Rural Education and the 1990 Kentucky Educational Reform Act:
Funding, Implementation and Research Issues

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Abstract

After discussing basic principles of school finance, and comparing selected education-related variables in southeastern states, this paper examines how schools districts are financed in Kentucky. Emphasis is given to issues of funding adequacy, efficiency and equity, and the lawsuit culminating in the 1990 Educational Reform Act. Changes in the formulae by which state school funds are distributed are discussed in detail.

Estimated per pupil school revenue data for the 1989-90 and 1990-91 years are analyzed to determine how funding inequality changed. In the aggregate, per pupil revenues across county school districts (*i*) have risen without exception; (*ii*) have become less variable as measured by a reduced standard deviation and; (*iii*) become less dependent on locally raised taxes. Nevertheless, funding differences among and within metro and nonmetro areas remain, as demonstrated by a variety of measures, including coefficients of variation, relative mean deviation, Gini coefficients and Theil indices. Most importantly, perhaps, increases in funds have been directed primarily towards Eastern Kentucky, where nearly two-thirds of all pupils live under "economically deprived" conditions. The reason for this result is obvious when the new funding formula is examined.

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Stephan J. Goetz and David L. Debertin[1]

Introduction

In a landmark 1989 decision, the Kentucky Supreme Court declared unconstitutional the mechanism whereby the public school system was funded, because it was inefficient and discriminated against students from poorer districts. The manner in which school boards were selected and the state's bureaucracy was organized were found, among other factors, to contribute to inequality in the public education system. Remedies for the malaise ranged from increased local management of schools to new methods of certifying teachers, along with a sizeable injection of new funds. The lawsuit[2] which eventually led to the reforms is being adopted in other states as a model for court cases dealing with educational funding disparities. More generally, Kentucky has gained national prominence as a leader in educational reform (in part because of the size of the increase in state funding of education).

The purpose of this paper is twofold. First, we review general issues in school finance. This includes a discussion of funding adequacy, distributional efficiency and equity; state aid distribution methods; and related issues such as state vs. local control of schools, and the effect of alternative classroom sizes (pupil-teacher ratios) on per pupil spending. Also presented are comparative data on education-related variables for various states. Second, we examine select financial aspects of the Kentucky educational reform package, along with recent developments in its implementation. A central question is whether the reforms have achieved their intended goals; more specifically, has the relationship between income and per pupil spending changed, and is spending within and between the various districts of the state more equal? Differences in per pupil funding in county school districts are examined for metro and nonmetro areas to address these questions. About 60 percent of all students in the state attend nonmetro schools, which attests to the predominantly rural nature of the state.

Section I discusses the events leading to the reform act, while section II presents principles of school finance and related issues. This is followed in section III by a discussion of school finance in Kentucky and a description of recent changes in the state funding formulae. The empirical analysis section (IV) begins with a description of county socioeconomic characteristics which are thought to

affect resources allocated to schools and their performance. Inequalities in spending per pupil before and after the reforms are examined, as are correlations between spending levels, income and student achievement scores in different districts. Section V presents research issues in the economics of education in the state.

I. Background to the Reform

In essence, substantial inequalities in the funding of pupils and resulting differences in resources used gave rise to the Supreme Court's decision. Statistical evidence for a variety of school districts was presented on numbers of classroom teachers and other certified personnel; fiscal capacity (a function of assessed property value, which ranged from $29,807 to $244,305 per pupil); local, state and federal revenues in total and per pupil; funds allocated from the state to districts through the minimum foundation and power equalization programs (described below); teacher salaries; and other variables.[3] Anecdotal evidence was also presented with regard to nepotism and corruption in the property valuation assessment process, particularly in rural areas.

In a 5-2 ruling the Supreme Court found that the school system was underfunded, unequal, and therefore unconstitutional. The court concluded (Lexington Herald Leader [LHL], Friday June 9, 1989, p. A17):

> ... in spite of the Minimum Foundation Program and the Power Equalization Program, there are wide variations in financial resources and dispositions thereof which result in unequal educational opportunities throughout Kentucky. The local districts have large variances in taxable property per student.

The following calculations for per pupil spending in 1987/88 illustrate the funding disparities. A district with high assessed property value per pupil raised $1,863 (per pupil) locally and received $1,458 in state aid; a district with low assessed value received $2,130 in state aid (per pupil), but raised only $159 locally (LHL, *op. cit.*). The range in per pupil spending between the two districts was therefore $1,032 ($3,321−$2,289). Not surprisingly, the court also opined that local property taxes "... are not the solution to the problems. Rather, they contribute to the disparity of per pupil expenditures." In regard to financial inefficiency, the Supreme Court stated:

> ... "Efficient," in the Kentucky constitutional sense was defined as a system which required "substantial uniformity, substantial equality of financial resources and substantial equal educational opportunity for all students." Efficient was also interpreted to require that the educational system must be adequate, uniform and unitary.

Details of this definition are shown in Appendix Table A-1, along with the General Assembly's interpretation of the goals of Kentucky's Education Reform Act (KERA, or House Bill 940).

Charged by the Supreme Court with achieving an efficient school system, which included assuring that all taxable property was assessed at fair market value, the General Assembly subsequently passed legislation to raise taxes on retail sales as well as state and corporate incomes by an estimated $1,267 million over two years. Seventy-five percent of these funds are appropriated for kindergarten-12th grade education. They represent an increase in spending of about $125 per state resident per year, compared with spending of $499 per resident on education in 1989 (a 25% increase).[4]

II. Principles of School Funding and Related Issues

Benson writes that there are three major issues in the economics of education: funding adequacy, distributional efficiency and equity across districts. We focus mainly on these issues here, although others, including fiscal and programmatic neutrality of school funding, local control, fiscal variability and political feasibility (NEA, 1987), are also important. Related issues discussed in this section include methods by which state aid is distributed and how local vs. state funding affects the control of schools.

