “charge-off” was calculated using recognized valuation.¹⁸ Starting in 2010, the local “charge-off” for districts at the 20-mill floor was calculated using total valuation, although the charge-off of all other districts continued to be calculated using recognized valuation. Beginning in 2006, Ohio gradually phased out taxation on business tangible personal property, with the state providing districts with funds to offset the loss in revenue resulting from this phase-out.

Similarities between Ohio and Michigan Financing Systems

There are several similarities between the two school funding systems. Michigan and Ohio both have school choice programs, which allow students to

16. There are two classes of real property in Ohio: class I includes all real residential and agricultural property and class II includes all real commercial, industrial, mineral, and railroad property.
17. Prior to 2006, Ohio school districts could levy income taxes on the traditional income tax base (adjusted gross income net personal and dependent exemptions). After 2006, districts were given the option of only taxing the earned income of residents. This earned income is not subject to personal and dependent exemptions.
18. Recognized valuation spreads out the inflationary increase in real property from reappraisal over three years to prevent the state share of funding to fluctuate greatly from one year to the next. Thus, the recognized valuation of a district in the year of reappraisal is the total valuation $- (2/3) \times$ Inflationary Increase. A year after reappraisal, recognized valuation becomes the total valuation $- (1/3) \times$ Inflationary Increase. Two years after reappraisal, recognized valuation is equal to total valuation. Also, because the school fiscal year runs from July to June and the tax year runs from January to December, valuation from two years prior is used in the calculation of the local charge-off. For example, valuation from 2008 is used in the calculation for the 2009–10 school year.

attend a school district even if they do not reside in that district. The state provides the attending district with additional funds to educate these students. For school districts that have capacity and elect to enroll students residing outside the district boundaries, Michigan requires the district to hold a lottery to determine which students are able to attend—with preference given to students with siblings who are already school of choice students in the district. Unlike Michigan, school districts in Ohio do not hold lotteries to determine which students are able to attend via open enrollment. Instead, the school superintendent determines which students are allowed to enroll in the school district when the number of open enrollment applications exceeds the number of slots available. School districts in Ohio also have the option to limit which students are eligible to enroll in the district through open enrollment.¹⁹

Another similarity is that both states have legislation that restricts the growth of local property taxes. The 1978 Headlee Amendment in Michigan requires that property tax rates be decreased (i.e., “rolled back”) if the growth in assessed values, excluding new construction and improvements, exceeds the growth in inflation. County, municipality, intermediate school district, and school district property tax rates are “rolled back” so that the same amount of property taxes, in real terms, are collected from the old base.²⁰ For parcels that do not transfer ownership, Proposal A also restricts the growth of individual parcel property assessments to the lesser of the inflation rate and 5 percent. For parcels that do transfer ownership, the taxable values are assessed at 50 percent of the true cash value. Ownership transfers usually result in a significant increase in the amount of property tax paid on these properties. Residents can “override” these Headlee rollbacks by voting on referenda that returns the tax rate back to its prior level or by voting on renewal specifying the prior tax rates.²¹

In Ohio, property taxes for current expenses (provided total current expense millage is greater than 20 mills), classroom facilities, and permanent improvements are subject to property tax rollbacks. Bonds, emergency operating levies, and all inside millage are exempt from these property tax rollbacks. All real property (both class I and class II) is assessed at 35 percent of true value. Tangible personal property is assessed at a rate between 23 percent and 100 percent of true value. Similar to Michigan, these property tax rollbacks

19. Currently, 431 Ohio school districts allow any student from the state to apply for open enrollment. Of the remaining districts, 62 only accept students from adjacent districts and 120 have no open enrollment policy in place.

20. Millage used to retire debt, along with the 6 mill state level property tax, are not subject to these Headlee rollbacks.

21. Many districts pass referenda stipulating a “maximum” non-homestead property tax millage of over 18. While the districts are restricted to only levy 18 mills, passing this type of referenda allows a district facing a Headlee rollback to maintain an 18 millage rate without voting on another referendum.

require that class I and class II property tax rates be reduced in proportion to the increase in assessed values. Tangible personal property is exempt from these rollbacks. Because changes in assessed valuation of class I and class II property differ, the rollback factor is different for both classes of real property. Therefore, often class I and class II real property are taxed at different rates, while tangible personal property is taxed at the voted millage rate.

3. DATA AND DESCRIPTIVE STATISTICS

Data

We obtained school district-specific variables from the National Center for Education Statistics (NCES) (Local Education Agency Finance Survey and Common Core of Data), the Michigan Department of Education, the Ohio Department of Education, the Michigan Department of Treasury, and the Ohio Department of Taxation. Detailed information on school district revenues and expenditures is obtained from the Local Education Agency Finance Survey. These data consist of annual school district information from 2002 through 2010.²² These data include information on total revenues, total federal revenues, total state revenues, total local revenues, and total expenditures. These data also include a measure of total enrollment in the district, which we supplement with data on the number of general education and special education students from the Ohio and Michigan Departments of Education. School district demographic data are obtained from the NCES Common Core of Data and the Small Area Income and Poverty Estimates. These data include the number of free and reduced priced lunch students, enrollments broken down by race, number of schools in the district, and the number of school-aged children in poverty.

We also collect annual tax rates and taxable property valuations from the Michigan Department of Treasury and the Ohio Department of Taxation. The tax information provides all the taxes levied in each year from 2002 through 2010 and includes information for whether the tax funds are for operating or capital expenditures. We then aggregate these tax rates at the district level, which provides us with a total district tax rate to fund operating expenditures and a total tax rate to fund capital expenditures. We then multiply these two aggregate tax rates by the total taxable value in the district for each year, which gives an estimate of the total local property tax revenue collected to fund operating and capital expenditures. We also obtain a measure of the level of income taxes collected by Ohio districts for operating expenditures from the Local Education Agency Finance Survey.

22. Year corresponds to the school fiscal year from 1 July to 30 June. Thus, we analyze data from the 2001–02 school year to the 2009–10 school year.

Descriptive Statistics

Table 1 contains the average school district property tax rates for Michigan and Ohio along with taxable value information. There are interesting differences to note across the states. Although both the local school districts and the intermediate school districts in Michigan collect property taxes, the local school districts in Ohio have a much higher overall millage rate from which to generate unrestricted operating revenue. This is due to the fact that Michigan imposes a dollar-for-dollar “tax” on revenue generated from the non-homestead millage and, therefore, this non-homestead revenue should be and is considered state revenue in our analysis. For Ohio, the local revenue generated to cover the adequacy amount defined by the state is considered local revenue. Although we do not have district-level information on these adequacy amounts, for most Ohio districts, especially the relatively wealthy districts, we expect that the current tax rates more than cover the adequacy amount and a nominal change in the tax rates will not change the revenue obtained from the state. Table 1 also indicates that the taxable values on which these local property taxes are imposed are greater for Michigan. Because the average number of students in a school district is 2,774 for Michigan and 2,870 for Ohio (table 2), the taxable value difference between Michigan and Ohio is not the result of Ohio having larger school districts. Taxable values differ across the two states because Ohio properties are assessed at only 35 percent of true value compared with a 50 percent assessment rate in Michigan; resulting in the taxable value per pupil being over twice as large in Michigan.

Table 2 indicates that, along with slightly larger enrollments, Ohio school districts have slightly greater total expenditures and total revenue on average than Michigan.²³ This results in almost identical total expenditures per student and total revenue per student, on average, for the two states. Total revenue is slightly greater in Ohio than Michigan because although Ohio districts average \$8.3 million less in state revenue, they average \$10.6 million more in local revenue than Michigan. Local revenue is composed primarily of local property and income taxes but there are other sources of local revenue including school lunch receipts, student activity receipts, student fees, and transfers from other school districts.²⁴ Greater local tax revenue by Ohio districts is expected because the larger overall millage rates more than offset the lower taxable

23. Using the Consumer Price Index, dollar figures in all tables and figures have been converted to 2010 dollars.

24. Excluding local property and income tax revenue, Ohio districts average \$2.7 million annually from other local revenue sources and Michigan districts average \$3.0 million annually. This includes revenue from other school districts (primarily payments associated with school choice programs and transfers from the ISDs), which average \$1.4 million and \$0.4 million annually for Michigan and Ohio districts, respectively. Although we include these transfers from other school districts as local revenue, it may be more appropriate to classify some as state revenue.

