



# Cost of Government Services: Trends and Comparisons for Kentucky and Its Neighboring States

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The authors examine expenditures for a variety of government functions for Kentucky and its neighbors (Illinois, Indiana, Missouri, Ohio, Tennessee, Virginia, and West Virginia) for 1992, 1997, and 2002. While per capita spending provides some gauge of the efficacy of public service provision, population may inadequately measure the client base or determinant of costs. To address this problem, they control for other factors that may influence expenditures, including population, age, and demographics. They believe this extensive quantification of costs and the comparison of these costs among states represent a unique effort in providing important information about service production for state governments. Although the authors do not offer conclusions regarding the efficacy of provision of public services, this study can aid state governments in their assessment of services.

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**G**overnment “waste” or occasionally even fraud has often been the subject of public concerns, political rhetoric, and investigative reports in the media. Yet, despite frequent overtures by elected officials about eliminating waste (or at least reducing costs) and occasional examples of claimed reductions in costs or elimination of waste, there have been very few examples in the popular press or even scholarly work of attempts to compare costs among governments. While there are legitimate concerns about how to interpret simple cost comparisons, such as those made here, it is still somewhat surprising that they are not made more often, given the amount of attention paid to government costs and relative taxation.

Here, our purpose is to make relatively simple comparisons of the costs of government services, both state and local, among the Commonwealth of Kentucky and its neighbors: Illinois, Indiana,

Missouri, Ohio, Tennessee, Virginia, and West Virginia. Because this study was initially done for the Governor’s Office of the Commonwealth of Kentucky, much of the discussion focuses on the costs of a variety of government services within Kentucky, for the years 1992, 1997, and 2002. In addition, employment and salaries in government services are also examined. For most of the services and government functions, cost comparisons are made on a per capita basis in 2002 dollars. Employment is also adjusted to reflect differences in population. Salary comparisons are adjusted for inflation and in some cases also adjusted to reflect differences in private earnings among the states.

While we think that this study can provide useful information for evaluating the relative efficacy of public service provision, we do not intend to imply that differences in costs by themselves, particularly when measured on a per capita basis, imply differences in the performance or

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efficiency in the provision of government services. For some services, population may not be a very accurate measure of the client base or determinant of costs. For a number of government functions, we use alternative measures as a base for costs. For example, education costs are on a per student basis and highway costs are on a mileage basis. While we believe that these alternative bases for costs more accurately reflect the determinants of costs, they, too, fail to reflect differences in the quality or extent of services.

In addition to providing data that indicate both trends and differences in the costs of government services and activities, we also provide some estimates of “cost” or expenditure functions for total state and local expenditures, administrative expenditures, and primary and secondary educational expenditures. We have three primary objectives in estimating these relationships. Our first objective is to determine how much of the expenditures within a state cannot be explained by controlling for factors that might affect either the cost or quality of services within the state (including state population and the demographic composition of its population). Second, we use a fixed-effect model to estimate a state fixed effect for each state so that we may better understand some of the reasons expenditures across states may vary. To do this, we decompose the source of variation in predicted costs using the coefficients obtained in our estimation. Finally, we estimate and depict the impact of population on costs, that is, the existence of economies or diseconomies of scale primarily to understand and explain differences in costs among states, but also to better understand what might constitute the “ideal” population of a jurisdiction, state or locality, for the purposes of public service provision.

While we estimate a relationship between (i) expenditures and (ii) factors likely to influence expenditures that might be referred to as a “cost” function, we are reluctant to ascribe that nomenclature to it. Numerous reasons for differences in spending are possible. One limitation in our analysis is the difficulty in reliably measuring “output” of a government service or function or the quality with which it is provided. When possible, we do attempt to measure the number of

customers or clients (vehicle miles for highways and students for education, for example), but even these measures do not control for differences in the quality of services.

Despite these qualifications about the measurement of both the quantity and quality of government services, we believe that the measurement of costs among state governments in this study represents a unique effort and provides important information about service production. Again, although the evidence presented in this study is not, by itself, conclusive regarding the efficacy of provision of public services, we believe it can direct state governments in assessing particular services more thoroughly. While the more qualitative approach used in typical performance evaluation studies has value, we believe that our focus on costs complements the approach in these other studies of assessing quality in performing a service.

The study is designed to focus on state government services, but there is significant variation among the states to which we compare Kentucky in the responsibilities of state and local governments. Kentucky, along with West Virginia, has the greatest share of state and local spending that is financed by the state. Therefore, for most of the services we examined, we believed it important to examine both state and combined state and local spending and employment. In addition, even if the spending is not done at the state level, the state is frequently the financier of these expenditures, particularly for Kentucky.

In our sample of states, we find that less populous states and states with more centralized spending have higher per capita expenditure. Regarding particular government functions, no clear patterns emerge for central administration expenditure and employment, though low-wage states, especially Kentucky and West Virginia, tend to have high central administration salaries. Regarding primary and secondary education spending, with the exception of West Virginia, spending per student is higher for states with higher income and larger populations. All states experienced a reduction in the student-teacher ratio, but (with the exception of Missouri) also a reduction in the student-administrator ratio. The least populous states—West Virginia and Kentucky—have the

highest per capita spending on highways. This does not hold for spending per road mile, however. West Virginia stands out as exceptionally high in employment in highway provision.

Our multivariate analysis reveals some interesting findings, too. There are economies of scale—more populous states have less spending per capita. States with more centralized spending have more state and local total spending and higher-wage states have greater spending. States with a greater population per municipality and a higher poverty rate have lower spending. Controlling for more covariates tends to raise the estimated scale economy. The state fixed effects change substantially after controlling for the covariates. More populous states now tend to have higher expenditure. The results of the multivariate analysis for central administration spending tend to mirror the findings for total expenditure.

For primary and secondary educational expenditures, economies of scale are strong for students per district, but less so for students per school. Higher-wage states have higher expenditure per student. Measures of student performance (i.e., test scores) have little relationship to spending. Control for covariates alters the estimated differences between states, but the ranking does not change much.

In the following section we provide some data on the demography of Kentucky and its neighboring states, as well as some information about the economic structure of these states. These data are from the 2000 (and 1990) Census of Population and Housing. We then report on aggregate government spending and employment without regard to government functions or services. We then report on government spending, employment, and earnings by government functions, including central administration, financial administration, primary and secondary education, and highways and roadways. The penultimate section reports the findings of our regression analysis.

## SOME BASIC FACTS ABOUT THE KENTUCKY POPULATION

Table 1 contains data from the 2000 U.S. Census of Population<sup>1</sup> on characteristics of

Kentucky's and its neighbors' populations. Information on employment is obtained from the Regional Economic Information System (REIS).<sup>2</sup> As Table 1, Panel A, shows, Kentucky is the second smallest state (in population) in this group of states and is the second most rural. It is ranked eighth when compared with neighboring states as well as the United States overall in the percentage of its population that is African-American. It is also ranked eighth in the percentage of its population that is Hispanic. The percentage of households with children under 18 years of age in Kentucky is very similar to its neighboring states and the U.S. average; it ranks relatively low in the percentage of households over 65 years of age.

Table 1, Panel B, provides U.S. Census data on income, earnings, and employment. Again, Kentucky's income (both median family and per capita) and earnings (for ages 16 and older) are above only West Virginia's levels and only West Virginia has a higher poverty rate. In 2000, Kentucky's unemployment rate (5.7 percent) was approximately the same as that in the United States (5.8 percent) and in the middle of the range of these states; yet, it had the lowest employment rate, that is, the percentage of its adult population (ages 16 and older) employed. A relatively high percentage of respondents to the survey in Kentucky reported themselves as disabled, meaning that a disability impairs their ability to be employed or function in their job if employed.

## AGGREGATE AND CURRENT GOVERNMENT SPENDING

Before considering spending on each of the several government functions in detail, we first provide some recent data on aggregate spending

<sup>1</sup> These data are available electronically from the U.S. Census Bureau, [www.census.gov](http://www.census.gov). Data in Tables 1A and 1B are from Census 2000, with the exception of the estimate of populations for 2003, which are also available at the Census website and are obtained from estimates made by the Bureau of Economic Activity (BEA).

<sup>2</sup> The REIS is produced by the Bureau of Economic Activity using data obtained from County Business Patterns: [www.bea.doc.gov/bea/regional/data.htm](http://www.bea.doc.gov/bea/regional/data.htm).

**Table 1**  
**Population Characteristics of Kentucky and Its Neighbors**

**A. Population and Population Composition, 2000**

State	Population		Urban		White		African-American		Hispanic		Households with children under 18		Households over 65	
	# (2003)	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
Kentucky	4,117,827	7	55.8	8	90.1	2	7.3	8	1.5	8	33.0	5	31.6	7
United States	290,809,777		79.2	2	75.2	7	12.3	4	13.7	1	33.5	2	33.1	4
Illinois	12,653,544	1	87.8	1	73.5	8	15.1	3	12.3	2	33.6	1	32.6	5
Indiana	6,195,643	4	70.8	5	87.5	3	8.4	7	3.5	4	33.4	3	32.2	6
Missouri	5,704,484	6	69.4	6	84.9	5	11.2	6	2.1	6	32.4	6	34.4	2
Ohio	11,435,798	2	77.4	3	85.0	4	11.5	5	1.9	7	32.2	8	33.9	3
Tennessee	5,841,748	5	63.6	7	80.2	6	16.4	2	2.2	5	32.2	7	31.5	8
Virginia	7,386,330	3	73.0	4	72.3	9	19.6	1	4.7	3	33.2	4	29.3	9
West Virginia	1,810,354	8	46.1	9	95.0	1	3.2	9	0.7	9	29.3	9	37.5	1

**B. Income and Employment Measures, 2000**

State	Median household income		Income per capita		Income below poverty level		Median earnings		Unemployed		Employed		Disabled	
	2000\$	Rank	2000\$	Rank	%	Rank	2000\$	Rank	%	Rank	%	Rank	%	Rank
Kentucky	33,672	7	17,819	7	15.8	2	20,951	7	5.7	4	44.5	8	9.9	3
United States	—		21,067		12.9		—		5.8		45.8		8.2	
Illinois	46,590	2	22,760	2	10.7	6	25,890	1	6.0	2	47.0	5	8.8	6
Indiana	41,567	3	20,076	4	9.5	9	23,229	4	4.9	8	48.8	1	7.2	8
Missouri	37,934	5	19,618	5	11.7	5	21,751	5	5.3	6	47.5	4	10.9	2
Ohio	40,956	4	20,694	3	10.6	7	23,949	3	5.0	7	47.6	3	9.6	4
Tennessee	36,360	6	19,120	6	13.5	3	21,700	6	5.4	5	46.6	6	11.2	1
Virginia	46,677	1	23,506	1	9.6	8	25,357	2	4.1	9	48.2	2	9.5	5
West Virginia	29,696	8	16,322	8	17.9	1	19,159	8	7.3	1	40.5	9	6.4	9

SOURCE: Census 2000 ([www.census.gov](http://www.census.gov)).