2.1. Three Funding Issues

2.1.1. *Funding adequacy*

Do state and local governments provide adequate resources to ensure that all elementary and secondary students have access to a "quality" education? Prior to the 1980s, school funding was generally deemed adequate if it averaged 8% of GNP or 20% of a government's budget (Levin; these criteria were applied primarily in the context of developing countries by the World Bank). For the U.S., the percentages were 5.7% and 17.5%, respectively, in 1987. Appendix Table A-2 compares the allocation of resources to schools in various countries. State-level data on spending patterns are shown in Table 1. Among southeastern states, Florida spent the most per pupil, Virginia the most per state resident, and Arkansas the most as a percent of all state government functions in 1989-90. Kentucky ranked below the regional and national averages on all three counts, spending $1,400 less per pupil than the U.S. average.

Funding adequacy in developing countries is nowadays more commonly judged by the performance or *output* of school systems as measured by (*a*) primary school enrollment rates of pertinent age groups; (*b*) enrollment rates by sex; (*c*) enrollment rates for secondary schools; and (*d*) adult literacy rates (Benson, p. 423). Indicators often used in the U.S. include the percentage of those 25 years and older who hold a high school diploma (with 53.1%, Kentucky had the nation's lowest

Table 1. Public School Spending by Region and Source of Funds, 1989-90

Region and State	Total State and Local Education Revenues Per Pupil (1987)	Elem. & Secondary Education Expend. Per Capita*		Source of Revenues		
		Amount	As a % of all functions	Federal	State	Local
	$		%			
Southeast	**2,813**	**577**	**24.7**	**7.8**	**55.5**	**36.7**
Alabama	2,493	461	20.7	13.5	67.1	19.4
Arkansas	2,248	552	28.3	9.7	59.5	30.8
Florida	3,817	616	24.1	6.0	53.6	40.5
Georgia	3,142	687	26.5	6.5	60.9	32.6
Kentucky	**2,278**	**499**	**22.0**	**9.2**	**69.7**	**21.1**
Louisiana	2,690	508	20.1	11.3	54.4	34.3
Mississippi	1,933	556	24.8	15.5	56.7	27.8
North Carolina	2,948	609	26.8	6.3	65.7	27.9
South Carolina	2,962	628	27.4	7.7	53.3	39.0
Tennessee	2,244	475	21.2	9.4	48.3	42.4
Virginia	3,752	700	26.5	4.7	34.7	60.6
West Virginia	3,253	632	27.7	8.2	64.3	27.5
United States	3,672	690	24.2	6.3	49.4	44.3

Source: NCES 90-681 (pp.172-3) for col. 1; NCES Publication No. 91-660 (1991, p. 37) for columns 2 and 3; NEA (1990, pp. 36 and 38) for cols. 4-6.

Note: *. Spending by state and local government only, per state resident.

percentage in 1980; Alaska led the nation with 82.5%), the percent of 9th graders graduating, the percent of high school graduates entering college, and standardized achievement scores. Achievement scores have been severely criticized as a measure of school output.

2.1.2. *Distributional efficiency*

Distributional efficiency is measured by cost-benefit and -effectiveness ratios resulting from local school policies, which are in turn influenced by government school funding decisions. Efficiency calculations incorporate (*a*) student wastage, (*b*) repetition of classes by students, (*c*) failures in examinations, and (*d*) a prolonged instruction process (Benson, p. 424). More generally, factors such as how funds are allocated within schools are examined to assess distributional efficiency. These may include the share of the total budget allocated to instruction as opposed to administration and other services, and teacher-to-staff ratios.

2.1.3. *Equity across districts*

As a matter of political philosophy, a state government may choose to completely decentralize school funding on the one extreme, or exercise complete control on the other. As Benson points out (p. 425), "[c]omplete decentralization leaves the pattern of financial provision to be determined by the pattern of local financial resources." A key question involved in the equity issue is whether state funds are "fairly" distributed across districts to ensure that sufficient resources are available for students to receive a "quality" education irrespective of where they live, *i.e.*, in rural or urban, and high- or low-income school districts. Per pupil funding inequality can be measured by standard deviations or by an index of concentration such as the Theil index or Gini coefficient. Reference to equity, or the "equal protection" clause of the 14th amendment, has been one important method by which the funding of school systems has been constitutionally challenged in the U.S. (NEA, 1987); this was also the method used in Kentucky. The other method has been to challenge the efficiency of funding.[5]

In practice, school districts and governments rarely operate at either funding extreme. Over time, however, the relative importance of states as a source of school revenues has been increasing (Figure 1). Nevertheless, there is considerable disparity in the relative importance of local, state and federal funding among individual states (Table 1 and Figure 2). At 70%, Kentucky ranks first among southeastern states in the relative importance of school funds obtained from the state, and next to last (before Alabama) in the relative importance of local funds; in contrast, Virginia schools receive 60% of their funds from local sources. Only Hawaii (92%), New Mexico (76%) and Washington (73%) provide a larger portion of school revenues from state sources than Kentucky. Among the southeas-