Table 1. Tax Rates and Taxable Values

Panel A: School District Millages (number of mills*)				
Michigan		Ohio		
			Class I	Class II
Debt	4.20 (2.85)	Debt	3.19 (2.61)	3.19 (2.61)
Hold-Harmless	0.33 (1.85)	Current Expenses	23.06 (5.96)	26.69 (9.42)
Sinking Fund	0.33 (0.75)	Emergency Operating	2.48 (3.97)	2.48 (3.97)
Recreational	0.02 (0.21)	Permanent Improvements	0.88 (1.03)	1.00 (1.13)
Non-Homestead	17.62 (1.72)	Classroom Facilities	0.14 (0.21)	0.14 (0.22)
Panel B: Intermediate School District Millages (number of mills*)				
Michigan				
Debt	0.003 (0.03)			
Vocational Education	0.76 (0.86)			
Special Education	2.67 (1.03)			
Enhancement	0.03 (0.19)			
Operating	0.21 (0.13)			
Panel C: School District Taxable Values (millions in 2010 dollars)				
Michigan		Ohio		
Homestead	349 (578)	Class I	269 (402)	
Non-Homestead	218 (391)	Class II	79 (219)	
Industrial Personal Property	16.2 (110)	Tangible Personal Property	28 (61)	
Commercial Personal Property	2.00 (16.2)	Tangible Public Utility Property	15 (28)	

Note: 1 mill is equivalent to \$1 in taxes per \$1,000 in taxable value.

values.^{25, 26} This greater local tax revenue collection in Ohio is mainly attributable to Ohio's current expense millage and is not appreciably affected by

25. The local taxes collected as reported by the districts in the Local Education Agency Finance Survey are less than the amounts calculated using the millage rates and taxable value information. Part of this difference is attributable to the fact that when we use the millage rates and taxable value

Table 2. Revenue and Demographic Characteristics

	Michigan	Ohio
Number of Students	2,774 (4,714)	2,870 (4,552)
Total Expenditures (millions in 2010 dollars)	32.6 (63.4)	33.8 (67.9)
Revenues:		
Total Revenue (millions in 2010 dollars)	31.2 (59.8)	34.0 (67.4)
State Revenue (millions in 2010 dollars)	23.1 (41.5)	14.8 (32.3)
Local Revenue (millions in 2010 dollars)	6.22 (12.2)	16.8 (30.6)
Total Local Operating Revenue (millions in 2010 dollars)	0.953 (3.608)	13.9 (27.7)
Total Local Capital Revenue (millions in 2010 dollars)	2.76 (5.57)	1.83 (3.78)
Total Local Income Tax Revenue (millions in 2010 dollars)		0.40 (1.07)
Number of Special Education Students	117 (323)	396 (714)
Number of White Students	2,134 (2,580)	2,251 (2,112)
Number of Students with Free or Reduced Lunch	939 (2,930)	824 (2,749)
Median Income (thousands in 2010 dollars)	57.3 (16.1)	59.6 (15.4)
Population	17,500 (36,185)	18,688 (36,186)
Population – Ages 5–17	3,165 (7,423)	3,314 (6,301)
Population in Poverty – Ages 5–17	462 (2,583)	489 (1,851)
Number of Schools	6.11 (8.92)	5.81 (8.98)
Number of Title I Schools	2.97 (7.64)	4.09 (8.20)
Number of Observations	4,953	5,523

information from the Michigan Department of Treasury and the Ohio Department of Taxation, we do not take into account either the various tax exemptions received by some property owners or delinquent payments.

- It is important to note that the difference in local revenue per pupil would be less if the non-homestead millage in Michigan was considered local revenue or if the local revenue generated by Ohio districts to achieve the adequacy amount was considered state revenue.

local income tax revenue, which averages only \$400,000 annually for Ohio school districts.

Although Ohio generates more local revenue for operating expenses, Michigan generates significantly more for capital expenditures. The reason the taxation for capital expenditures differs so dramatically is in part due to the Ohio School Facilities Commission (OSFC). The OSFC is a state agency that provided funds for capital expenditures (e.g., school building construction and renovations) to the school districts. Besides the number of special education students and number of Title I schools, the averages of the other school district demographic characteristics are similar across the states.²⁷ While the difference in the number of Title I schools is surprising, the fewer number of special education students in Michigan local school districts is partly attributable to the fact that many Michigan special education students attend schools operated by the intermediate school districts.²⁸

School District Revenue

Figures 1 through 6 present yearly student enrollment and per pupil revenue from different sources across different quintiles based on average annual taxable property values per pupil. To compare the inequality in these various revenue sources, separate graphs are provided for Michigan and Ohio.^{29,30} Figure 1 depicts how total enrollment in the different quintiles changes across years. It is interesting to note that the poorer and poorest quintiles are the smaller, more rural, school districts. While all Michigan quintiles saw an enrollment decrease between 5 and 10 percent, enrollment of the wealthier and wealthiest quintiles in Ohio remained stable across the years while the others, especially the median quintile, experienced a significant decline.³¹ Figure 2

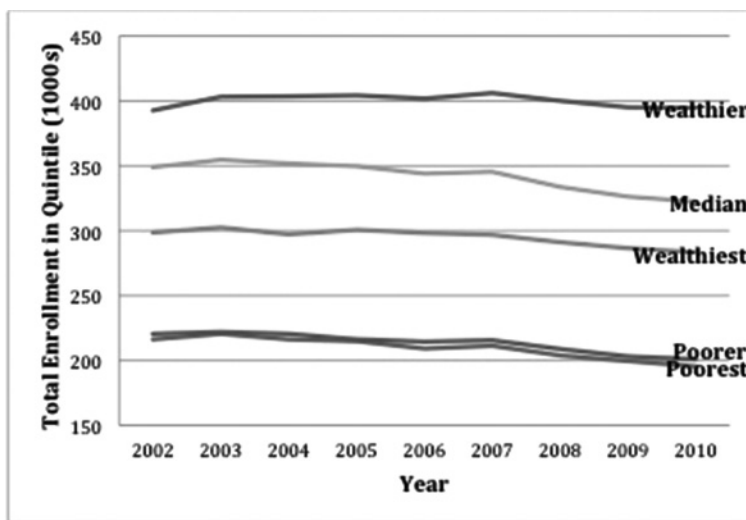
27. It should be noted that the number of free and reduced lunch students is not available for Ohio in 2008, but removing this variable from our regressions does very little to change the main conclusions. In addition, the median income by school district is available in the 2000 U.S. Census and five-year estimates are available from the Census for all Ohio, and almost all Michigan, school districts from 2005 to 2009, 2006–10, and 2007–11. We construct annual median income by district by interpolating this information.

28. In addition, the structure of special education financing in Ohio provides districts more incentive to classify a student as special education relative to Michigan.