**Table 2****State and Local Total Expenditures Per Capita (2002\$), Selected Years**

	Per capita, 2002\$			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	4,697	5,170	6,073	7	7	6	2.6
United States	5,865	6,217	7,125	1	1	1	2.0
Illinois	5,230	5,843	6,944	3	2	3	2.9
Indiana	4,568	4,966	5,896	8	8	8	2.6
Missouri	4,255	4,838	5,827	9	9	9	3.2
Ohio	5,357	5,746	7,010	2	4	2	2.7
Tennessee	5,112	5,775	6,328	4	3	5	2.2
Virginia	4,797	5,344	5,994	6	6	7	2.3
West Virginia	4,896	5,564	6,609	5	5	4	3.0

**Table 3****State Share of State and Local Expenditures, 2002, by Function (percent)**

	Higher education	Primary and secondary education	Public welfare	Health	Highways	Correction	Parks and recreation	Financial administration	Judicial and legal services
Kentucky	100	67	99	51	81	65	47	74	82
United States	84		85	53	61	68	16	55	46
Illinois	68	37	96	81	45	72	7	47	28
Indiana	100	55	89	73	64	74	11	51	30
Missouri	80	39	97	71	59	76	9	55	50
Ohio	92	49	80	30	54	77	11	54	17
Tennessee	100	48	98	75	64	58	26	38	47
Virginia	97	44	79	47	82	69	13	58	46
West Virginia	99	68	100	71	94	85	53	75	68

in Kentucky and its neighboring states.<sup>3</sup> In addition, we offer data suggesting how responsibilities for the revenue collection and the provision of government functions (expenditures) often differ

<sup>3</sup> In this section and in the following tables, data on both state and local government spending and employment, unless otherwise indicated, are obtained from the U.S. Census Bureau surveys of state governments (U.S. Census Bureau Governments Division Annual Survey of Government Finances and Annual Survey of Government Employment), which were used to obtain figures (estimates) of government finances and employment in years in which a census is not undertaken ([www.census.gov/govs/www/index.html](http://www.census.gov/govs/www/index.html)).

significantly among states. State and local total expenditures per capita are shown in Table 2. While Kentucky ranks second for state spending per capita among these states, for combined state and local expenditure, Kentucky ranks sixth, reflecting more centralized expenditures.

As shown in Table 3, the share of state spending in total state and local spending is disaggregated by government function. For some functions, states are very similar in their allocation of spending between state and local governments. These are general functions performed exclusively by



**Table 4**  
**Mean Wage and Relative Wage (May 2003)**

State	Wage	Rank	Relative to Kentucky	Relative to U.S.
Kentucky	15.15	8	1.00	0.86
United States	17.70	3	1.17	1.00
Illinois	17.95	1	1.18	1.01
Indiana	15.90	6	1.05	0.90
Missouri	16.23	5	1.07	0.92
Ohio	16.77	4	1.11	0.95
Tennessee	15.34	7	1.01	0.87
Virginia	17.76	2	1.17	1.00
West Virginia	14.20	9	0.94	0.80

state governments, such as social insurance and public welfare. With the exception of Illinois and Missouri, public higher education is primarily financed by state governments. Kentucky bears a much higher share of expenditures on highways, parks and recreation, and primary and secondary education than its neighboring states and the U.S. average. The same is true for financial, judicial, and legal administration. Only in health and corrections is Kentucky's state share below the national average, and, in these cases, it is only slightly below.

The significant differences in how spending is allocated between state and local governments among our group of states suggests that for much of our analysis the examination of state and local expenditures, rather than only state or only local, is appropriate.

Meaningful comparison of expenditures over time requires adjusting for changes in the base population—or, for some government goods or services, some measure of the good produced or population being served. For this reason we generally report expenditures on a per capita basis. In addition, changes in prices need to be accounted for when comparing expenditures over time. All expenditures here are reported in 2002 dollars, meaning that expenditures in early years (1992, 1997) are inflated to 2002 values using the consumer price index (CPI) produced by the U.S. Department of Labor, Bureau of Labor Statistics.

In addition to examining expenditures and employment, we also report trends and comparisons in salaries for the government functions. To make meaningful comparisons among the states and over time, we adjust the reported salaries in two ways. First, salaries are adjusted for inflation and reported in 2002 dollars, as is done with expenditures using the CPI. Second, we adjust for differences in the general level of salaries and wages among the states. Specifically, we create a wage index, reported in Table 4, to adjust for differences in the general level of wages and salaries among states. Thus, if a state has higher earnings in the private sector, salaries in the public sector will be deflated to reflect the higher private sector compensation in that state. As Table 4 shows, private sector workers in Illinois are paid, on average, 18 percent more than workers in Kentucky, so we would expect public sector employees to be paid more in Illinois as well. As the table shows, of the neighboring states, only West Virginia has lower wages on average.

The focus of Tables 5 and 6 is the salaries of state employees. Table 5 reports the average monthly salary of state employees adjusted for inflation but not adjusted for geographical differences in salaries. For all three years reported, Kentucky is ranked in the middle (fifth or sixth) in salaries, with average salary being almost \$400 per month less than the U.S. average. However, when salaries are indexed based on differences

**Table 5****Salaries, Average for All State Employees, Adjusted for Inflation**

	Monthly salary, 2002\$			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	2,797	2,873	3,115	6	5	5	1.09
United States	3,259	3,209	3,514	1	3	2	0.75
Illinois	3,257	3,349	3,583	2	1	1	0.96
Indiana	3,070	2,861	3,002	4	6	6	-0.22
Missouri	2,653	2,566	2,739	8	9	9	0.32
Ohio	3,225	3,249	3,419	3	2	3	0.58
Tennessee	2,708	2,712	2,865	7	7	7	0.57
Virginia	2,848	2,905	3,286	5	4	4	1.44
West Virginia	2,477	2,609	2,841	9	8	8	1.38

**Table 6****Salaries, Average for All State Employees, Indexed and Adjusted for Inflation**

	Monthly salary, indexed			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	2,797	2,873	3,115	3	2	1	1.09
United States	2,790	2,747	3,008	4	5	5	0.75
Illinois	2,749	2,826	3,024	5	3	4	0.96
Indiana	2,925	2,726	2,861	1	6	6	-0.22
Missouri	2,477	2,396	2,557	8	9	9	0.32
Ohio	2,914	2,935	3,088	2	1	2	0.58
Tennessee	2,674	2,678	2,829	6	7	7	0.57
Virginia	2,430	2,478	2,803	9	8	8	1.44
West Virginia	2,643	2,783	3,031	7	4	3	1.38

in mean wages, intended to reflect differences in local labor markets, the rankings change dramatically. Indexing for these differences in average state wages leads to Kentucky having the highest indexed salary among its neighbors in 2002. This finding indicates that while wages, both private and public, are on average 17 percent lower in Kentucky than the entire United States, the difference in salaries for state employees in Kentucky is not nearly this great, being only about 11.4 percent lower than the U.S. average. In determining an appropriate comparison for salaries adjusted

only for inflation or salaries adjusted for inflation and general differences in salaries across the states, the nature and extent of the labor market for the state employee must be considered. For some occupations, the labor market is national or at least regional; for these occupations, local market conditions are not relevant and comparisons based on salaries should not be adjusted for geographical differences in wages. If, instead, state employees in an occupation are hired from local labor markets and tend to search within the state rather than the region or state, then the

**Table 7****Salaries, Average for All State and Local Employees, Indexed and Adjusted for Inflation**

	Monthly salary, 2002\$			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	2,853	3,122	2,648	3	4	6	-0.74
United States	2,943	3,203	2,780	2	2	3	-0.57
Illinois	2,824	3,194	2,677	5	3	5	-0.53
Indiana	2,849	3,069	2,746	4	6	4	-0.37
Missouri	2,701	2,918	2,527	9	9	8	-0.66
Ohio	2,960	3,287	2,889	1	1	2	-0.24
Tennessee	2,722	2,937	2,614	7	8	7	-0.40
Virginia	2,707	3,009	2,504	8	7	9	-0.78
West Virginia	2,740	3,075	2,926	6	5	1	0.66

**Table 8****State and Local Government Employment Per 1,000 Residents, Selected Years**

	Employment per 1,000			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	52.47	53.14	56.25	3	4	2	0.70
United States	51.68	53.60	54.29	4	3	4	0.49
Illinois	47.51	50.35	51.08	9	8	9	0.73
Indiana	52.48	52.75	52.81	2	5	7	0.06
Missouri	47.64	54.10	55.12	8	1	3	1.47
Ohio	48.29	50.24	53.37	7	9	5	1.01
Tennessee	49.68	52.01	52.91	6	6	6	0.63
Virginia	54.60	53.81	56.40	1	2	1	0.33
West Virginia	50.31	50.70	51.61	5	7	8	0.26

salaries are adjusted for differences in mean wages in the state.

Table 7 reports the average salary, indexed and adjusted for inflation, for all state and local employees. In contrast to indexed salaries for state employees only, indexed salaries aggregated to include local employees are not particularly high. This, of course, suggests that local employee salaries must be quite low relative to those in other states. The ranking for Kentucky fell from third in 1992 to sixth in 2002, with average real salaries falling by an annual average of -0.74

percent, the biggest decrease except for salaries in Virginia. In contrast, real state salaries have risen 1.09 percent per annum, well above the national average of 0.75 percent.

Unlike salary comparisons, when state and local employment is combined (Table 8), Kentucky's level still remains very high, with 56.25 state and local employees per 1,000 residents in 2002. This is second only to Virginia's rate of 56.40 and is above the 2002 U.S. average of 54.29. Again, the differences in the distribution of government services between state and local



governments are similar to the differences between the states in state and local employment; the latter differences are much smaller than those found when considering only state government employment. In contrast to state government employment alone, state and local government employment has been growing relative to the population for Kentucky as well as to the population of neighboring states. While state employment has been declining relative to population, local employment has been growing at a rate that more than replaces the declines in state government employment.