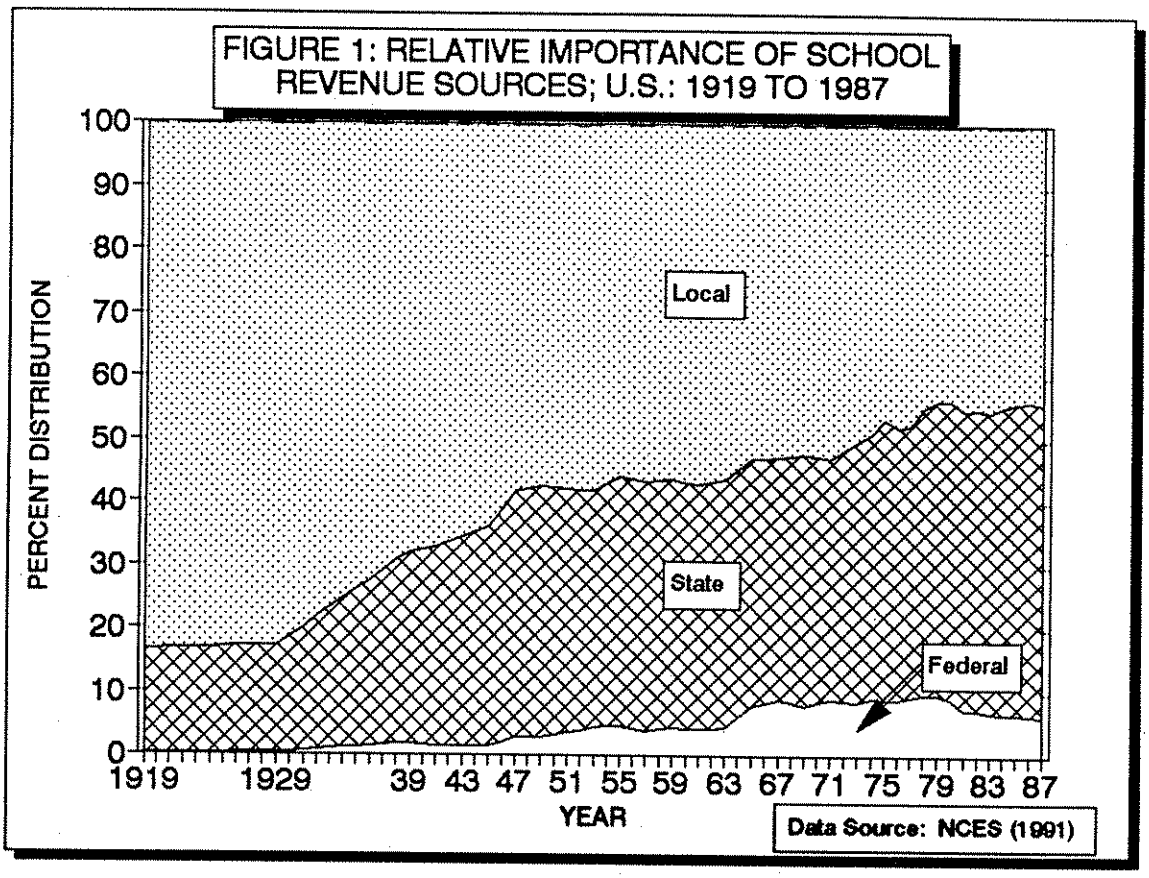


FIGURE 1: RELATIVE IMPORTANCE OF SCHOOL REVENUE SOURCES; U.S.: 1919 TO 1987
PERCENT DISTRIBUTION
100
90
80
70
60
50
40
30
20
10
0
Local
State
Federal
1919
1929
39 43 47 51 55 59 63 67 71 75 79 83 87
YEAR
Data Source: NCES (1991)

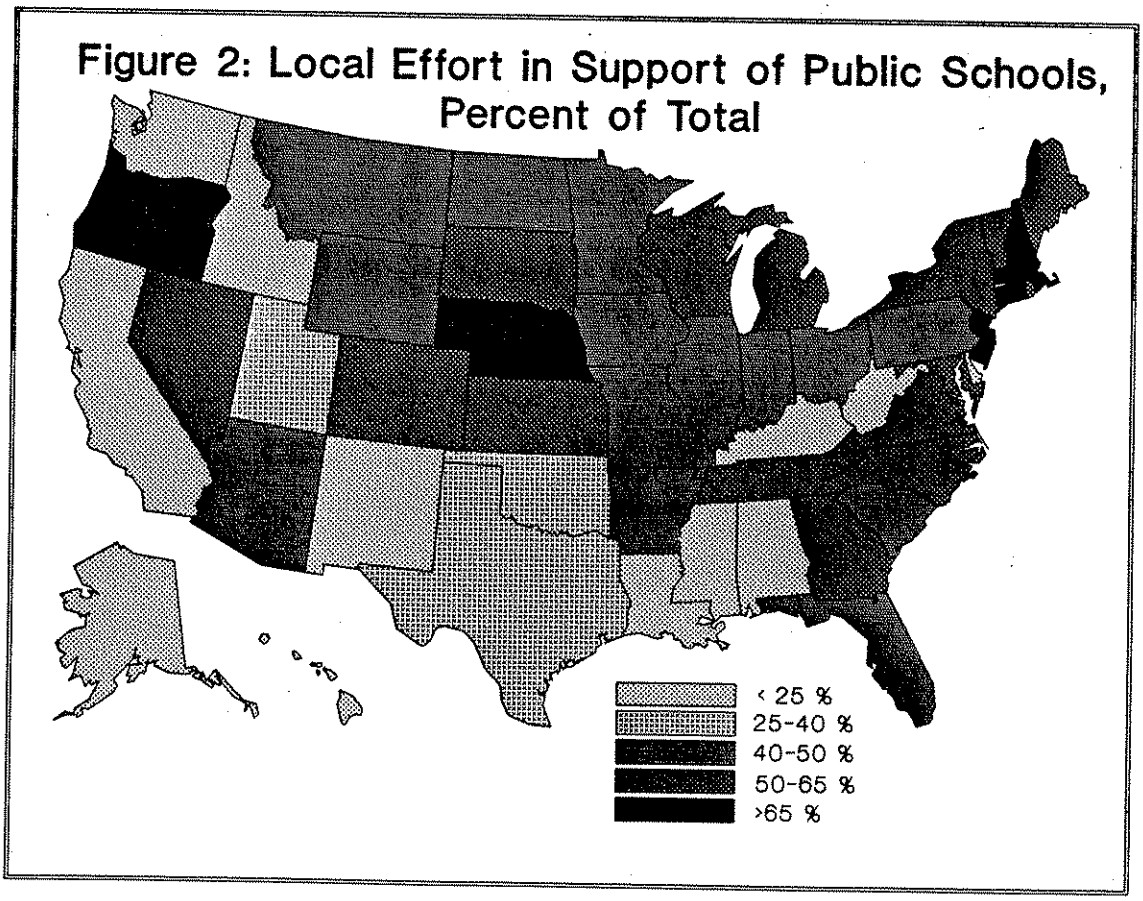


Figure 2: Local Effort in Support of Public Schools, Percent of Total
< 25 %
25-40 %
40-50 %
50-65 %
>65 %

tern states, Tennessee stands out from W. Virginia, Kentucky, Alabama, Mississippi and Louisiana; this may reflect the influence of that state's former governor (Lamar Alexander, currently the U.S. Secretary of Education, was instrumental in initiating school reform in Tennessee). Statewide averages in Virginia, North Carolina and Georgia probably reflect urban influences (from Washington, D.C., the "research triangle" and Atlanta, respectively). Also, the sharp contrast between the state of Washington (which has no income tax) and Oregon (which has no sales tax) is noteworthy. In general, the larger the share of the state in total funding, the more equal the distribution of funds at the district level (this of course does not guarantee equal distribution *within* school districts, which may be a concern in large districts).