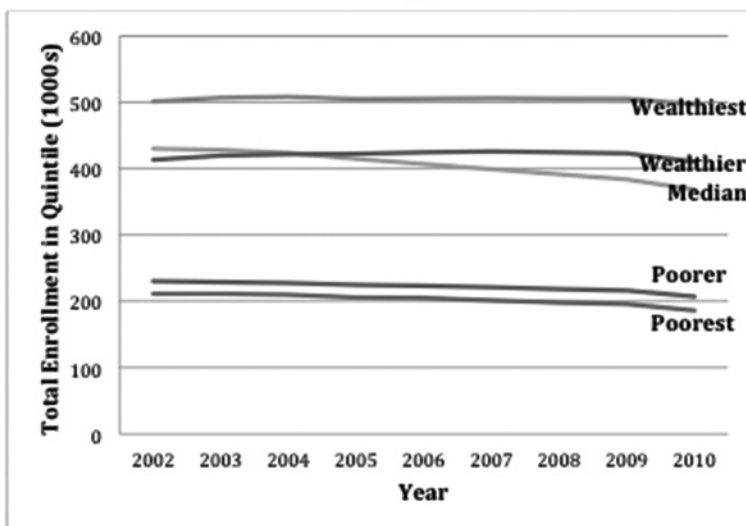
29. The wealthiest quintile are the 20 percent of school districts with the largest taxable values per pupil, wealthier quintile are the districts from 20 percent to 40 percent, median quintile are the districts from 40 percent to 60 percent, poorer quintile are the districts from 60 percent to 80 percent, and poorest quintile are the 20 percent of school districts with the smallest taxable values per pupil.

30. The quintiles are based on the average annual taxable property values per pupil so that a district remains in a given quintile across all years. To ensure that the composition of each quintile does not change across years, the seven districts with at least one year of missing information are dropped (48 district-year observations).

31. Because Detroit and other districts around Detroit are dropped due to missing at least one year of data, the actual decline in enrollment for the poorest Michigan quintile is likely larger than depicted in figure 1.



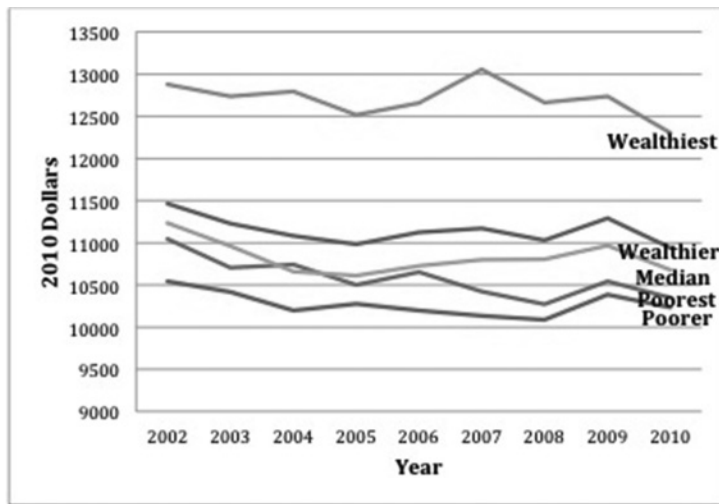
(a)



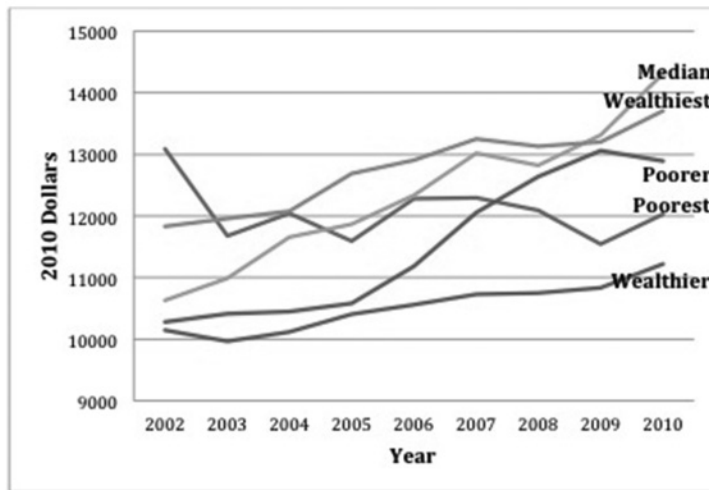
(b)

Figure 1. Total Enrollment of Quintiles: (a) Michigan; (b) Ohio. Note: The quintiles are based on the average annual taxable property values per pupil so that a district remains in a given quintile across all years.

presents total revenue per pupil obtained from the Local Education Agency Finance Survey. Whereas the more wealthy quintiles in Michigan have greater total revenue per pupil than the other quintiles, this relationship does not hold for Ohio. The Ohio quintile with the highest average total revenue per pupil in 2010 is the median quintile. The dramatic increase in this quintile across years is in part attributable to its 14 percent drop in enrollment, as



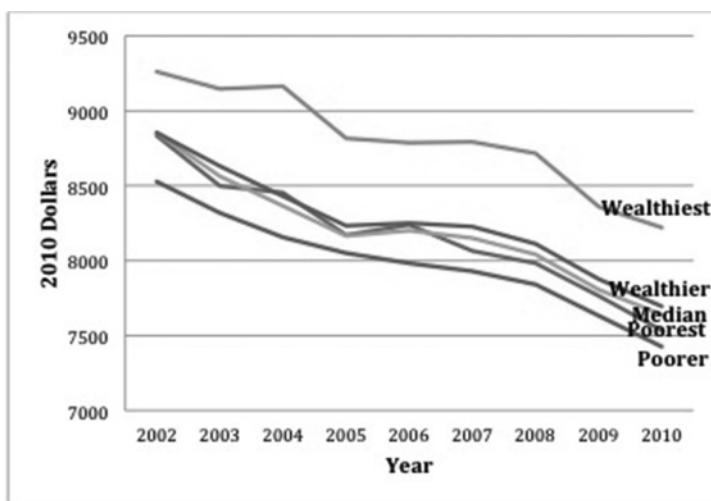
(a)



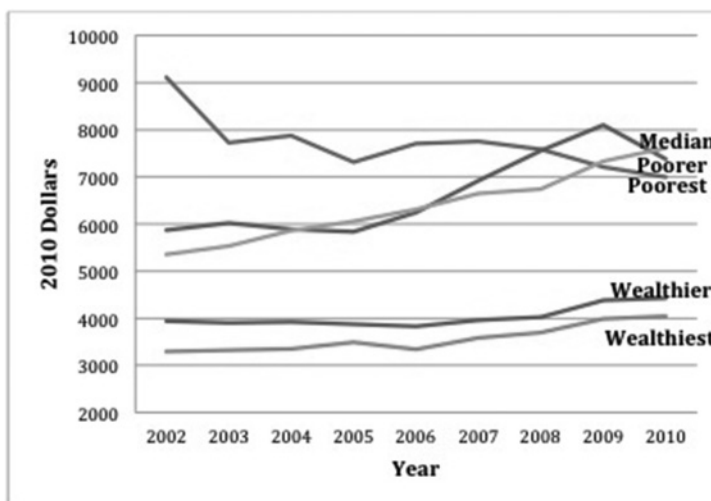
(b)

Figure 2. Total Revenue per Pupil: (a) Michigan; (b) Ohio. *Note:* The quintiles are based on the average annual taxable property values per pupil so that a district remains in a given quintile across all years.

depicted in figure 1. Also note that in 2002, all Michigan quintiles, besides the poorest, had greater total revenue per pupil than their corresponding Ohio quintiles. By 2010, Ohio districts in all quintiles had total revenue per pupil that exceeded their corresponding Michigan quintiles. This is the result of total revenue per pupil declining for all Michigan quintiles from 2002 to 2010, while total revenue per pupil for Ohio quintiles has increased over the period. For several Michigan quintiles, the largest decrease in total revenue per pupil occurred in the last year or last several years of our data, when the United States



(a)



(b)

Figure 3. State Revenue per Pupil: (a) Michigan; (b) Ohio. *Note:* The quintiles are based on the average annual taxable property values per pupil so that a district remains in a given quintile across all years.