## STATE AND LOCAL GOVERNMENT EXPENDITURES AND EMPLOYMENT BY GOVERNMENT FUNCTION

This section provides several alternative comparisons between Kentucky and its neighbors on costs and resources used in four different government functions: central administration, financial administration, primary and secondary education, and highways. As discussed previously, examining different government functions individually is important because states differ in both how they allocate expenditures across functions and between state and local governments. As a result, for some of the functions observed, our primary focus is on combined state and local expenditures rather than on state expenditures alone. To facilitate comparisons over time, we report inflation-adjusted amounts (2002 dollars) as in the preceding section. In addition to reporting per capita spending, we rank Kentucky relative to the other states and calculate the annualized change in real (inflation-adjusted) government spending on the function over our period of analysis.

Differences in per capita spending by government function or service are not, by themselves, indications of differences in efficiency or performance. These differences could be explained by differences in the costs of production of the services in the states, differences in use, and, possibly, differences in the quality or extent of the services provided. It is difficult to quantify, at least in a relatively simple and direct way, these

differences for some services. However, for other services and functions, we can at least provide some indication of differences in the use of services, that is, some measure of output. Thus, for primary and secondary education, we report expenditures per student, and, for corrections, we report expenditures per inmate. For highways, we report expenditures per mile of highway. While these measures still do not account for differences in the quality or effectiveness of the government service or differences in costs of production, they are undoubtedly a better baseline than expenditures per capita.

We can also obtain insights into the production of government services by examining employment and compensation within the government function. As we calculated for expenditures, we determine employees per 1,000 residents for each function and, where possible, clients per employee. For example, for primary and secondary education, we calculate students per faculty member, and, for corrections, inmates per employee.

### Central Administration

Expenditures on the central administration of state and local government are not related to the provision of any specific government function nor are they related to financial administration, as expenditures by the revenue function are. Instead, these expenditures are related to the general operations of the executive and legislative branches of government. For this reason, we make no attempt to measure an “output” or “quality of services” associated with central administration; instead we provide comparisons and trends based on per capita expenditures. When comparing central administration expenditures, particularly on a per capita basis, it is important to bear in mind that these services are likely to exhibit economies of scale. That is, while central administration costs can be expected to increase with the population of a state, they are not likely to increase at the same rate as the population.

Formally, the U.S. Census Bureau’s *Annual Survey of Government Finances and Employment*, the source of our data, defines government administration, which we refer to as central administration, as “[g]overnment-wide executive,

**Table 9****State and Local Expenditures on Central Administration, Selected Years**

	Per capita, 2002\$			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	35	49	69	8	5	4	7.2
United States	51	54	63	3	3	5	2.2
Illinois	58	49	90	2	6	1	4.5
Indiana	66	68	85	1	1	2	2.5
Missouri	36	52	56	6	4	6	4.5
Ohio	35	39	51	7	9	7	4.0
Tennessee	30	41	43	9	8	9	3.6
Virginia	41	47	51	5	7	8	2.3
West Virginia	42	65	80	4	2	3	6.6

**Table 10****State and Local Employment in Central Administration Per 1,000 residents, Selected Years**

	Per 1,000 residents			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	0.81	0.90	1.01	4	4	1	2.29
United States	0.86	0.94	0.94	3	2	4	0.92
Illinois	0.95	0.99	0.93	1	1	5	-0.27
Indiana	0.88	0.94	1.00	2	3	2	1.23
Missouri	0.61	0.83	0.84	8	7	7	3.23
Ohio	0.69	0.86	0.94	6	5	3	3.15
Tennessee	0.60	0.74	0.81	9	9	9	3.14
Virginia	0.76	0.84	0.83	5	6	8	0.93
West Virginia	0.66	0.81	0.88	7	8	6	2.85

administrative, and staff service agencies other than financial, judicial, legal, and Federal or state legislative activities.”<sup>4</sup>

For example, costs associated with the legislative and executive branches of government are only weakly linked to population, as the number of legislators, support staff, and executive branch personnel are not likely to be significantly greater in larger states.

Table 9 gives the combined state and local central administration spending per capita. In 2002, Kentucky ranked fourth among the states, with spending of \$69 per capita. Given the more centralized nature of Kentucky’s government structure, the higher ranking for state spending is no surprise. Central administrative costs per capita are a small share of state and local government expenditures and, therefore, have a relatively modest influence on total state or combined spending. It is perhaps more important, in the case of Kentucky, to consider the rate at which central administrative expenditures have been

<sup>4</sup> For the definitions and examples from the manual for the *Annual Survey of Government Finances and Employment*, see [www.census.gov/govs/www/classfunc29.html](http://www.census.gov/govs/www/classfunc29.html).

**Table 11****State and Local Expenditures on Financial Administration, Per Capita, Selected Years**

	Per capita, 2002\$			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	73	70	80	7	8	7	0.9
United States	92	104	114	3	5	5	2.1
Illinois	81	122	115	5	4	4	3.6
Indiana	74	79	100	6	6	6	3.0
Missouri	65	71	76	8	7	8	1.6
Ohio	102	124	191	1	2	1	6.5
Tennessee	53	64	67	9	9	9	2.5
Virginia	98	124	119	2	1	3	1.9
West Virginia	92	123	174	4	3	2	6.6

**Table 12****State and Local Employment in Financial Administration Per 1,000 Residents, Selected Years**

	Per 1,000 residents			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	1.14	1.28	1.17	6	6	6	0.22
United States	1.25	1.36	1.33	4	5	4	0.60
Illinois	1.13	1.14	1.10	8	8	9	-0.27
Indiana	1.40	1.50	1.17	2	2	7	-1.83
Missouri	1.15	1.21	1.18	5	7	5	0.33
Ohio	0.99	1.44	1.45	9	4	3	3.87
Tennessee	1.13	1.14	1.15	7	9	8	0.21
Virginia	1.48	1.52	1.53	1	1	2	0.37
West Virginia	1.33	1.48	2.13	3	3	1	4.85

increasing. Per capita state and local spending in Kentucky increased during the 10-year period from 1992 to 2002 by an inflation-adjusted rate of 7.2 percent during this period, the highest rate among all the comparison states.

Table 10 reports state and local employment in central administration per 1,000 residents. Kentucky has the highest ranking in this category. While Kentucky ranks first in combined state and local employment, the differences between Kentucky and the rest of the states (and the U.S. average) in this category are not very pronounced.

### **Financial Administration**

Financial administration includes government services provided by the finance and administrative agencies of government and revenue-collection and auditing/accounting agencies. As with central administration, output is difficult to measure for these services. Although it would seem reasonable to expect that states with smaller populations might spend more per capita, based on an expectation of economies of scale in these services, examination of costs for Kentucky and its neighbors does not seem to suggest that this is the case.

The definition of “financial administration” guiding the collection of data for the U.S. Census Bureau’s *Annual Survey of Government Finances and Employment* is “[o]fficials and central staff agencies concerned with tax assessment and collection, accounting, auditing, budgeting, purchasing, custody of funds, and other finance activities.”<sup>5</sup>

Table 11 shows that Kentucky spends relatively less in state and local expenditures on financial administration, ranking near the bottom of the comparison states and having a real per annum increase of only 0.9 percent. Not surprisingly, combined state and local employment for Kentucky, however, ranks low, with a rate of state and local financial employment of 1.17 per 1,000 residents, which is similar to most of its surrounding states (Table 12).

### **Primary and Secondary Education**

While the provision of primary and secondary education is the responsibility of local governments, specifically school districts, it is heavily financed by state funds. In Kentucky, in 2001, 67 percent of primary and secondary education funding came from state sources, far above the typical level for its neighboring states with the exception of West Virginia. The state government is also involved in primary and secondary education through its regulatory role, imposing requirements for training, curricula, and facilities.

Although we use a rather standard measure of output for education (i.e., number of students), this measure, as with other measures of output we have used, does not adjust for the quality of services. In particular, higher expenditures per student may indicate a better quality education, a less efficient provision of services, or, possibly, both. Here, we make no attempt to measure the quality of services provided to students or to provide output measures such as results on standardized tests. While these issues are certainly important in understanding the efficacy of educational services, they are beyond the scope of this study.

<sup>5</sup> The online version of the *Government Finance and Employment* manual has the definition of financial administration and examples at [www.census.gov/govs/www/classfunc23.html](http://www.census.gov/govs/www/classfunc23.html).

Table 13 provides a comparison of primary and secondary education costs per student (average daily attendance) for Kentucky and its neighbors for 1992, 1997, and 2002. Current expenditures, including all expenditures except capital expenditures, are reported. Administration and instructional expenditures are reported separately. As the table shows, educational costs per student are quite low in Kentucky when compared with its neighboring states; Kentucky ranks seventh in both current expenditures and instructional expenditures per student in 2002. Administrative spending per student is relatively higher—in fact, the highest among the states in 1997, although the rank decreased to fifth in 2002.

Table 14 reports (i) student-to-teacher, (ii) student-to-administration and staff, (iii) student-to-central administration and staff, and (iv) student-to-central administration ratios for Kentucky and its neighboring states. For this table, bear in mind that a higher student-to-teacher or student-to-administrator ratio means fewer employees per output. Thus, the higher (closer to 1) the state ranks, the fewer the number of employees per student. As Panel A of the table shows, Kentucky has relatively high student-to-teacher ratios and there have been very modest decreases in the number of students per teacher during the period 1992 to 2002. In contrast, the ratio of students per administrators including staff (Panel B) was the second lowest among the states in 2002 and decreased at a rate of 5.2 percent per annum from 1992 to 2002. This is by far the greatest decrease in the ratios of students to administrators among Kentucky and its neighboring states. Panel C focuses on the ratio of students per district central office administrators and staff: While Kentucky has the third lowest ratio of students per central office administrators and staff, this ratio has decreased at a rate of 6.8 per annum since 1992. This represents the greatest increase in central administrators and staff (per student) among the states.

Focusing only on central administrators and not including staff (Panel D) shows more modest increases (in percentage terms) in central administrators, indicating the increase has been primarily staff and not administrators in central offices.