2.2. State Aid Distribution Methods

There are four basic methods by which states distribute taxes to local schools in accordance with need, wealth and local effort; they differ primarily in whether they contribute to equalizing fiscal opportunity (the ability to raise money) or outcomes (such as dollars spent per pupil). Nevertheless, when local need, wealth and effort are defined in the same manner, all produce an identical algebraic result for state transfers. The methods are the minimum foundation formula, the capacity equalization (or power) formula and variations thereof, flat grants and full state funding; they are summarized in Table 2, which also shows the equalization effects of each program. Appendix Table A-3 shows the funding method(s) used by different states.

2.2.1. *The Minimum Foundation Approach*

Under the (minimum) foundation approach, used by 39 of the 50 states, state governments determine the number of dollars (F^{min}) needed to provide each pupil with a "minimum" quality education. A funding plan is then developed to ensure that every pupil in the state is supported by the calculated "minimum foundation." The state compensates for any difference between locally raised funds and F^{min}, using revenues from state sources. The money raised by local property taxes (the levy, tax yield or liability)[6] is the product of a (in this case) mandated tax rate (τ)--*e.g.* 30¢ per $100 of property, which represents a *mill* rate of 3--multiplied by the assessed valuation V_i: τV_i. As discussed in Cohn and Geske (p. 315), the mandated tax rate may be determined from $F^{min} = \tau V_i^{max}$, where V_i^{max} is the per pupil assessed property value in the wealthiest district, or it may be based on the statewide average assessed value V_i^s: $F^{min} = \tau V_i^s$. In the former case all but the wealthiest district receive state support; in the latter case all districts below the state average receive support. After appropriate substitution, the formula can be rewritten (Cohn and Geske) as $E_i = wADA_i F^{min} (1 - V_i^s/V_i^{max})$.

Table 2: Overview of State Aid Programs and their Equalization Effects

Program Name	Program Formula	Equalization Effect
1. *Minimum Foundation*	$E_i = wADA_i(F^{min} - \tau V_i)$	Equal \$ per Unit (Classroom or Pupil)
2. *Capacity Equalization*		
2.1. *Tax Base*	$E_i = wADA_i[\tau(V_g - V_i)]$	Equalized Tax Base/Pupil
2.2. *Tax Yield (Power)*	$E_i = wADA_i[\tau_i(V_s - V_i)]$	Equalized \$ per Mill Levied
2.3. *Percentage (Aid Ratio)*	$E_i = wADA_i(1 - \alpha V_i/V_s)EXP_i$	Equalized Budget Portions
3. *Flat Grants*	not applicable	Equal \$ per Pupil
4. *Full State Funding*	not applicable	Equal Call on State Resources

Source: Adapted from Cohn and Geske (1990) and NEA (1987)

Explanation of Symbols: E_i = amount of state equalization aid to school district i.
$wADA_i$ = weighted average daily attendance.
F^{min} = minimum foundation program funding amount.
V_i = per pupil assessed property value in district i.
$\tau_{(i)}$ = local tax or mill rate (in district i).
V_g = state-guaranteed per pupil assessed property value.
V_s = average per pupil assessed property value in the state.
EXP_i = per pupil expenditure in district i.
α = share of education expenses falling on local government.

The key feature of a foundation program is that "... any local authority can provide an adequate educational program at no higher rate of local taxation than is required of a wealthy authority" (Benson, p. 425). School districts may spend *more* than the minimum foundation by raising additional local funds, however, and this has been the main criticism of foundation programs. The argument has also been made that these higher expenditures are desirable because they induce educational innovations, the cost of which eventually become part of the foundation (NEA, 1987).

2.2.2. *Capacity Equalization*

To deal with "overspending" in wealthy districts, transfer programs were devised to *equalize* the financial *capacity* of school districts irrespective of property wealth; in addition, these programs were intended to compensate for rising costs of education over time (NEA, 1987). Percentage equalization programs, for example, were designed to equalize the financial capacity of school districts in general. The state paid a proportion of school expenditures, whereby the proportion varied inversely with a district's taxable wealth. Districts with little assessed value per pupil receive larger subsidies than districts with higher values. The three equalization programs discussed here are variations of this basic principle.

(*i*) *Guaranteed Tax Base*

The guaranteed tax base plan is identical to the minimum foundation program so long as τ is mandated by the state. A guaranteed per pupil assessed property value (V_i^g) is identified by the state such that $F^{min}=\tau V_i^g$. The effect of the program is to equalize the tax base per pupil.

(*ii*) *Guaranteed Tax Yield*

Under a guaranteed tax yield plan, a certain tax yield per mill is guaranteed by the state up to a maximum (such as the state average). This plan ensures equal revenue per pupil based on equal tax effort and the aid can be either positive or negative--the latter representing the so-called "recapture provision". Evidently, under this scheme individual districts can vary the rate at which they tax themselves. One reason for the popularity of this funding method--also known as *power* equalization --is that it appears to ensure wealth neutrality among districts. However, as pointed out by Cohn and Geske (p. 319, quoting Feldstein), this is true only when the absolute values of wealth and price (of education) elasticities are the same; if they are not, then costs of raising local dollars for education will vary with the level of wealth in a district.