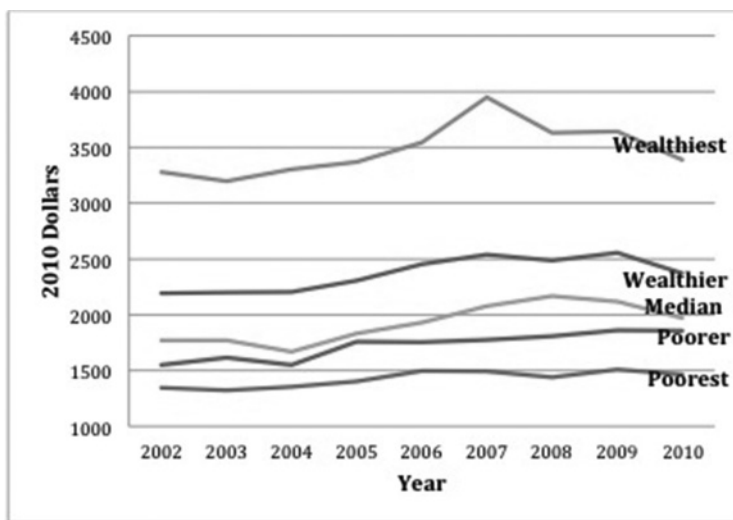
experienced a significant recession. Interestingly, total revenue per pupil for most Ohio quintiles increased during this Great Recession, suggesting that perhaps Ohio districts are better able to respond to economic downturns because of their ability to generate local revenue for operating expenditures. Thus, the structure of the state school financing system may greatly influence how economic downturns impact school districts.

As demonstrated in panel (a) of figure 3, Michigan’s slight decrease in total revenue per pupil is primarily attributable to a decrease in state revenue.

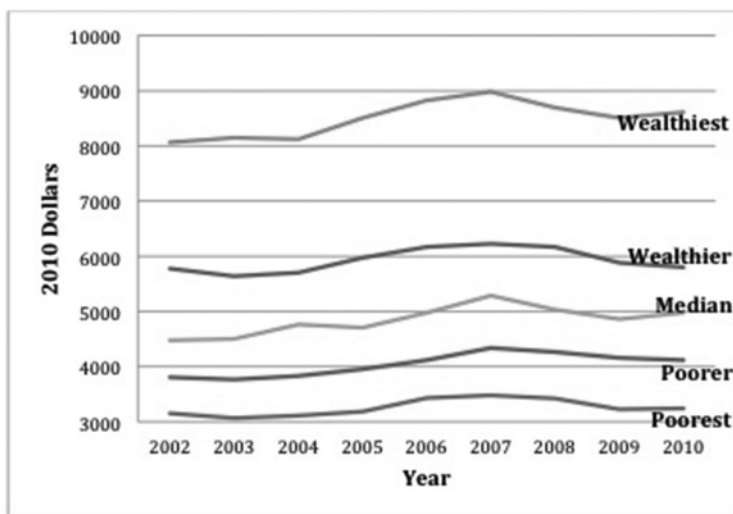
Given that Michigan restricts how much revenue can be raised locally to fund operating expenditures, it is not unexpected that Michigan districts usually receive more in state revenue per pupil than comparable Ohio districts. Interestingly, Michigan distributes state revenue relatively evenly across school districts, but districts in the wealthiest quintile receive nearly \$600 more in state revenue per pupil than districts in the other quintiles. This distribution of state aid, which is provided irrespective of district wealth, is consistent with what would be expected given the framework of the Michigan funding laws, which targets inequality by restricting collection of local property taxes. In contrast, Ohio attempts to address inequality by allocating significantly more state revenue to less wealthy districts. Districts in the wealthiest quintile in Ohio receive between \$3,000 and \$5,800 less state revenue per pupil than districts in the poorest quintile, but this difference has decreased across years.

Unlike Ohio, which addresses inequality through disproportionate state aid to the poorest districts, Michigan addresses inequality by placing restrictions on the use of local property taxes for operating expenditures. These restrictions explain the large differences in local revenue we observe in figure 4 between Ohio and Michigan districts in all taxable value quintiles. Michigan districts obtain approximately 2.5 times less local revenue than similar districts in Ohio. Due to unrestricted property and income taxation at the local level in Ohio, the gap in local revenue between the richest and poorest districts is much larger in Ohio than in Michigan. In Michigan, the wealthiest school districts raise approximately \$2,000 per pupil more in local revenue than the poorest districts, whereas in Ohio, the wealthiest districts raise \$5,000 more per pupil than the poorest districts. This disparity between the top and bottom is so large in Ohio that even though the state gives disproportionately more state revenue to the relatively poor districts it is not enough to offset this \$5,000 per pupil gap.

In addition to the disparity in total local revenue, the restrictions placed on taxes for operating expenditures in Michigan may result in different mixes of taxes for capital and operating expenditures across the two states. Figure 5 focuses strictly on local operating tax revenue, which is generated exclusively through property taxes in Michigan, while in Ohio districts generate local operating revenue through property and income taxes. The minimal local property tax revenue collected by Michigan districts for operating expenditures is obtained primarily from the hold harmless millage of wealthy districts and the special education millage of the intermediate school districts. In contrast to Michigan, a significant portion of local revenue in Ohio is generated from local taxes and almost all is unrestricted, as state revenue is often used toward funding special education. As expected, based on figure 4, the amount of local operating tax revenue generated is greater in the relatively wealthy districts and significantly greater in the wealthiest districts. In Ohio, a relatively small



(a)

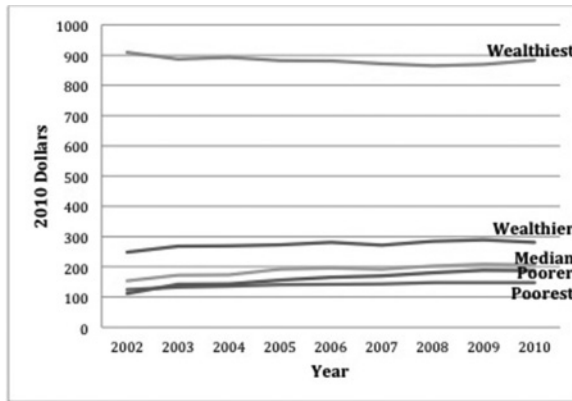


(b)

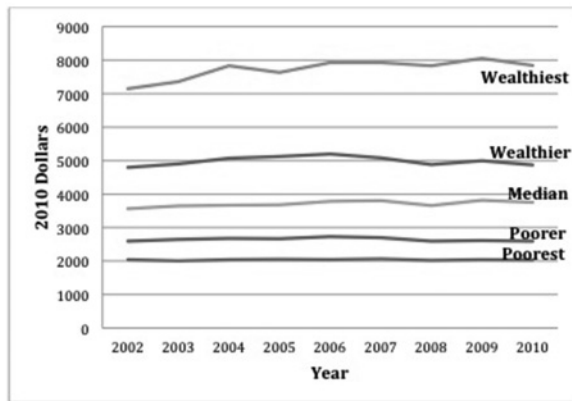
Figure 4. Local Revenue per Pupil: (a) Michigan; (b) Ohio. *Note:* The quintiles are based on the average annual taxable property values per pupil so that a district remains in a given quintile across all years.

fraction of local operating revenue is from income taxes but use of these taxes has increased since 2006—especially in poorer, agricultural districts that have low taxable value bases but relatively higher taxable income bases.³²

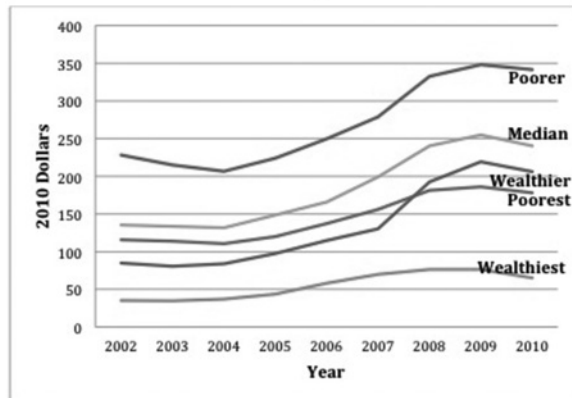
32. As found in Spry (2005) and Hall and Ross (2010), a majority of districts using these income taxes are districts in rural areas. Ross and Nguyen-Hoang (2013) show that Ohio districts use the income tax as a supplement to property taxation.