**Table 13****Current, Administrative, and Instructional Expenditures on Primary and Secondary Education, Various Years (2002\$)**

	Per student (average daily attendance)			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
<b>A. Current expenditures</b>							
Kentucky	6,051	6,646	7,536	7	5	7	2.22
Illinois	7,270	7,350	8,967	2	2	1	2.12
Indiana	6,506	7,403	8,268	4	1	4	2.43
Missouri	6,193	6,527	7,699	6	6	6	2.20
Ohio	7,301	7,305	8,928	1	4	2	2.03
Tennessee	4,734	5,617	6,489	8	8	8	3.20
Virginia	6,255	6,363	7,928	5	7	5	2.40
West Virginia	6,511	7,307	8,451	3	3	3	2.64
<b>B. Administration</b>							
Kentucky	604	629	648	3	1	5	0.71
Illinois	607	615	786	2	2	1	2.63
Indiana	481	548	621	6	6	6	2.59
Missouri	568	595	694	4	5	3	2.02
Ohio	618	612	779	1	3	2	2.34
Tennessee	371	417	459	8	8	8	2.16
Virginia	458	447	601	7	7	7	2.76
West Virginia	554	611	694	5	4	3	2.28
<b>C. Instructional expenditures</b>							
Kentucky	3,707	4,036	4,625	7	5	7	2.24
Illinois	4,355	4,421	5,335	1	3	1	2.05
Indiana	4,042	4,629	5,032	3	1	4	2.22
Missouri	3,757	4,006	4,690	5	6	6	2.24
Ohio	4,161	4,349	5,181	2	4	3	2.22
Tennessee	3,013	3,642	4,223	8	8	8	3.43
Virginia	3,725	3,865	4,887	6	7	5	2.75
West Virginia	3,939	4,526	5,212	4	2	2	2.84

SOURCE: National Center for Educational Statistics, U.S. Department of Education (<http://nces.ed.gov/>).

**Table 14****Student-to-Teacher and Student-to-Administrator Ratios, Selected Years**

A.	Student to teacher (full-time equivalent)			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	17.3	16.5	16.3	3	4	2	-0.6
Illinois	16.8	16.8	15.9	5	2	3	-0.5
Indiana	17.6	17.2	16.7	2	1	1	-0.5
Missouri	16.2	15.0	13.9	6	6	7	-1.5
Ohio	16.9	16.7	14.7	4	3	5	-1.4
Tennessee	19.6	16.5	15.8	1	4	4	-2.1
Virginia	15.1	14.3	11.8	8	8	8	-2.4
West Virginia	15.2	14.4	14	7	7	6	-0.8

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B.	Student to administration and staff			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	87.3	94.6	51.1	4	1	7	-5.2
Illinois	99.3	85.1	74.9	1	4	4	-2.8
Indiana	93.3	90.3	89.5	2	3	1	-0.4
Missouri	64	58.4	71.1	7	8	5	1.1
Ohio	58.4	66.3	46.8	8	7	8	-2.2
Tennessee	77.9	71.7	70.7	6	6	6	-1.0
Virginia	91.4	92.2	77	3	2	2	-1.7
West Virginia	86.9	83.5	77	5	5	2	-1.2

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C.	Student to district central administration and staff			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	206.5	184.6	102.1	5	5	6	-6.8
Illinois	270.8	210.8	184.3	3	4	4	-3.8
Indiana	727.8	662.8	637.4	1	1	1	-1.3
Missouri	170.7	106.1	93.8	6	8	8	-5.8
Ohio	121.4	122.1	94.4	8	7	7	-2.5
Tennessee	257.8	217.6	237.2	4	3	2	-0.8
Virginia	292.7	317.4	226.4	2	2	3	-2.5
West Virginia	152.1	133.4	127.3	7	6	5	-1.8

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D.	Student to district central administration			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	646.6	635.6	543.4	6	4	6	-1.7
Illinois	1,128.7	572.1	517.3	2	6	7	-7.5
Indiana	1,086.7	1,072.6	1,031.7	3	1	1	-0.5
Missouri	1,020.6	831.6	701.4	4	3	3	-3.7
Ohio	322.8	333.4	280.7	8	8	8	-1.4
Tennessee	1,019.3	504.8	775.3	5	7	2	-2.7
Virginia	573.9	634.8	634.6	7	5	5	1.0
West Virginia	1,233.7	936.1	680.6	1	2	4	-5.8



**Table 15****State and Local Expenditures on Highways, Selected Years**

	Per capita, millions of 2002\$			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	368	365	477	3	3	2	2.6
United States	340	349	402	6	6	6	1.7
Illinois	399	359	451	1	4	3	1.2
Indiana	273	311	330	9	9	8	1.9
Missouri	320	358	436	8	5	4	3.2
Ohio	322	315	359	7	8	7	1.1
Tennessee	341	338	306	5	7	9	-1.1
Virginia	359	420	426	4	2	5	1.7
West Virginia	392	513	576	2	1	1	3.9

Kentucky's ratio of students to school administrators was also the second lowest among states in 2002, and, during that period, the rate of reduction in that ratio, 5.2 percent per annum, was again the greatest among our benchmark states.

It is possible to calculate a salary figure for employees in primary and secondary education and even calculate a salary figure for personnel involved in instruction. However, we cannot calculate the salaries of specific educational occupations such as administrator or teacher because administrative staff are included in salary expenses for administrators and instructional aides are included in instructional salaries. For this reason, we do not attempt to construct any salary figure and, instead, focus on educational spending and employment as it relates to the number of students being taught.

### **Highways and Roadways**

While revenues for highway and roadways in most states, including Kentucky, do not come from general funds, they are still a major expenditure for the state and a critical component of infrastructure. Spending in Kentucky, as is the case with most services, is primarily done by the state government, with state expenditures comprising 80 percent of combined state and local spending in 2000. In contrast, the U.S. average is only 60 percent; in Illinois it is less than 50 per-

cent. Thus, when reporting state expenditures and employment, clearly, appropriate comparisons require comparisons of state and local expenditures and employment. Table 15 reports combined state and local governments capital outlays per capita. For both state and state and local per capita spending, Kentucky ranks second, trailing only West Virginia.

It is difficult and probably misleading to attempt to infer much about relative costs of or efficiency in the production of highway services based on per capita costs. Per capita costs could vary for a number of reasons that are unrelated to efficiency in provision, including differences in highway miles (per capita), terrain, climate, and usage. While all these factors are likely to influence costs, attempts to account for all of them are beyond the scope of this study. However, we do attempt to account for differences in highway usage and highway miles using data from the Highway Performance Monitoring System (HPMS) administered by the Federal Highway Administration ([www.fhwa.dot.gov/policy/ohpi/hpms/](http://www.fhwa.dot.gov/policy/ohpi/hpms/)). Table 16 reports usage (average annual daily traffic flow) and lane miles for each of the states for federal, state, and local highways and roadways. As the table indicates, Kentucky has significantly more lane miles, particularly controlled by the state, than many states with much larger populations.

**Table 16****Average Daily Traffic Flow and Lane Miles by Government in Control, 1999**

State	Average daily traffic			Lane miles		
	Federal	Local	State	Federal	Local	State
Kentucky	2.00	1.42	0.81	2,053	100,720	60,812
Illinois	9.79	2.35	2.16	511	244,485	43,952
Indiana		0.45	0.56		166,332	28,248
Missouri	1.12	0.49	0.63	2,208	181,739	69,938
Ohio		4.28	1.88	540	193,218	55,681
Tennessee		3.37	2.06	594	147,821	35,825
Virginia	2.02	7.21	3.21	3,793	26,335	122,929
West Virginia		4.21	1.41	1,355	4,528	70,233

SOURCE: Highway Performance Monitoring System (HPMS) administered by the Federal Highway Administration (<http://www.fhwa.dot.gov/policy/ohpi/hpms/>).

**Table 17****Highway Expenditures, Per Mile Traffic Flow in 1999, 2002\$**

State	Road miles			Lane miles		
	Local	State	Combined	Local	State	Combined
Kentucky	7	55	24	4	25	12
Missouri	11	42	19	5	19	9
Indiana	9	121	23	5	48	11
Tennessee	10	90	23	5	36	11
West Virginia	24	27	26	12	13	13
Illinois	20	117	32	10	45	15
Ohio	21	102	36	10	41	17
Virginia	44	41	41	20	19	19

Table 17 reports the expenditures per traffic mile for state, local, and combined (state and local) highways for fiscal year 1999. This is calculated using the data in Table 16 with data on highway expenditures (Table 15). Traffic miles are simply the number of miles of roadways and the average annual traffic flow. Costs are reported both per mile of roadway and per mile of lanes. As the table suggests, once differences in use and miles of roadway are accounted for, Kentucky's costs are relatively low.

Table 18 reports highway employees per 1,000

residents. Again, when costs are measured in terms of population, Kentucky has high levels of employment. Although not reported here, if costs per mile of roadway is calculated, Kentucky has relatively modest employment in this function.

## THE DETERMINANTS OF STATE AND LOCAL EXPENDITURES

In preceding sections, we documented the differences in state and state and local expenditures for Kentucky and its neighboring states.

**Table 18****State and Local Employment in Highways per 1,000 Residents, Selected Years**

	Per 1,000 residents			Rank			Annual % change
	1992	1997	2002	1992	1997	2002	
Kentucky	2.25	2.18	2.13	5	4	3	-0.56
United States	2.06	2.00	1.90	6	6	6	-0.81
Illinois	1.56	1.61	1.69	9	9	9	0.81
Indiana	1.85	1.81	1.69	8	8	8	-0.87
Missouri	2.26	2.52	2.34	4	2	2	0.33
Ohio	1.85	1.86	1.84	7	7	7	-0.07
Tennessee	2.27	2.19	1.92	3	3	5	-1.66
Virginia	2.37	2.08	1.98	2	5	4	-1.78
West Virginia	3.65	3.76	3.26	1	1	1	-1.11

However, we made no attempt to discern what might be the reason for these differences in expenditures and, in particular, whether these differences might be due to differences in the cost of provision or in the quality (and mix) of services provided. In particular, if there are differences in costs, are these differences in costs attributable to factors external to government agencies, the providers of services, or are they related to factors that might be considered internal to the operation and structure of the state and local governments?

Definitive answers to these questions are beyond the scope of this study, particularly given the lack of a measure of quality of services or, for some functions, even a measure of quantity or customer base. However, we believe that by estimating the relationship between expenditures and factors likely to affect it, we can offer some insights into understanding some of this variation in expenditures among states.