(*iii*) *Percent State Aid Ratio*

With a percentage state aid ratio, the per pupil transfer depends on local school expenditures and the statewide assessed valuation average relative to the district's valuation, and a parameter α which reflects the state's willingness to share in local school expenditures. This method "... equalizes

local fiscal capacity, while leaving the decision about the size of the budget to local discretion" (Benson, p. 425). Evidently, in this case the relative proportion of state money in, and therefore local marginal costs per dollar of, total spending varies across districts.

2.2.3. *Flat Grants and Full State Funding*

Flat grants usually transfer a fixed amount per pupil or per teacher. The advantages of this system include the provision of a basic amount of school funds and the use of student and teacher numbers in aid calculations, which reflect actual needs. The drawback of such a program is, of course, that it equalizes neither fiscal opportunities nor outcomes (NEA, 1987). Overall, nine states rely only on an equalization approach, while eight (including Kentucky) combine it with a foundation program; Delaware and Illinois also use flat grants, while Hawaii is unique in that it relies exclusively on *full state funding* (Appendix Table A-3). Under this method all school districts are essentially merged into one system which is funded using state taxes and, in principle, equity is assured both for taxpayers and pupils.[7]

While the equalization approaches discussed above theoretically equalize per pupil spending, disparities persist. They arise because the three key variables entering the formulae, local needs, wealth, and effort are subject to different interpretations. Furthermore, either of the formula-based systems permits opportunistic behavior in the form of undervaluation of property and/or non-collection of taxes. This can give rise to inefficiencies through high costs of tax collection and non-compliance (Levin, p. 431), and it may lead to inadequate funding of schools as has occurred in some rural parts of Kentucky.

Some states have used yet another variant of the percentage equalization approach discussed earlier. This approach in essence allows parameter α to vary with the level of per pupil spending; a state may fund 100 percent of a particular amount per pupil, say \$2,500 ($\alpha=0$). The next \$500 may be funded 70 percent by the state, the remainder locally ($\alpha=.3$); the next \$500 might be funded 30 percent from the state, the remainder locally ($\alpha=.7$). Beyond the \$3,500 level additional spending must be funded entirely from local sources ($\alpha=1$). High-spending districts are thus constrained by the fact that they must raise additional funds locally, which in turn prevents them from "overspending" relative to the case where the state provides 100% of the funds. However, if per pupil assessed valuation in a district is high, substantial amounts of money can be raised locally even if property tax rates are low.

2.3. Local vs. State Control and Funding

A traditional rule-of-thumb in school finance is that the state exerts control over local school districts approximately proportional to the percent of state-to-total funding; in the case of full state funding, local control over variables such as spending per pupil is essentially nonexistent. To the extent that states fund higher proportions of total costs over time, school boards may make few decisions outside state-required mandates, which can include statewide salary schedules, increments paid for additional experience and education of teachers, and maximum pupil-teacher ratios. With full state funding, the state may set local salary schedules and determine other key elements of contracts with teachers. A related issue is the extent to which teachers are involved in decision-making. Appendix Table A-4 shows that while many teachers are involved in choosing textbooks and shaping school curricula, very few have an input into the selection of new teachers and administrators, and in evaluating their peers.

A competing theory of educational finance suggests that quality education can come about only if the school satisfies the needs of and provides programs desired by local residents, and that the state is unable to fully judge what these programs should be. If the state controls and mandates, there may be less local interest or participation in educational programs by parents and teachers (*i.e.*, a "crowding out" effect). This philosophy, therefore, suggests it is desirable to maintain some local funding and community control over the school system. Some researchers argue that, in a community in which the median educational level of residents is high and parents feel strongly about the importance of excellence in public education, student interests are better served by a system of finance that permits significant local control. This raises another important philosophical question, *viz.* should there be an *upper* limit on total per pupil spending in a given district?

2.4. Related Issues

Another important, and often poorly understood, issue in school finance is the nonlinear relationship between the pupil/teacher ratio and per pupil spending on instruction. This is important for nonmetropolitan areas, which have lower enrollment numbers. In most school districts, expenses in the "instruction" category are comprised primarily of teacher salaries. Assume (for simplicity) that all expenditures for instruction are for teachers' salaries. In that case,

Expenditures for Instruction/pupil = (Average Teacher Salary) / (pupil/teacher ratio).

Therefore, each reduction in the pupil/teacher ratio costs the school district more and more dollars per pupil. This relationship is illustrated in Figure 3. Suppose that the average teachers' salary in a district is $25,000, and that the pupil/teacher ratio is 25:1. Then per pupil expenditures for instruction are $25,000/25 or $1,000 per pupil. Reducing the pupil/teacher ratio to 20:1 increases per pupil expenditures for instruction to $25,000/20 or $1,250 per pupil. Decreasing the pupil/teacher ratio to 15:1 results in a per pupil expenditure of $1,667. A 10:1 pupil/teacher ratio results in an additional cost of $833 per pupil ($2,500), and so on. For instructional expenditure per pupil of $1,667, a school can operate at alternative salary-pupil/teacher ratio combinations, for example $25,000 and 15:1 or $30,000 and 18:1 or $35,000 and 21:1. Rural schools that lack and/or face declining enrollment must often operate at low pupil/teacher ratios, and salaries are therefore lower than in urban districts even though *expenditures per pupil* are similar.

There is also a public perception that a linkage exists between the level of per pupil funding and achievement scores. Prior to the KERA, many districts with low average achievement scores were also poorly funded in per pupil terms. Under the reform, this relationship no longer holds, as demonstrated in Section IV. Correlation does not necessarily imply causation, however, and the potential impact of additional funding on future achievement scores is unclear. Also, if there is a (causal) relationship, change may occur over decades rather than years.

A final issue exists in the financing of education, particularly in rural areas. It arises from the economic power imparted to the (usually elected) school board members who disburse school funds and make employment decisions. This power is sometimes inversely related to the number of employment opportunities facing residents of a given school district.