(a)

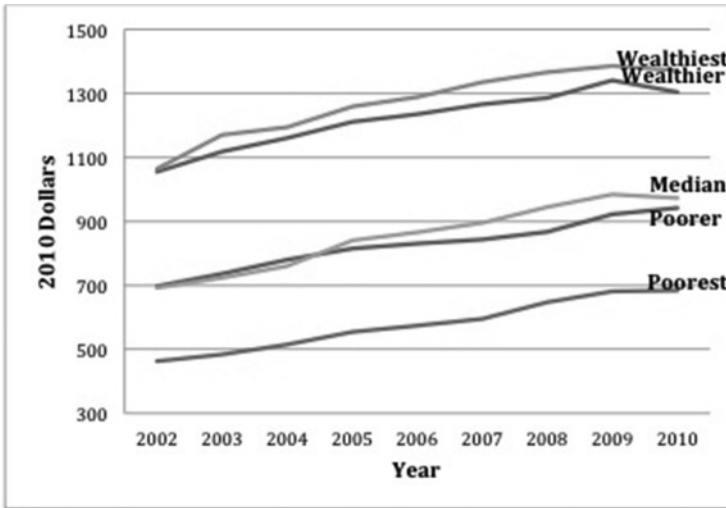


(b)

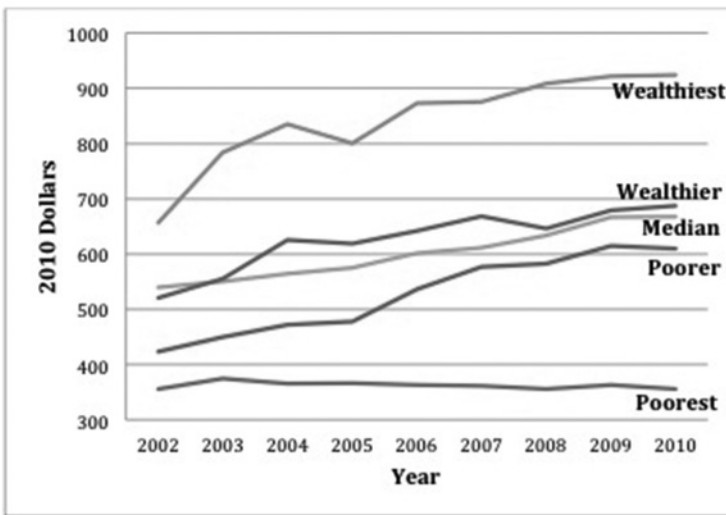


(c)

Figure 5. Local Operating Tax Revenue per Pupil: (a) Michigan Property Tax; (b) Ohio Property Tax; (c) Ohio Income Tax. *Note:* The quintiles are based on the average annual taxable property values per pupil so that a district remains in a given quintile across all years.



(a)



(b)

Figure 6. Local Capital Property Tax Revenue per Pupil: (a) Michigan; (b) Ohio. *Note:* The quintiles are based on the average annual taxable property values per pupil so that a district remains in a given quintile across all years.

As state revenue has decreased and local revenue for operating expenditures has largely remained constant from 2002 to 2010, property tax revenue for capital expenditures has increased in Michigan. As depicted in figure 6, the Michigan quintiles increased property tax revenue for capital expenditures by between \$200 and \$300 per pupil, with the largest increase occurring in the wealthiest quintile. Ohio districts in all quintiles collect less tax revenue

for capital expenditures than districts in the corresponding Michigan quintiles. For the median, poorer, and poorest quintiles, this difference is partly attributable to the OSFC, which designated \$7 billion for capital expenditures to, primarily, the relatively poor school districts between 2002 and 2010.³³ The OSFC made these capital funds available to the least wealthy districts first by ranking the districts based on a weighted average of taxable value per pupil and median income.³⁴ This capital expenditure subsidy from the OSFC is likely to have crowded out some capital expenditures by the school districts. Interestingly, the wealthier and wealthiest quintiles in Ohio, mainly comprising school districts that did not have access to these OSFC funds, also obtain significantly less tax revenue for capital expenditures than comparably wealthy Michigan school districts. Perhaps these wealthy Ohio districts preferred to have local tax revenue fund operating expenditures rather than capital expenditures. Because of the constraints Proposal A places on raising local operating revenue, the wealthy Michigan districts do not have this choice.

Although these figures give some sense of the inequality of revenue in both states, they do not account for differences in district size and demographics that may contribute to differences in revenue across the two states. To better account for these other factors we estimate the following regression equation:

$$\ln(y_{st}) = \beta_0 \ln(\text{Taxable Value}_{st}) + \mathbf{X}_{st}\boldsymbol{\beta} + \lambda_s + \theta_t + \epsilon_{st}$$

where $\ln(y_{st})$ is the natural log of either total revenue, state revenue, or local revenue of district s in year t ; $\ln(\text{Taxable Value}_{st})$ is the total taxable value for the district in year t ; \mathbf{X}_{st} is a vector of school district demographics that includes median income, total and special education enrollment counts, the number of white students, the number of students eligible for free/reduced priced lunch,

33. The decision to use a significant portion of the tobacco settlement funds to subsidize school capital investments was, in part, a response to a U.S. General Accounting Office report entitled "School Facilities: Profiles of School Condition by State." The 1996 report summarized results from a national survey of school buildings and concluded that the physical condition of school buildings in Ohio was worse than the school building condition in almost all, if not all, other states. For example, the report indicates that 61 percent of the 3,600 Ohio schools surveyed indicate at least one on-site building in inadequate condition compared with only 34 percent for the 3,325 Michigan schools surveyed.
34. The OSFC began offering funds to the most needy school districts in 1997 and by 2010 funds had worked up to the 450th spot in the rankings. The state has contributed a certain percentage of the capital funds and this percentage depends on the district rankings with poorer districts having lower rankings receiving a greater percentage. For most districts, the state's percent contribution is one minus the ranking list percentile. For example, a district ranked 61 out of the 613 school districts would be at the tenth percentile and the state contribution would be 90 percent of the total project cost. Most districts raise their share by passing a referendum that generates property taxes so that the district can sell bonds. A few districts use existing property taxes, cash on hand, and voluntary contributions to raise the local share. In recent years especially, many districts chose not to pursue the available funding or were unable to pass referenda to fund the district's portion of the costs.