### **Data**

We estimate the relationship for a few categories (including total state and local spending, administrative spending, and primary and secondary education) and what we believe are factors likely to influence spending, both because of supply (cost) and demand considerations. Data on these categories of government spending are

obtained for the years 1992, 1997, and 2002 from the Census of Governments. All spending is converted to 2002 dollars and measured on a per capita basis, with state and local spending combined.

Table 19 shows variable means and values for the categories and influencing factors. Explanatory variables include the state population (and population squared) and population density (people per square mile). How the population affects per capita costs and, in particular, whether there is evidence of economies or diseconomies of scale related to the population of the state is a primary focus of this exercise. While our primary focus is on population rather than population density, we estimate a model in which both measures are included.

In addition, the distribution of expenditures between state and local governments is included with expenditure share measuring the fraction of expenditures in the category made by the state government. Our intention in including this variable is to see whether more centralized government service provision results in greater spending, perhaps because of reduced monitoring or less Tiebout competition. In addition to how the expenditures are distributed between state and local governments, we also have data on the number of counties, municipalities, and school districts and determine the average population for each of these jurisdictions for each state. This, we believe, offers some measure of whether there are economies or diseconomies of scale associated

**Table 19**  
**Variable Means and Values for Eight States**

	Mean, eight states	Kentucky	Illinois	Indiana	Missouri	Ohio	Tennessee	Virginia	West Virginia
Total expenditures	6,372	6,073	6,945	5,895	5,816	7,009	6,325	6,006	6,609
Administrative expenditures	247	330	309	229	408	215	310	352	308
Population (1,000)	7,243	4,089	12,585	6,158	5,679	11,410	5,792	7,273	1,805
Density	165	103	226	172	82	279	141	184	75
Expenditures, state share	0.63	0.74	0.56	0.61	0.63	0.66	0.55	0.64	0.79
County population	77,556	34,370	123,384	67,674	49,823	129,664	62,960	76,564	32,822
Municipal population	13,543	9,646	9,748	10,861	6,004	12,113	16,597	31,762	7,715
Students per district	3,782	3,339	1,954	3,056	1,717	2,241	6,702	5,845	4,963
Federal revenue to state and local	0.21	0.24	0.17	0.18	0.24	0.19	0.23	0.16	0.26
Local revenue to state	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.01
State revenue to local	0.31	0.34	0.28	0.30	0.29	0.35	0.21	0.33	0.42
Relative earnings	0.91	0.82	1.08	0.88	0.89	0.92	0.87	1.00	0.76
Employment to population	0.59	0.57	0.59	0.59	0.62	0.60	0.60	0.62	0.49
Poverty rate	11.7	14.8	11.3	9.6	11.3	10.2	13.6	9.6	16.1
Income, median	40,789	35,875	44,946	41,973	40,309	42,246	37,129	48,224	30,695
Unemployment rate	4.9	6.1	5.9	5.1	5.0	4.7	4.8	4.5	4.6
Lower house, % Democrat	0.52	0.66	0.53	0.53	0.53	0.40	0.58	0.34	0.75
Upper house, % Democrat	0.48	0.47	0.46	0.36	0.41	0.33	0.55	0.45	0.82
Governor, Democrat	0.43	1	0	1	1	0	0	0	1
African American	0.12	0.07	0.15	0.08	0.11	0.11	0.16	0.19	0.03
Hispanic	0.04	0.01	0.12	0.04	0.02	0.02	0.02	0.05	0.01
Native American	0.002	0.002	0.001	0.002	0.004	0.002	0.002	0.003	0.002
Asian American	0.02	0.01	0.03	0.01	0.01	0.01	0.01	0.04	0.01
Urban	0.70	0.56	0.88	0.71	0.69	0.77	0.64	0.73	0.46
Median age	36.2	36.1	35.2	35.4	36.1	36.1	36.2	35.4	38.9

with the number and population of local governments. Differences in revenue sources are also considered, with variables included that measure the fraction of state and local revenue from federal sources, the fraction of state revenues from local sources, and the fraction of local revenues from state sources. These variables might reflect cost-sharing between the levels of government in the form of matching grants, for example, which might reduce the cost of providing the service for the government receiving the revenue. These data are also obtained from the Census of Governments.

Our next set of variables includes measures of employment and income, specifically, median household income, the (average annual) unemployment rate, the poverty rate, and a constructed variable, that is, the ratio of employment to population.<sup>6</sup> Additionally, in some specifications we also included measures of the political climate in the state, specifically the percentages of the lower and upper house members that were members of the Democratic Party and a categorical variable for the political party of the governor.<sup>7</sup> A final set of variables controlled for demographic factors, including the racial composition of the state's population (percentage of African American, Native American, and Asian American), the percentage of its population of Hispanic ethnicity, the percentage of the population living in urban areas, and the median age of the population.

For our estimates on the determinants of primary and secondary educational spending, our dependent variable is state and local education per student (in 2002 dollars) rather than per capita. Additionally, we include variables measuring student achievement: specifically, relative state scores on the National Assessment of Educational Progress (NAEP) exams for fourth graders in mathematics and reading and for eighth graders in mathematics. State averages for the SAT verbal and mathematics sections are also included, as

is the percentage of students taking the exam in the state. Because states vary greatly in the percentage of students taking the exam and the exam is voluntary, this measure of achievement is probably less reliable than the NAEP, which is given to all students, with few exceptions, in participating states. Also included are measures of the educational attainment—that is, the percentage graduating from high school and the percentage having a BA or greater within the state population (adults over age 18), as this may affect the demand for educational services. We also include the percentage of the population between the ages of 5 and 19 and the percentage of primary and secondary students attending private schools, as these variables are likely to influence the (tax) cost of public education.

### **Empirical Methodology: Fixed-Effect Estimation**

The empirical models we use are intended to address our two primary interests: to what extent are differences in costs related to economies or diseconomies of scale and how much of the difference in costs among states is not explained by differences in population or other factors that may influence costs. The basic form of the model we estimate is

$$E_{it} = \beta_1 P_{it} + \beta_2 D_{it} + \beta_3 S_{it} + \beta_4 J_{it} + \beta_5 R_{it} + \beta_6 IE_{it} \\ + \beta_7 L_{it} + \beta_8 RH_{it} + \beta_9 T_t + \mu_i + \varepsilon_{it},$$

where the subscript  $i$  denotes the state and the subscript  $t$  denotes the year. The term  $E_{it}$  is the measure of expenditure per capita in state  $i$  and year  $t$ ;  $P_{it}$  is state population (and population squared) in year  $t$ ;  $D_{it}$  refers to population density;  $S_{it}$  is the state share of expenditures;  $J_{it}$  is a vector consisting of measures of population per jurisdiction (county, municipality, or district) or in some cases the number of jurisdictions;  $R_{it}$  measures sources of revenue;  $L_{it}$  are our measures of political sentiments; and  $RH_{it}$  is a vector of demographic variables reflecting race, ethnicity, age, and extent of urbanization in the state. The term  $T_t$  consists of year dummies. We estimate this as a fixed-effect model with  $\mu_i$  being the state fixed-effect invariant over time by varying among states. In addition,

<sup>6</sup> Employment, unemployment, and poverty data are from the Bureau of Labor Statistics, U.S. Department of Labor, small area surveys. No survey was undertaken in 1992, so 1993 data were used. Income estimates are from the Census Bureau, U.S. Department of Commerce.

<sup>7</sup> Obtained from various editions of the *Statistical Abstract of the United States*, U.S. Printing Office.

**Table 20**  
**Estimation of Total State and Local Expenditures Per Capita**

Variable	A		B		C		D		E	
	Coefficient	T	Coefficient	t	Coefficient	t	Coefficient	T	Coefficient	t
Population	-0.000106	0.000	-7.36E-05	-0.57	-0.000102	-0.83	-0.0003703	-3.14	-0.0003004	-2.39
Population <sup>2</sup>	3.04E-12	0.000	2.70E-12	1.07	2.85E-12	1.16	5.78E-12	2.71	5.09E-12	2.35
Density			-3.201617	-1.24						
Density <sup>2</sup>			0.0002	1.41						
State share of expenditures					2,833	2.54	3,507	2.46	3,737	2.58
County population							-0.0001991	-0.53	-0.0001367	-0.36
Municipal population							-0.0132	-3.15	-0.0212	-2.47
District students							0.0092212	0.46	0.0254	0.98
Federal to state and local revenue							1,521	0.96	1,506	0.89
Local to state revenue							2,483	0.69	4,226	1.16
State to local revenue							-2840	-3.48	-2420	-2.79
Relative earnings							5,255	5.17	4,637	4.57
Employment to population							1,422	0.68	1,197	0.55
Poverty rate							-79.3	-2.91	-75.5	-2.67
Median income							-0.0360532	-1.42	-0.0325	-1.13
Unemployment rate							36.1	1.33	56.6	2.1
Lower house, % Democrat							-991	-2.58		
Upper house, % Democrat							250	0.67		
Governor, Democrat							52.6	1.07		
African American									-35.9	-0.01
Hispanic									-2,545	-0.57
Native American									-386	-0.02
Asian American									-3,774	-1.58
Urban									482	0.37
Median age									-119	-1.44
1992	-1,270	69.59	-1,308	-17.67	-1,228	-17.06	-1,300	-7.75	-1,632	-5.38
1997	-920	57.35	-940	-15.61	-874	-14.75	-1,000	-8.3	-1,032	-6.83
F	149.37		145.45		113.65		152.98		140.92	
R <sup>2</sup>	0.988		0.988		0.9848		0.9924		0.9924	
MSE	250.85		249.67		244.7		189.66		192.26	



**Table 21****State and Local Expenditures Per Capita, State Fixed Effects for Alternative Specifications**

State	Difference from mean	A	B	C	D	E
Kentucky	-221	-386	-478	-822	-850	-849
Illinois	466	771	830	810	1,147	991
Indiana	-389	-402	-345	-515	-754	-744
Missouri	-562	-609	-808	-714	-1,196	-1,117
Ohio	504	779	1,034	554	1,370	1,078
Tennessee	189	139	105	284	-17	71
Virginia	-161	-114	-59	-203	-238	-30
West Virginia	174	-178	-279	606	538	599

there is an error component varying both over time and among states,  $\varepsilon_{it}$ .