III. School Finance In Kentucky

For many rural Kentucky communities funding of public education has traditionally not been a high priority. This meant that local school boards were often unwilling to take advantage of the state revenue obtainable through power equalization. The result was low tax rates for residents, but uneven and sometimes low funding levels per pupil. Consequently, despite the theoretical promise for spending equity across districts suggested by the use of both a minimum foundation and a power equalization component in the school distribution formula, significant spending differences across Kentucky school districts existed at the time the KERA was initiated. The concentration of low-spending districts in southeastern Kentucky in 1989/90 is particularly noteworthy (Figure 4).

Figure 3: Per Pupil Instructional Expenditures, Average Salaries and the Pupil/Teacher Ratio

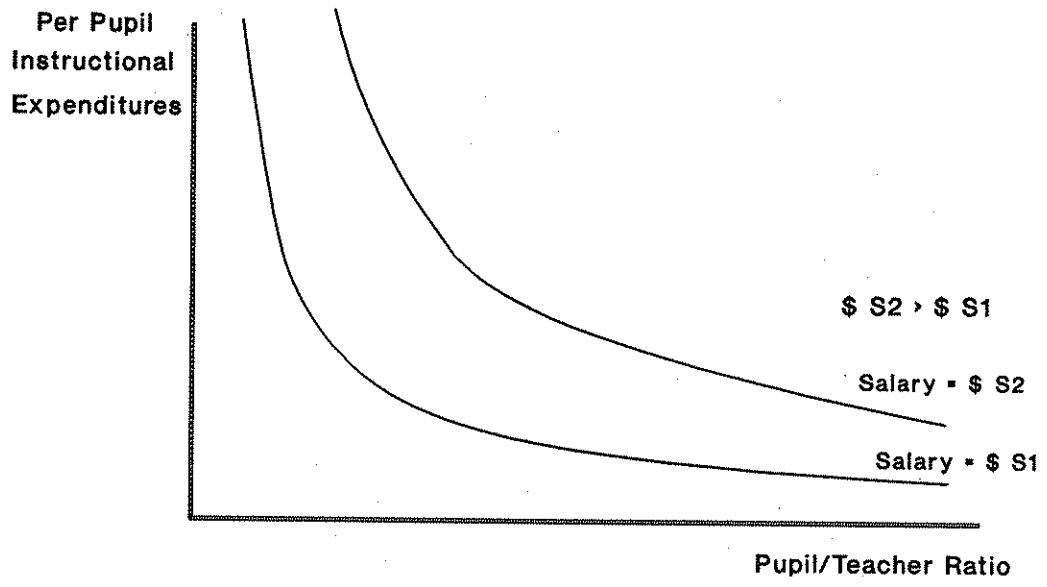
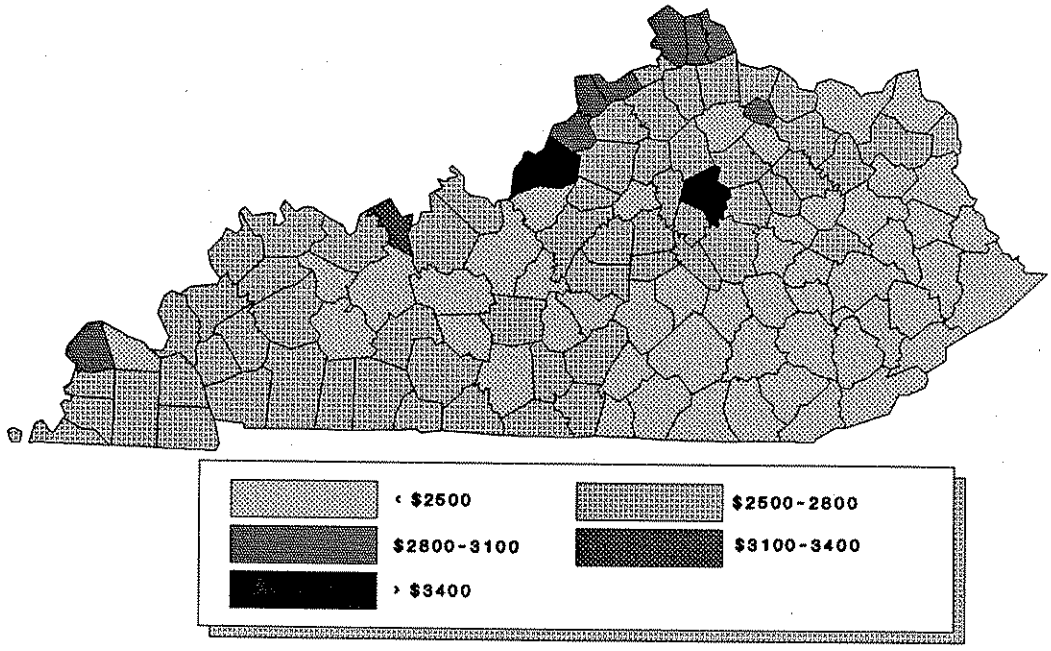


Figure 4: Per Pupil Revenue, 1989-90



For illustrative purposes, Appendix Table A-5 shows school funding program calculations in Kentucky prior to the KERA (for 1989/90) along with other budgetary details. The base funding per pupil was computed using costs of school operation, educational materials and salaries, and expressed on a per classroom basis. For example, the value of one classroom unit in 1989/90 was $31,700; the number of children needed to qualify as a classroom varied with the grade level (*e.g.*, 21 pupils in average daily attendance for grade one but 27 pupils in grades seven through 12). Regional differences within the state were taken into account, and comparisons made with costs in neighboring states.

The formulae used to distribute funds before and after the KERA are summarized in Table 3 and discussed below. A key reform element is that the basic funding unit was changed from a classroom to a pupil. More generally, the KERA attempted to address all issues in the economics of education finance raised by Benson, as illustrated in the following sections.