Table 3. Revenue Regression Results without District Fixed Effects

	Total Revenue		State Revenue		Local Revenue	
	Michigan	Ohio	Michigan	Ohio	Michigan	Ohio
ln(Total Taxable Value)	0.127** (0.019)	0.126** (0.031)	0.093** (0.016)	-0.659** (0.050)	0.301** (0.054)	0.805** (0.030)
ln(Median Income)	0.212** (0.053)	0.035 (0.067)	0.085 (0.045)	-0.020 (0.084)	0.942** (0.159)	0.225** (0.077)
ln(Enrollment)	0.728** (0.083)	0.748** (0.057)	0.769** (0.087)	1.162** (0.082)	0.569** (0.133)	0.320** (0.060)
ln(Spec Ed Enrollment)	0.036** (0.012)	0.154** (0.026)	0.022* (0.009)	0.141** (0.037)	0.103** (0.038)	0.092** (0.026)
ln(White Enrollment)	-0.103** (0.017)	-0.123** (0.025)	-0.055** (0.009)	-0.071** (0.019)	-0.177** (0.046)	-0.150** (0.030)
ln(Free/Reduced Lunch Enroll)	0.019 (0.013)	-0.034* (0.017)	0.020* (0.010)	-0.004 (0.020)	0.023 (0.043)	0.006 (0.018)
Number of Schools	0.004** (0.001)	0.002 (0.003)	0.003** (0.001)	-0.008* (0.004)	0.007 (0.004)	0.018** (0.004)
Number of Title I Schools	-0.003* (0.001)	0.001 (0.003)	-0.002** (0.001)	0.012** (0.004)	-0.004 (0.004)	-0.015** (0.003)
ln(Population)	0.123** (0.041)	-0.030 (0.055)	0.062* (0.028)	0.035 (0.085)	0.303 (0.166)	0.009 (0.061)
ln(Pop. under age 18)	0.022 (0.071)	0.073 (0.059)	0.053 (0.073)	0.361** (0.099)	-0.046 (0.180)	-0.130* (0.063)
ln(Pop. <18 in poverty)	0.013 (0.015)	0.048** (0.015)	0.009 (0.011)	0.016 (0.020)	-0.114* (0.047)	-0.037* (0.015)
R-squared	0.99	0.95	0.99	0.90	0.87	0.95
Observations	4,659	4,824	4,659	4,824	4,656	4,824

Notes: Dependent variables are natural logs of the listed revenue variables. Each specification contains year fixed effects. Robust standard errors, clustered at the school district level, given in parentheses.

**Statistically significant at the 1% level; *statistically significant at the 5% level.

the total number of schools and Title I schools, total district population, and total school-aged population in poverty; λ_s is a vector of school district fixed effects; θ_t is a vector of year fixed effects; and ϵ_{st} is an idiosyncratic error term. Tables 3 and 4 contain estimates when school district fixed effects are not included and are included in the specification, respectively.

The estimates from the specification without fixed effects use primarily across-school district variation to identify the relationship between taxable value and revenue. These estimates in table 3 suggest that a 10 percent increase in total taxable value is associated with approximately a 1.3 percent increase in total revenue for both states, and a 10 percent increase

Table 4. Revenue Regression Results with District Fixed Effects

	Total Revenue		State Revenue		Local Revenue	
	Michigan	Ohio	Michigan	Ohio	Michigan	Ohio
ln(Total Taxable Value)	0.239** (0.035)	0.097* (0.037)	0.225** (0.039)	-0.571** (0.061)	0.391** (0.115)	0.666** (0.038)
ln(Median Income)	0.055* (0.025)	-0.007 (0.074)	0.065* (0.026)	-0.027 (0.113)	0.152 (0.094)	0.081 (0.048)
ln(Enrollment)	0.344** (0.128)	0.416** (0.082)	0.394** (0.147)	0.799** (0.120)	0.130 (0.077)	0.162 (0.090)
ln(Spec Ed Enrollment)	0.028* (0.011)	0.041 (0.023)	0.033** (0.013)	0.049 (0.035)	0.011 (0.016)	0.037* (0.017)
ln(White Enrollment)	-0.006 (0.007)	-0.169** (0.056)	-0.002 (0.007)	-0.345** (0.070)	-0.008 (0.015)	-0.002 (0.072)
ln(Free/Reduced Lunch Enroll)	0.039** (0.013)	0.017 (0.015)	0.040** (0.015)	0.052* (0.022)	0.041** (0.014)	0.003 (0.012)
Number of Schools	0.003 (0.002)	0.004 (0.003)	0.004* (0.002)	0.006 (0.004)	-0.004 (0.003)	0.005* (0.002)
Number of Title I Schools	0.001** (0.000)	0.000 (0.002)	0.001* (0.000)	0.002 (0.003)	0.001 (0.001)	-0.003 (0.002)
ln(Population)	0.322** (0.090)	-0.119 (0.203)	0.074 (0.102)	-0.067 (0.307)	1.457** (0.333)	0.215 (0.164)
ln(Pop. under age 18)	0.071 (0.090)	0.517** (0.162)	0.017 (0.099)	0.549* (0.240)	0.206 (0.222)	0.020 (0.119)
ln(Pop. <18 in poverty)	0.026** (0.008)	0.003 (0.010)	0.034** (0.008)	0.004 (0.015)	-0.014 (0.021)	-0.005 (0.008)
R-squared	0.99	0.97	0.99	0.94	0.97	0.99
Observations	4,659	4,824	4,659	4,824	4,656	4,824

Notes: Dependent variables are natural logs of the listed revenue variables. Each specification contains year and school district fixed effects. Robust standard errors, clustered at the school district level, given in parentheses.

**Statistically significant at the 1% level; *statistically significant at the 5% level.

in median income is associated with a 2.12 percent increase in total revenue for Michigan and a negligible change for Ohio. When median income is not included as a covariate, the coefficient on taxable value when total revenue is the dependent variable increases to 0.146 for Michigan and to 0.139 for Ohio. As expected based on the graphs in figure 3, the coefficient estimates associated with taxable value indicate that state revenue is larger in Michigan districts with greater taxable values. In Ohio, however, state revenue is significantly lower in high taxable value school districts compared with low taxable value districts, since the state funding laws give these low taxable value districts disproportionately more state aid. In terms of local revenue, the coefficient estimates indicate

that low taxable value districts obtain less in local revenue than high taxable value districts and this difference is greater in Ohio. The results in table 3, along with the greater variance in taxable value and median income for Michigan (see tables 1 and 2), suggest there is greater inequality in Michigan than in Ohio.

The estimates from the fixed effects specifications in table 4 use within-school district, across-year variation to identify the relationship between changes in taxable value and changes in revenue. These estimates indicate that an increase in taxable value is associated with a significant increase in state, local, and total revenues for Michigan school districts. For Ohio school districts, an increase in taxable value is associated with an increase in local revenue, a decrease in state revenue, and a slight increase in total revenue. Table 4 also suggests that changes in median income are associated with relatively small increases in revenue for Michigan school districts, and a negligible change in revenue for Ohio districts.³⁵

The graphs in figures 2 and 3 suggest that total and state revenues decreased for Michigan and increased for Ohio school districts during the Great Recession. It is also interesting to consider how this recession affected taxable values, inequality, and the relationship between taxable value and revenue. Due in part to differences in assessment procedures, Ohio's assessed values started to decrease in 2007 (affecting school district's 2007–08 taxable values), whereas Michigan did not experience this decline in taxable values until the 2009–10 school year (denoted as year 2010). The taxable value per pupil decreased less than taxable values in both states because of the decline in the number of students. The variance of the taxable value per pupil in both states, however, was much larger after 2007 compared with prior years. In addition, based on the estimates in table 5, the relationship between total taxable value and revenue does appear to change slightly as the result of the Great Recession. Table 5 estimates similar specifications as in tables 3 and 4 except an interaction term, $\ln(\text{Total Taxable Value}) \times \text{Great Recession indicator}$, is included as a covariate to allow for the relationship between taxable value and revenue from 2002 to 2007 to differ from this relationship from 2008 to 2010. The coefficient estimates associated with this interaction term indicate the positive relationships between taxable value and total/state revenues are stronger during the Great Recession for Michigan school districts but not for Ohio school districts. Although these positive coefficient estimates are statistically significant in the Michigan regressions, the magnitudes suggest a relatively small increase in these positive relationships during the Great Recession.

35. Because median income is not available annually by district (requiring us to interpolate when constructing these annual measures—see footnote 27), the coefficient estimates pertaining to median income should be viewed with caution when using within-district, across-year variation for identification.