We estimate and report a number of alternative specifications, basically extending the sets of variables included as regressors. In addition to reporting the coefficients from the regression, we report the fixed effect for each of our eight states, our measure of the difference in cost not explained by the regressors that is invariant to the state over time. We also determine the relationship between expenditures per capita (or other base) and population for the alternative specifications. Finally, we decompose the variation in costs among our states to provide an indication of the determinants of differences in costs among the states.

## Results

**Total State and Local Expenditures.** Table 20 reports the results of the fixed-effect estimation of per capita total state and local expenditures for a number of alternative specifications. Only when relative earnings are included as an explanatory variable (specifications D and E) do the population variables, both independently and evaluated jointly, become significant. The state's share of expenditures has a significant positive impact on total expenditures: for example, a 10 percent (0.10) increase in the state share increases total expenditures per capita from approximately \$270 to \$480, depending on the specification. Although the average population of counties or students in school districts had little impact on

expenditures, the negative and significant coefficients on the municipal population variable provides some evidence of economies of scale in municipal services. Somewhat surprisingly, the state to local revenue variable is negative and significant, suggesting that a greater percentage of local funding coming from the state results in reduced total expenditures. The relative earnings variable appears to have a strong impact on total expenditures, with 10 percent higher earnings resulting in increased expenditures per capita of \$370 to \$525.

Table 21 reports the fixed effect for each of the eight states. The first column simply gives the actual difference in total expenditures per capita for each state without controlling for any factors that might affect expenditures. For Kentucky, for example, combined state and local expenditures are \$221 below the mean of the eight states. When controlling only for population, (A), Kentucky's expenditures fall to \$386. The large decrease in the fixed effect,  $-\$386$  to  $-\$822$ , that occurs when the state share of expenditures variable (A to C) is included suggests that this is an important element in explaining state and local expenditures in Kentucky.

In Table 22 we use specification E reported in Table 20 to decompose the differences in expenditures between the states. Thus, for example, the \$707 reported under population for Kentucky equals

**Table 22**  
**Sources of Differences Among States in State and Local Expenditures**

Decomposition of E	Population	Expenditure share	No. of local governments	Source of revenue	Relative earnings	Income/employment	Demographics
Kentucky	707	399	77	-55	-450	-33	43
Illinois	-1,435	-253	28	92	764	-49	-75
Indiana	251	-79	40	-17	-157	132	137
Missouri	396	-12	111	95	-111	84	76
Ohio	-1,161	82	-16	-125	37	60	118
Tennessee	362	-307	11	283	-219	-15	38
Virginia	-75	27	-333	-120	387	-75	13
West Virginia	1,663	542	160	-208	-701	-139	-306

$$-0.0030404 \left( Population_{KY} - \overline{Population} \right) + (5.09E - 12) \left( Population_{KY}^2 - \overline{Population}^2 \right)$$

using the coefficients from specification E. Then, for Kentucky, population and the state’s share of expenditure act to increase costs while its lower relative earnings reduce costs. Conversely, for Illinois, its large population and decentralized expenditures reduce expenditures, but its higher relative earnings and its demographic composition increase expenditures.

Figure 1 illustrates the relationship between population and per capita expenditures for our alternative specifications. For our most parsimonious specifications, the impact of population is relatively small and statistically insignificant. However, when controlling for the impacts of relative earnings and other factors, there are pronounced economies of scale of a large magnitude.

**Administrative Costs.** We use the same methodology and the same variables to examine the determinants of combined state and local administrative costs per capita. We broadly define administrative costs to include the categories of financial administration, judicial, other administration (central and legislative), and building operations. Although this is a relatively small share of total state and local government expenditures, we are interested in these expenditures because of frequent suggestions of excesses or waste in administration.

The results of the fixed-effects estimation, reported in Table 23, are generally qualitatively similar to those for total expenditures—with some notable exceptions. First, both the population and population<sup>2</sup> variables are statistically significant for all specifications. Similar to what was found with total expenditures, increases in the municipal population variable reduced administrative costs, but the share of administrative costs between the state and local governments had no impact on the level of administrative costs. Surprisingly, the relative earnings variable was positive but statistically insignificant. Increases in both the poverty rate and median income reduced administrative expenditures, as did the fraction of the population that was Hispanic or Asian American.

Table 24 reports the fixed effects for the eight states for the alternative specifications reported in Table 23, and Table 25 reports the decomposition of the differences in spending among the states and is analogous to what was presented in Table 22 for total expenditures. Viewing both tables suggests that differences in the population explain much of the differences in administrative costs among states. For Kentucky, as seen in Table 25, based on specification E, the difference between Kentucky’s population and the mean for the eight states leads to an estimated increase in administrative expenditures of \$142, while demographic factors in the state reduce predicted costs by \$113. Other factors have a much smaller influence on costs.

**Table 23****State and Local Administrative Costs**

Variable	A		B		C		D		E	
	Coefficient	T	Coefficient	t	Coefficient	t	Coefficient	T	Coefficient	t
Population	-0.00004	-2.73	-3.5E-05	-2.54	-3.55E-05	-2.61	-0.0000403	-2.78	-0.0000594	-4.19
Population <sup>2</sup>	6.78E-13	2.55	6.64E-13	2.44	6.57E-13	2.43	7.32E-13	2.76	9.68E-13	3.90
Density			-0.054976	-0.2						
Density <sup>2</sup>			1.92E-06	0.12						
Expenditures, state share					130.2822	1.06	119.519	0.68	150.6181	0.92
Counties, population per							-0.0000829	-1.80	-0.0000558	-1.33
Municipalities, population per							-0.0012165	-2.66	-0.001953	-2.87
Revenue, federal to state and local							-750	-3.8	-608	-3.17
Revenue, local to state							-153	-0.34	-149	-0.36
Revenue, state to local							29.3	0.29	49.3	0.51
Salary, relative to other states							163	1.30	34.8	0.30
Employment to population							342	1.31	429	1.73
Poverty rate							-3.34	-1.00	-6.41	-2.01
Income, median							-0.00549	-1.74	-0.0054779	-1.66
Unemployment Rate							3.28	0.97	3.56	1.15
Lower house, % Democrat							-19.6	-0.41		
Upper house, % Democrat							-22.4	-0.49		
Governor, Democrat							4.31	0.71		
African American									998	1.53
Hispanic									1,516	2.99
Native American									1,554	0.71
Asian American									-463	-2.04
Urban									227	1.52
Age, median									-0.6726	-0.07
1992	-83.5	-11.3	-83.8	-10.49	-81.0	-10.22	-123	-5.89	-77.1	-2.22
1997	-45.7	-7.48	-46.2	-7.11	-43.9	-6.72	-86.8	-5.83	-62.0	-3.59
F	53.45		51.58		44.64		47.56		52.3	
R <sup>2</sup>	0.9653		0.9678		0.9621		0.9755		0.9791	
MSE	27.44		26.953		26.942		23.652		22.054	

**Table 24****State and Local Administrative Expenditures Per Capita, State Fixed Effects for Alternative Specifications**

State	Difference from mean	A	B	C	D
Kentucky	-43	-127	-127	-139	-70
Illinois	29	153	153	158	88
Indiana	-3	-28	-27	-28	-17
Missouri	-31	-70	-72	-68	-87
Ohio	72	178	181	171	255
Tennessee	-60	-99	-99	-86	-102
Virginia	30	30	31	32	-29
West Virginia	6	-38	-40	-40	-36

Analogous to Figure 1, Figure 2 provides a relationship between per capita administrative costs and state population. In this case, decreasing costs are exhibited throughout the range of population for the states and there is much less variation in the extent of these economies of scale among the alternative specifications.

**Primary and Secondary Education.** Unlike many of the other functions of state and local governments, there is a voluminous literature examining educational finance and educational productions; much of this literature has focused directly on the relationship between educational expenditures and educational “outputs,” most frequently performance on standardized tests, but occasionally on other measures such as high school completion or earnings.

Given the extensive research on educational finance and returns to education, our contribution to this literature is minor; perhaps, though, it is valuable as an examination of the impacts of differences in the structure and financing of education among states. We follow the same general methodology as used for our examination of total and administrative expenditures, albeit using some different measures of scale economies and some measures of output (test results). In addition, we also include an alternative measure of the age distribution, the fraction of the population under age 19, because this will affect the (tax) cost of educational services. Also, because primary and

secondary education is almost exclusively provided by local governments, we do not include any measure of the state share in educational expenditures.<sup>8</sup>

We are again interested in the issue of economies of scale, but, rather than relate costs to the states total population, we consider costs relative to students per district and students per school. Rather than measure per capita expenditures, we use educational expenditures per student as our dependent variable. The results of our fixed-effect estimation are found in Table 26. From the table we can see that there are generally significant effects of the number of students per district. The marginal effect,<sup>9</sup> evaluated at the mean of 8,249 students per district, is statistically significant at a level of 0.05 in all specifications. The marginal effect of students per school is significant at a level of 0.05 in specifications B and C but not in the other specifications. These results can be seen more clearly in Figures 3 and 4. In Figure 3, the relationship between the average number of students per school in the state and expenditures per student is clearly U-shaped with, for most specifications, the minimum approximately between

<sup>8</sup> The notable exceptions being Hawaii, which has a single school jurisdiction and, of course, the District of Columbia. Also excluded are the political variables. These variables were included in some unreported estimation and were found to be insignificant and having little impact on the other variables' coefficients.

<sup>9</sup> Specifically the test is whether  $\beta_{SD} + 2 * \overline{SD} \beta_{SD}^2 = 0$ , where  $SD$  refers to students per district.