3.1. Adequacy

The KERA substantially increased overall funding for elementary and secondary education. The $950 million mentioned in the introduction (75% of $1,267 mn.) amount to spending $1,669/pupil over two years, relative to average total per pupil spending of $2,573 in 1989/90 (a 32% year-to-year increase).[8] For the first year of the reforms, actual per pupil revenues are estimated to have increased by $701. Furthermore, the Support Excellence in Education in Kentucky (SEEK) fund guarantees *minimum* spending of $2,305/pupil in 1990-91 (Table 3) and $2,420 in 1991-92 (up from about $1,700/pupil in 1989/90). Each school district will receive a funding increase of between 8% and 25% and 5% and 25% in 1990-91 and 1991-92, respectively. In addition, new provisions are made for the costs of educating economically deprived children and exceptional children (see below). Other expenses covered by SEEK range from pre-school for 4-year-olds who may be at risk of educational failure to classroom technology and professional development programs.

In Kentucky, property valuation administrators (PVAs) are elected county officials. Depending on community preferences (Tiebout, Starrett), PVAs have an incentive to undervalue property (V_i) to ensure reelection. Moreover, there are economic incentives for a community to undervalue property since, with power equalization, lower property taxes lead to greater state funding of local districts. In Kentucky and many other southeastern states, there has historically been strong resistance to using property taxes as a source of revenue (see also Figure 2). Although the state attempts to ensure that local PVAs value property at fair market values, there is much anecdotal and some statistical evidence to support the contention that property value equalization is incomplete, and

Table 3: Pre- and Post-KERA School Funding Formulae

Item	Pre-KERA (1989/90)	Post-KERA (1990/91)
1. Base Funding		
Funding Unit	Classroom	ADA
Salaries	$24,900	$2,205
Current Expenses	$5,421	–
Capital Outlay	$1,800	$100
Total Base	$31,700	$2,305
2. Add-Ons		
Per "At Risk" Child	–	0.15xBase
Exceptional Child(ren)	$(N-R/7.2)xC$	$\Sigma(n_a x c_a)$
Transportation Costs per ADA Transported, Funded @	80-85%	100%
3. Local Effort (Taxes)		
Equivalent Tax Rate/$100 property	25¢ min.	30¢ min.
Property @ 100% of FMV by	No Deadline	July 1, 1994
4. Additional Local Effort		
Tier I (Power equalized)	*	0.15xBase
Tier II (maximum; not equalized)	*	0.30xBase

Source: General Assembly, 1990, HB 940, and Legislative Research Commission, 1991 [personal communication].

Note: * Since their were no tiers prior to the KERA, it is impossible to establish a precise relationship between power equalization funding and the Tiers.

Symbols: ADA = average daily attendance.
N = weighted total number of *staffed* special education (classroom) units.
n_a = number of exceptional children in category *a*.
R = resource units (teachers already counted in the base).
C = value of a classroom unit (=$31,700 in 1989/90 & $32,364 in 1990/91).
c_a = value of a classroom unit per child of category *a*.
FMV = fair market value of assessed property.

Weights for exceptional child categories (*a*):
Minor: 60 children/classroom
Mild-Moderate: 12 " / "
Severe: 6 " / "

newspaper articles frequently report instances in which influential residents of local communities own undervalued property (particularly noteworthy is a widely discussed series entitled "Cheating our Children").

To deal with the problem of undervaluation, the KERA specifies that local tax rates will be set at 30¢ per $100 of property value (homes and cars), all of which has to be assessed at "full market value" by July 1994 (Table 3, item 4). While the provision of 100% of fair market or cash value is not new, the stating of a deadline is a novelty. Districts are allowed to raise additional revenues amounting to 15% of the SEEK funds (the so-called Tier I); these funds will be equalized by the state at 150% of V_s (the statewide average per pupil equalized assessment), which yields $225,000 in 1990-92. If desired and approved by local voters, additional funds up to an equivalent of 30% of the SEEK amount may be raised (Tier II), but that amount will not be equalized by the state. This therefore represents an implicit cap on total per pupil spending. However, under a "grandfather clause", districts already spending above that cap will not be required to reduce their spending.

3.2. Efficiency

The KERA provides specific guidelines for improving the internal management of local school districts. They include the implementation of (initially optional) site- or school-based management and decision making[9] and a refined system of rewards and penalties, based on an assortment of tests of students, teachers, principals *and* superintendents. A maximum pupil/teacher ratio has been specified for different grade levels, although schools which have implemented site-based management are exempt from this regulation.[10] Special provisions are made for "schools in crisis", including the reassignment of outstanding educators to such schools, and permission for students to transfer to better schools. Many other changes in the governance structure of schools will be implemented, including anti-nepotism laws and a radical reorganization of the Department of Education with all employment contracts terminating in July 1991. Also, a detailed implementation timetable for the reforms has been devised.

3.3. Equity

Modifications in the distribution formula were made to reduce variation across districts in the level of per pupil spending. The ramifications of this change are explored in detail in Section IV, and constitute the major empirical portion of this paper. Particular attention was given to ensuring that less wealthy school districts are placed on a more equal footing with wealthier districts, and a supplementary formula used in previous years was maintained to adjust for transportation costs in different school districts (*i.e.*, with varying pupil transportation densities). Also, under the KERA trans-

portation costs will be fully funded; districts formerly relied on local support to fund deficits in transportation services.[11] This change will be critical especially for rural districts with low pupil transportation densities.

As shown in Table 3, perhaps the most important changes in the funding formulae were (*a*) the switch from classroom units to per pupil units (measured as ADA, or average daily attendance) for purposes of calculating allotments or add-ons for exceptional children (as reported to federal authorities in the so-called "December Child Count") and (*b*) the addition of .15 ADA for each economically deprived or "at risk" pupil as determined by eligibility for school lunch programs along state and federal guidelines. Prior to the reforms, funds were available for 4,500 classroom units of exceptional students for school districts able to hire teachers specifically certified to instruct exceptional students. In practice, nonmetropolitan districts were often unable to attract qualified personnel and most of the units were allocated to urban school districts. Under the new rules, districts receive funds on a per exceptional child basis and may use the funds as deemed appropriate (so long as they are targeted at exceptional children in accordance with state and federal guidelines). For example, a district may cooperate with adjacent districts to attract and share a teacher for exceptional children. Appendix Table A-6 shows how equalized funding in districts with low and high assessed property values in 1990/91 operates under the KERA; in this illustration the district with low assessed property value is spending more total funds per pupil than the district with a high value. The latter is paying one-third of the total funds, while the less wealthy district is paying less than 5%.