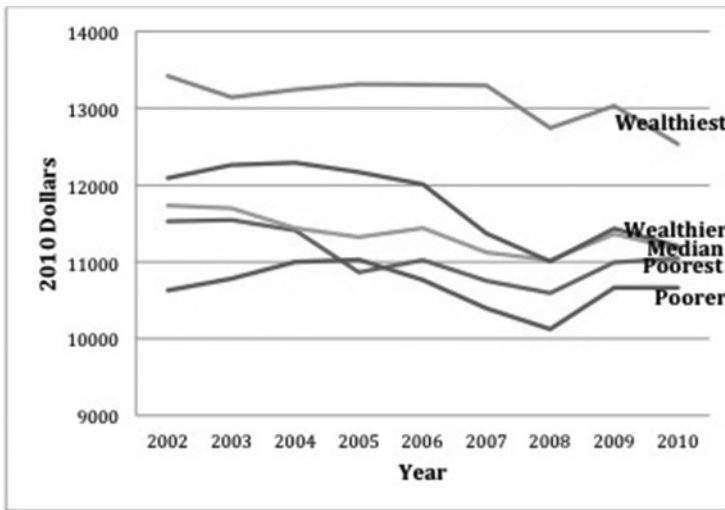
Table 5. Revenue Regression Results with Interaction for Great Recession

Panel A: Without Fixed Effects						
	Total Revenue		State Revenue		Local Revenue	
	Michigan	Ohio	Michigan	Ohio	Michigan	Ohio
In(Total Taxable Value)	0.123** (0.018)	0.127** (0.314)	0.091** (0.016)	-0.660** (0.050)	0.296** (0.055)	0.807** (0.030)
In(Total Taxable Value) *Great Recession	0.008* (0.004)	-0.007 (0.007)	0.006* (0.003)	0.012 (0.011)	0.012 (0.016)	-0.010 (0.056)
R-squared	0.99	0.95	0.99	0.90	0.87	0.97
Observations	4,659	4,824	4,659	4,824	4,656	4,824
Panel B: With Fixed Effects						
	Total Revenue		State Revenue		Local Revenue	
	Michigan	Ohio	Michigan	Ohio	Michigan	Ohio
In(Total Taxable Value)	0.244** (0.036)	0.094* (0.038)	0.232** (0.039)	-0.553** (0.061)	0.385** (0.115)	0.656** (0.039)
In(Total Taxable Value) *Great Recession	0.006* (0.003)	-0.004 (0.006)	0.010** (0.003)	0.021* (0.009)	-0.009 (0.008)	-0.012** (0.004)
R-squared	0.99	0.97	0.99	0.94	0.97	0.99
Observations	4,659	4,824	4,659	4,824	4,656	4,824

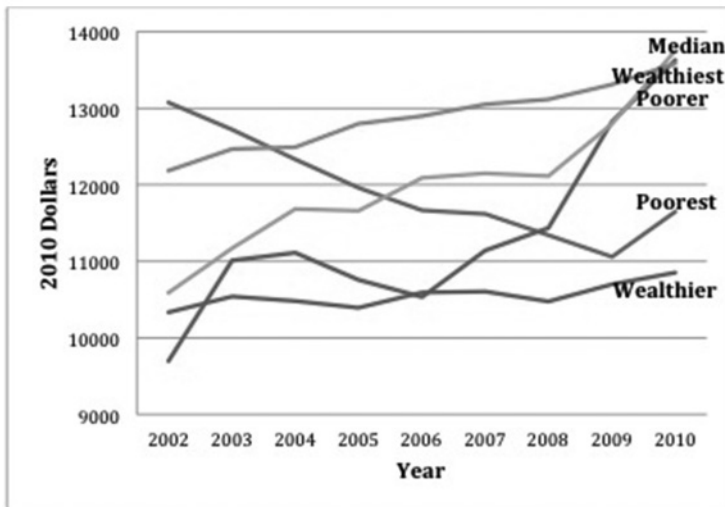
Notes: Dependent variables are natural logs of the listed revenue variables. Each specification contains year and Panel B includes school district fixed effects. Robust standard errors, clustered at the school district level, given in parentheses.

**Statistically significant at the 1% level; *statistically significant at the 5% level.

The results in tables 3 and 4 suggest that the Ohio funding system leads to more equitable funding than the Michigan system. Targeting equality through disproportionate state aid to the poorest districts appears to be more effective at promoting equality than imposing constraints on what local revenue can be used to fund. A problem with the Michigan system is that even with constraints that limit how much local revenue can be used for operating expenditures, local revenue is greater in high taxable value districts and does not offset the fact that state aid is not targeted to relatively poor districts. These constraints may also hinder the ability of Michigan school districts to react to economic downturns, exacerbating this inequality. Whereas wealthy districts in Michigan may be able to counteract these downturns with funding from other local sources, the relatively poor districts in Michigan do not get much funding from other sources, making them the least able to respond to these downturns. The table 5 results suggest that the inequality in Michigan may be growing during the Great Recession. Another problem is that these constraints could lead to



(a)



(b)

Figure 7. Total Expenditures per Pupil: (a) Michigan; (b) Ohio. Note: The quintiles are based on the average annual taxable property values per pupil so that a district remains in a given quintile across all years.

inefficiencies in terms of how local school districts allocate resources between capital, labor, and materials.

School District Expenditures

Figure 7 demonstrates that the pattern in total expenditures per pupil is quite similar to total revenue per pupil, both in terms of level and across quintiles. As with total revenue per pupil, total expenditures per pupil on average are

similar across the states with expenditures in Michigan decreasing slightly across years while increasing in Ohio. Also similar to total revenue per pupil, Michigan's decrease in total expenditure per pupil was more prevalent during the Great Recession whereas Ohio districts experienced an increase during this time period. The main difference in per pupil revenue and expenditures is that there are a number of quintile-years where total expenditures per pupil are slightly greater than total revenue per pupil. This is most often the case for the more wealthy quintiles in the earlier years of our data. Perhaps more wealthy Ohio and Michigan districts were able to draw on reserve funds to supplement expenditure beyond what they raise in yearly revenue and that these reserve funds were less available in later years.

Figure 7 does not provide details on the composition of these expenditures—specifically, capital versus operating. How capital expenditures of Ohio school districts compare with those in Michigan school districts depends on whether the comparison is between relatively poor or relatively wealthy districts. Defining relatively poor districts in Ohio as those below the median OSFC ranking and in Michigan as those below the median taxable value per pupil, the average annual capital expenditure per pupil is \$1,922 in the relatively poor Ohio districts and \$999 in the relatively poor Michigan districts. Interestingly, over half of these Ohio expenditures are state funds distributed by the OSFC. In terms of the relatively wealthy districts (i.e., districts above the medians), annual capital expenditures per pupil are \$1,027 for Ohio and \$1,321 for Michigan.³⁶ Not only do Michigan's relatively wealthy districts spend 29 percent more in capital expenditures per pupil, over 10 percent of the capital expenditures made by Ohio's relatively wealthy districts are state funds from the OSFC.³⁷

In terms of operating expenditures, there are difficulties in making a comparison because the structure of special and vocational education, along with input prices, differs across Ohio and Michigan. It is interesting to note,

36. A possible explanation for these greater apparent capital expenditures is that wealthy Michigan districts may be able to circumvent the Proposal A restrictions on supplementing operating expenditures by classifying some ambiguous expenditures as capital. Although wealthy Michigan districts do attempt to circumvent these restrictions, this is unlikely the reason for the significant difference in capital expenditures as well as capital taxation. As for capital expenditures, over 72 percent is accounted for by new construction in both Ohio and Michigan. It is likely difficult to supplement operating expenditures with expenditures on new construction. Expenditures on new construction are 28 percent more per pupil in relatively wealthy Michigan districts than in relatively wealthy Ohio districts. As for capital taxation, we include classroom facility millages in Ohio as capital taxation although it is clear that much of this revenue would be classified as operating expenditures in Michigan districts. If Michigan districts are circumventing Proposal A, including Ohio tax revenue from classroom facility millages as capital revenue in figures 5 and 6 should make the comparison across states more comparable.