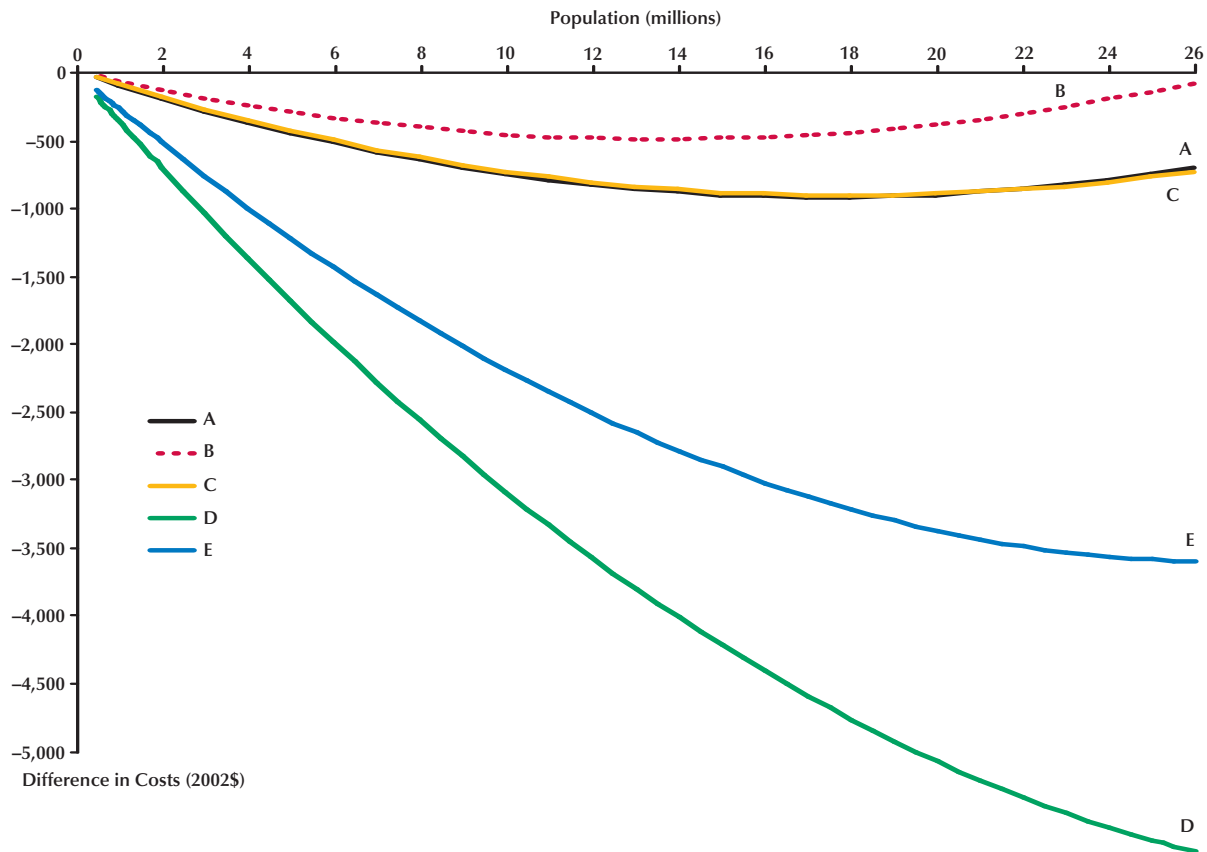
**Table 25**  
**Sources of Differences in Administrative Expenditures Among States**

State	Deviation from mean	Population	Expenditure share	No. of local governments	Source of revenue	Relative salary	Income/employment	Demographics	Explained	Difference between explained and actual
Kentucky	-60	142	16	10	-19	-3	3	-113	36	96
Illinois	22	-146	-9	5	16	6	-16	188	44	22
Indiana	2	25	-3	6	13	-1	9	-38	11	10
Missouri	-78	40	0	16	-21	-1	19	-32	21	99
Ohio	100	-120	3	0	11	0	4	-19	-120	-220
Tennessee	-92	36	-10	-5	-18	-2	14	5	20	112
Virginia	2	-9	1	-36	28	3	-16	84	55	53
West Virginia	45	175	18	14	-29	-5	-15	-189	-32	-76
Mean	308									

**Table 26****State and Local Primary and Secondary Education Expenditures Per Capita, Fixed-Effect Estimation**

Variable	A		B		C		D		E	
	Coefficient	T	Coefficient	t	Coefficient	t	Coefficient	T	Coefficient	t
Students/district	-0.0378313	-2.68	-0.1512172	-3.69	-0.1525052	-3.78	-0.1123068	-2.03	-0.1277763	-2.74
(Students/district) <sup>2</sup>	-2.24E-08	-0.16	2.16E-07	1.41	2.44E-07	1.6	1.89E-07	0.93	2.66E-07	1.52
Students/school	-11.28282	-1.6	-14.10065	-2.37	-12.4991	-2.11	-11.3965	-1.48	-7.901093	-1.21
(Students/school) <sup>2</sup>	0.0126233	2	0.0152521	2.86	0.013537	2.53	0.0122561	1.75	0.0100554	1.69
State to local revenue			2,121.976	2.31	1,780.62	1.93	1,433.601	1.07	1,147.321	1.17
Relative Earnings					2,136.813	1.93	3,530.235	1.64	3,185.971	2.27
Fraction < 19							-14,614.94	-1.45	-8,298.532	-1.03
NAEP, 4th reading							113.793	0.03		
NAEP, 4th math							5,016.547	0.97		
NAEP, 8th math							-6634.675	-1.03		
African American							3,108.104	0.3	6,643.901	0.72
Hispanic							-6,038.257	-0.83	-2,760.4	-0.44
Native American							35,067.22	0.96	29,748.77	1.03
Asian American							1,581.305	0.62	326.9808	0.14
Urban							207.0132	0.09	5.419015	0
Poverty rate							-27.48045	-0.56	-70.47135	-1.68
Median income							-0.0010409	-0.02	0.0097922	0.24
1992	-1,673	-22.02	-1,703.032	-23.8	-1,749.257	-23.47	-1,860.216	-6.76	-1,619.869	-6.53
1997	-1,368	-16.91	-1,301.528	-17.9	-1,343.076	-17.94	-1,474.479	-8.69	-1,398.308	-9.79
Number of observations	153		151		151		127		151	
F ( 56, 96)	60.33		74.06		74.96		57.73		67.98	
Probability > F	0		0		0		0		0	
R <sup>2</sup>	0.9724		0.9784		0.9793		0.9859		0.9816	
Adjusted R <sup>2</sup>	0.9563		0.9652		0.9662		0.9688		0.9672	
Root MSE	381.34		321.28		316.7		307.98		312.15	



**Figure 1****Economies of Scale for Total State and Local Expenditures, Alternative Specifications**

400 and 500 students, a range encompassing the mean for our sample, 454 students per school. In contrast, as shown in Figure 4, expenditures per student decrease throughout the relevant range for average students per district, with the difference in expenditures being quite substantial.

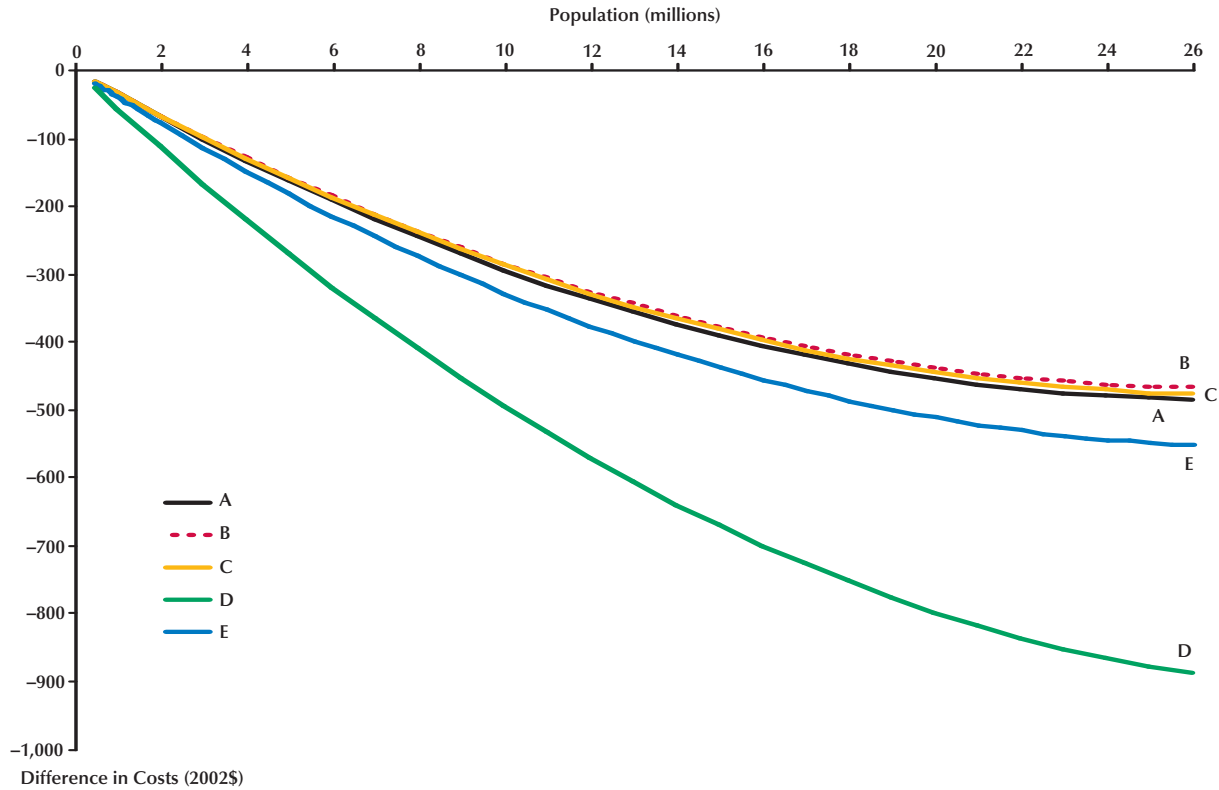
Both the magnitude and statistical significance of the coefficient on the state to local revenue variable were sensitive to specification, that is, inclusion of additional variables, with the magnitude of the coefficient decreasing with inclusion of demographic factors. This may not be surprising, as the extent of revenue sharing may be positively related to the degree of poverty and its geographical concentration within the state. Not surprisingly, the relative earnings variable has a

positive and significant impact on expenditures, whereas the fraction < 19 variable has a negative impact but is only statistically significant in specification C. The relative average NAEP scores were insignificant, as were the demographic variables.

Table 27 reports the estimated fixed effect for each of the eight states. Although the magnitude of the fixed effect generally diminished with increased explanatory variables, as expected, West Virginia's effect increased dramatically when demographic characteristics were included and NAEP scores omitted. In contrast, Tennessee's fixed effect was relatively invariant to specification while Kentucky's decreased dramatically, from a value of  $-1,076$  with fixed effects to only  $-365$  in specification E. In contrast, Illinois's large positive

**Figure 2**

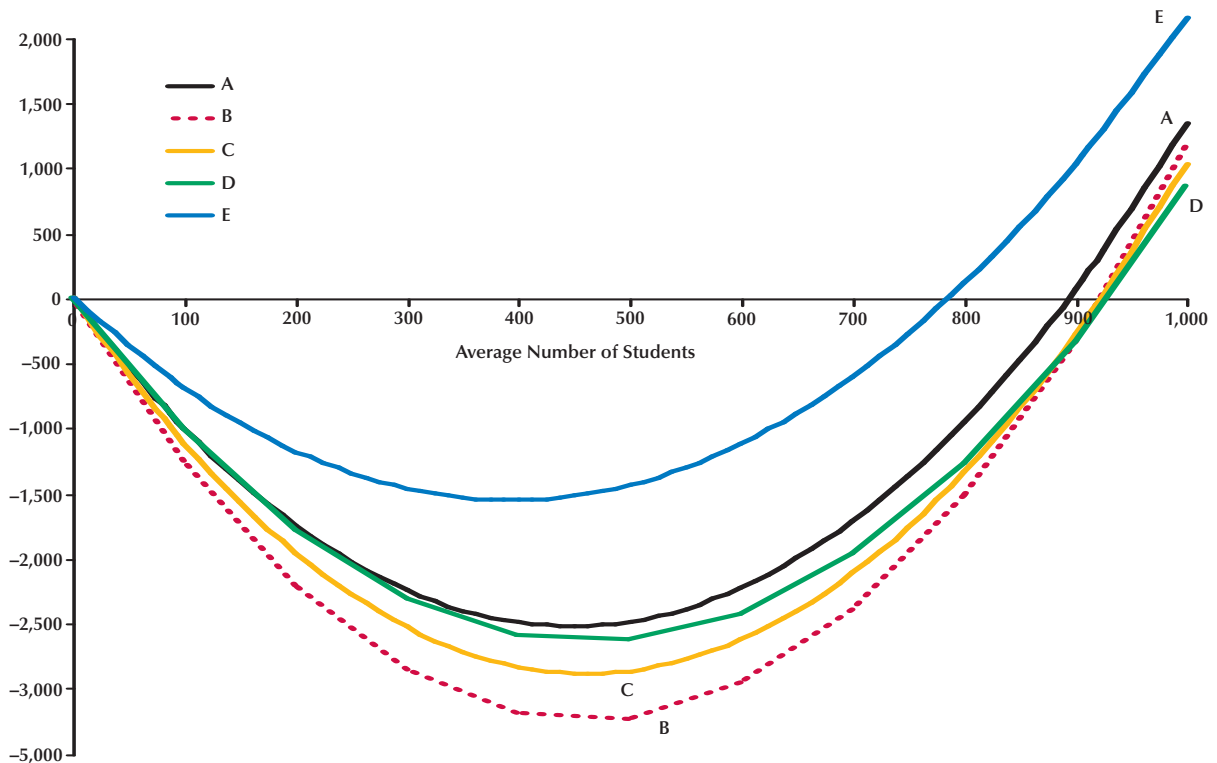
**Economies of Scale for State and Local Administrative Expenditures, Different Controls**



**Table 27**

**Primary and Secondary Expenditures Per Capita, State Fixed Effects for Alternative Specifications**

	Difference from mean	A	B	C	D	E	F
Kentucky	-1,076	-1,037	-1,225	-1,041	-989	-748	-365
Illinois	729	729	637	272	918	907	9
Indiana	415	422	353	381	342	386	392
Missouri	-204	-254	-461	-449	-214	-423	-324
Ohio	844	858	680	614	866	715	483
Tennessee	-1,412	-1,407	-863	-807	-1,057	-1,234	-1,268
Virginia	358	351	685	564	168	-93	-520
West Virginia	346	338	195	465	-33	490	1,594

**Figure 3****Costs versus Average Number of Students Per School**

effect became statistically insignificant in specification E.

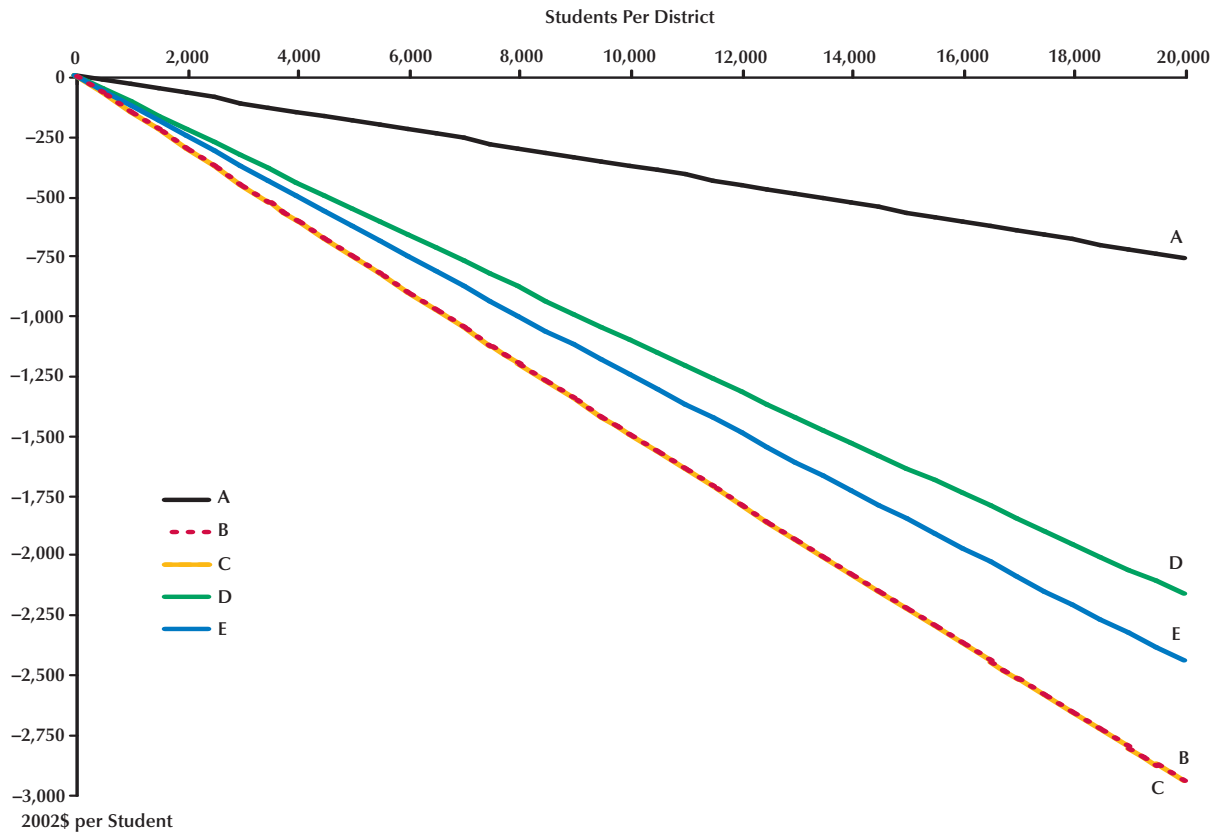
Table 28 reports the results of a decomposition of specification E, explaining the difference in each state's predicted expenditures and the mean expenditure of the states. Illinois, Virginia, and West Virginia have significant reductions in expenditures attributable to the significant number of students per district, with the relatively small number of students per district in Indiana, Ohio, and Tennessee increasing their expenditures. Only for Illinois did the number of students per school have much impact on expenditures. Relative earnings had a large impact on expenditures in Indiana and West Virginia, and demographics played a significant role in increasing costs in Illinois and West Virginia and reducing costs in Indiana.

## CONCLUSION

In our sample of Kentucky and its seven neighboring states, states with smaller populations and more centralized spending have higher per capita expenditure. State government employment tends to mirror expenditure, that is, less populous and more centralized states have greater employment per capita; but this pattern breaks down when state and local government employment is considered. For state government salaries, lower-wage states tend to have relatively high wages, but for state and local salaries there is no clear pattern relating government salaries and relative wages.

Regarding particular government functions, no clear patterns emerge for central administration expenditure and employment, though lower-wage states, especially Kentucky and West Virginia, tend to have high central administration salaries.

**Figure 4**  
**Costs versus Average Number of Students Per District**



**Table 28**  
**Sources of Differences among States in Primary and Secondary Educational Expenditures**

State	Districts	Schools	Revenue source	Relative salary	Age < 19	NAEP	Demographics
Kentucky	74	-45	-22	-77	-146	-13	-35
Illinois	-449	203	-7	122	-161	15	285
Indiana	197	-61	-54	624	-203	-26	-364
Missouri	43	-60	37	-300	39	-38	-126
Ohio	223	21	-40	-41	-125	-28	160
Tennessee	165	-63	48	71	-69	-36	146
Virginia	-329	52	-146	-124	61	81	182
West Virginia	-235	40	17	337	91	-14	297

Regarding primary and secondary education spending, with the exception of West Virginia, spending per student is higher for higher income, more populous states. All states experienced a reduction in the student-to-teacher ratio but also a reduction in the student-to-administrator ratio (with the exception of Missouri). The least populous states—West Virginia and Kentucky—have the highest per capita spending on highways. This does not hold for spending per road mile, however. West Virginia stands out as exceptionally high in employment in highway provision.

Our multivariate analysis reveals some interesting findings, too. There are economies of scale: More populous states have less spending per capita. States with more centralized spending have greater state and local total spending and higher-wage states have greater spending. States with a greater population per municipality and a higher poverty rate have lower spending. Controlling for more covariates tends to raise the estimated scale economy. The state fixed effects change substantially after controlling for the covariates. More populous states now tend to have higher expenditure. The results of the multivariate analysis for central administration spending tend to mirror the findings for total expenditure.

Regarding school expenditure: Economies of scale are strong for students per district, but less

so for students per school. Higher-wage states have higher expenditure per student. Measures of student performance (i.e., test scores) have little relationship to spending. Control for covariates alters the estimated differences between states, but the ranking does not change much.

We find substantial differences in state spending, both in the aggregate as well as for specific functions. We also find substantial economies of scale in the provision of government services. Controlling for these economies of scale alters the ranking of high-to-low spending states. A major shortcoming of the study is that we have not controlled for or quantified the differences in the quality of public services among these states. However, by controlling for a number of factors that are likely to affect both the demand for and the cost of government services, we have reduced the difference in costs among states that is “unexplained,” that is, differences in costs that cannot be attributed to differences in the demographics or populations of the states. It is the remaining “unexplained” difference in costs or residual that government officials who seek to claim efficiency must justify as representative of quality.