37. Stone (2014) documents the dramatic increase in capital spending by Michigan school districts immediately after the implementation of Proposal A and how this increase was larger for wealthier school districts.

however, that the student-teacher ratio in Ohio averaged 16.88 from 2002 to 2010 while averaging 18.64 in Michigan.³⁸ In summary, these descriptive statistics suggest that although Michigan districts spend more per pupil on capital expenditures than Ohio districts not eligible for state capital funds, Ohio districts spend a larger fraction on teachers. The constraints on Michigan districts that limit how much local revenue can be raised to pay for operating expenditures may result in an inefficient resource allocation between capital, labor, and materials.

4. CONCLUSION

This paper considers equality and efficiency issues of two different school funding systems—a state-level system and a foundation system. The state-level system in Michigan provides all districts with nearly the same amount of state revenue for general operating expenditures and places restrictions on the ability of districts to raise operating revenue through local property taxes. Most notably, Michigan districts have restrictions on raising additional property tax revenue to fund operating expenditure for general education students but do not have these restrictions on capital expenditures. In contrast, Ohio districts are able to raise unrestricted property and income taxes to fund operating and capital expenditures. To account for the large differences in local tax revenue generated by poor versus wealthy districts, Ohio allocates state aid based on the district tax base size.

Our results indicate that, although the average revenue per pupil and expenditure per pupil of Michigan and Ohio school districts are almost identical between 2002 and 2010, they have slightly decreased over this period for Michigan and increased for Ohio. We also find that Michigan districts receive a significantly larger proportion of total revenue from the state whereas Ohio districts receive a larger proportion from local property and income taxes. In terms of degree of equality, measured by how revenue and expenditures vary across districts based on taxable value per pupil, there is less variation across Ohio districts. This suggests the Ohio funding system leads to greater equality than the Michigan funding system. In terms of the distribution of expenditures, we find wealthy Michigan districts spend more per pupil on capital expenditures and wealthy Ohio districts spend more per pupil on labor and materials. This suggests that the constraints on raising local revenue to fund operating expenditures in Michigan could create efficiency issues.

38. Even after adjusting for possible differences in special education expenditures by local school districts, the student-teacher ratio is significantly higher in Michigan than in Ohio.

Despite Ohio and Michigan spending similar amounts per pupil on average from 2002 to 2010, there are noticeable differences in student achievement on the National Assessment of Educational Progress (NAEP) 2003, 2005, 2007, and 2009 math and reading exams.³⁹ Ohio performs better on these exams than Michigan irrespective of grade and year.⁴⁰ Across all states, Ohio most often ranks between 12 and 18 in exam performance whereas Michigan most often ranks between 30 and 37. Perhaps the efficiency issues associated with the Michigan school funding system are contributing to the difference in student performance across the states. Ohio not only outperforms Michigan on these NAEP exams, but the difference in performance has increased across years: Ohio's ranking has slightly improved from 2003 and 2009 for almost all grades and subjects, yet Michigan's ranking has steadily declined across years. Perhaps the reductions in revenue and expenditures have contributed to the decline in student performance in Michigan.

We thank Leslie Papke for valuable advice. We also thank seminar participants at the Lincoln Institute's October 2013 conference entitled *The Property Tax and Financing of K–12 Education*, Michigan State University, and the Michigan/Michigan State/Western Ontario Labor Day Conference.

REFERENCES

- Berry, Christopher. 2007. The impact of school finance judgments on state fiscal policy. In *School money trials: The legal pursuit of educational adequacy*, edited by Martin West and Paul Peterson, pp. 213–242. Washington, DC: Brookings Institution Press.
- Brunner, Eric, and John Sonstelie. 2003. School finance reform and voluntary fiscal federalism. *Journal of Public Economics* 87(9):2157–2185. doi:10.1016/S0047-2727(02)00040-3
- Brunner, Eric, and Jennifer Imazeki. 2005. Fiscal stress and voluntary contributions to public schools. In *Developments in school finance: 2004*, Fiscal proceedings from the annual state data conference of July 2004, edited by William J. Fowler, pp. 39–54. Washington, DC: National Center for Education Statistics.
- Corcoran, Sean P., and William N. Evans. 2008. Equity, adequacy, and the evolving state role in education finance. In *Handbook of research in education finance and policy*, edited by Helen F. Ladd and Edward B. Fiske, pp. 332–356. New York: Routledge.
- Corcoran, Sean P., William N. Evans, Jennifer Godwin, Sheila E. Murray, and Robert M. Schwab. 2004. The changing distribution of education finance: 1972–1997. In *Social inequality*, edited by Kathryn M. Neckerman, pp. 433–465. New York: Russell Sage Foundation.

39. See <http://nces.ed.gov/nationsreportcard/states/>.

40. The NAEP math and reading exams in Michigan and Ohio are taken by fourth and eighth graders.

- Dye, Richard, and Andrew Reschovsky. 2008. Property tax responses to state aid cuts in the recent fiscal crisis. *Public Budgeting & Finance* 28(2):87–111. doi:10.1111/j.1540-5850.2008.00906.x
- Fernandez, Raquel, and Richard Rogerson. 2003. Equity and resources: An analysis of education finance systems. *Journal of Political Economy* 111(4):858–897. doi:10.1086/375381
- Hall, Joshua C., and Justin M. Ross. 2010. Tiebout competition, yardstick competition and tax instrument choice: Evidence from Ohio school districts. *Public Finance Review* 38(6):710–737. doi:10.1177/1091142110373479
- Hoene, Christopher. 2004. Fiscal structure and the post-Proposition 13 fiscal regime in California's cities. *Public Budgeting & Finance* 24(4):51–72. doi:10.1111/j.0275-1100.2004.00347.x
- Hoxby, Caroline M. 2001. All school finance equalizations are not created equal. *Quarterly Journal of Economics* 116(4):1189–1231. doi:10.1162/00335530175326552
- Loeb, Susanna. 2001. Estimating the effects of school finance reform: A framework for a federalist system. *Journal of Public Economics* 80(2):225–247. doi:10.1016/S0047-2727(00)00083-9
- Murray, Sheila E., William N. Evans, and Robert M. Schwab. 1998. Education-finance reform and the distribution of education resources. *American Economic Review* 88(4):789–812.
- Reschovsky, Andrew. 2004. The impact of state government fiscal crises on local governments and schools. *State & Local Government Review* 36(2):86–102. doi:10.1177/0160323X0403600201
- Ross, Justin M., and Phuong Nguyen-Hoang. 2013. School district income taxes: New revenue or a property tax substitute? *Public Budgeting & Finance* 33(2):19–40. doi:10.1111/j.1540-5850.2013.12004.x
- Roy, Joydeep. 2011. Impact of school finance reform on resource equalization and academic performance: Evidence from Michigan. *Education Finance and Policy* 6(2):137–167. doi:10.1162/EDFP_a_00030
- Springer, Matthew G., Keke Liu, and James W. Guthrie. 2009. The impact of school finance litigation on resource distribution: A comparison of court-mandated equity and adequacy reforms. *Education Economics* 17(4):421–444. doi:10.1080/09645290802069269
- Spry, John A. 2005. The effects of fiscal competition on local property and income tax reliance. *Topics in Economic Analysis & Policy* 5(1):1–19. doi:10.2202/1538-0653.1054
- Stone, John. 2014. Foundation-style funding and capital outlays in primary and secondary schools in Michigan. Unpublished paper, Weber State University.
- Yinger, John, ed. 2004. *Helping children left behind: State aid and the pursuit of educational equity*. Cambridge, MA: MIT Press.