Before examining statewide changes in pre- and post-KERA per pupil spending in detail, it should be noted that funding changes in Kentucky are consistent with a nation-wide trend of accounting in a more specialized (and complex) manner for varying costs of education. In fact, anticipated fine-tuning of the KERA includes the use of class-specific (cost) weights for pupils in different grade levels, beginning in 1994. All state aid programs in the U.S. have some form of built-in allotments for exceptional children, and some have add-ons for compensatory and bilingual education as well as grade level differences (Cohn and Geske, pp. 326-7). The same authors discuss (pp. 323-4) ongoing research on weights reflecting different costs of education for different types of children; the use of cost of education indices (CEI) which incorporate differences in local supply and demand conditions for school personnel; and resource cost models (RCMs) which combine both CEIs and the different programmatic costs of educating exceptional children.

IV. Empirical Analysis of Pre- and Post-KERA per Pupil Spending

County-level economic data on Kentucky, shown in Figures 5 and 6, provide the broader context in which the KERA is implemented. Particularly noteworthy in Figure 5 is the economic diversity of the state. Not surprisingly, in view of this diversity, per capita income levels also vary considerably across the state. In fact, "wide economic disparity" was one reason cited in the recent *Development Report Card for the State* (LHL, April 24, 1991; quoting the Corporation for Enterprise Development, Washington, D.C.) for poor economic performance.

Table 4 shows characteristics of Kentucky county school districts stratified by region; independent districts and private schools--each representing about 10% of all students--are excluded from the calculations. The relatively low per capita incomes and high incidence of poverty in Eastern Kentucky are noteworthy, along with the low level of education among residents 25 years of age or older. The local financial indices (LFIs)[12] in nonmetro areas are relatively similar, and lower than the metro index. The pupil transportation density is lowest in the Western part of the state, reflecting the relative importance of farming in that area. While school districts are considerably smaller in nonmetro counties compared to metro counties, average pupil-teacher ratios and teacher salaries do not differ significantly across the different counties. In contrast, average student achievement scores rise from the Eastern to the Western part of the state; metro scores are above the state average, but below those in Western Kentucky. The percent of ninth-graders completing high school in Eastern Kentucky is below the state average, but among those who do graduate, 44% go on to college (this is relatively high for a region which apparently values education less, but not surprising in light of the selection taking place through dropping-out behavior between ninth and 12th grade). When the analysis underlying Table 4 is carried out by the economic base of all the counties of the state (see Figure 5), the 25 nonmetro manufacturing counties stand out by having the highest average incomes, highest level of education, LFI, achievement scores, percent of ninth graders graduating and percent of nonmetro pupils, on the one hand, and the lowest proportion of students from economically deprived backgrounds, on the other.

The KERA clearly boosted the funds available to school districts. While they have to be interpreted with caution because of the unreliability of the LFI, Figures 7 and 8 show three important aggregate effects of the KERA. First, per pupil revenues received by schools have increased, without exception. Second, revenue per pupil across districts has become less variable (the distribution in Figure 8 is "slimmer" when viewed from the revenue per pupil axis). Third, per pupil revenues have

Figure 5: Regional Partition and USDA Classification of Kentucky Counties

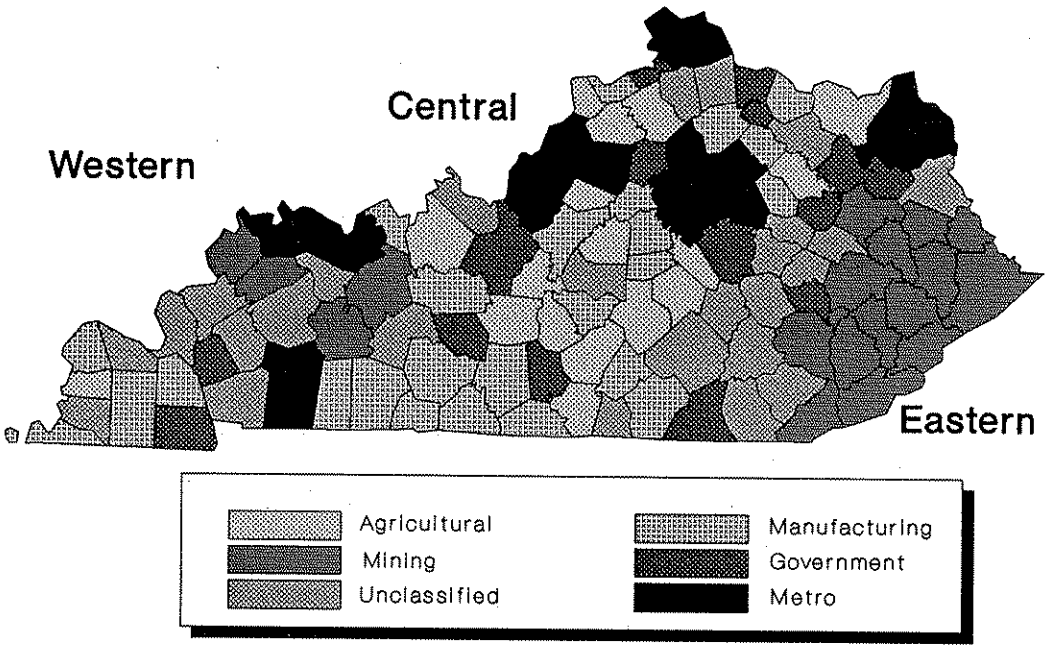


Figure 6: Kentucky Per Capita Personal Income, 1987

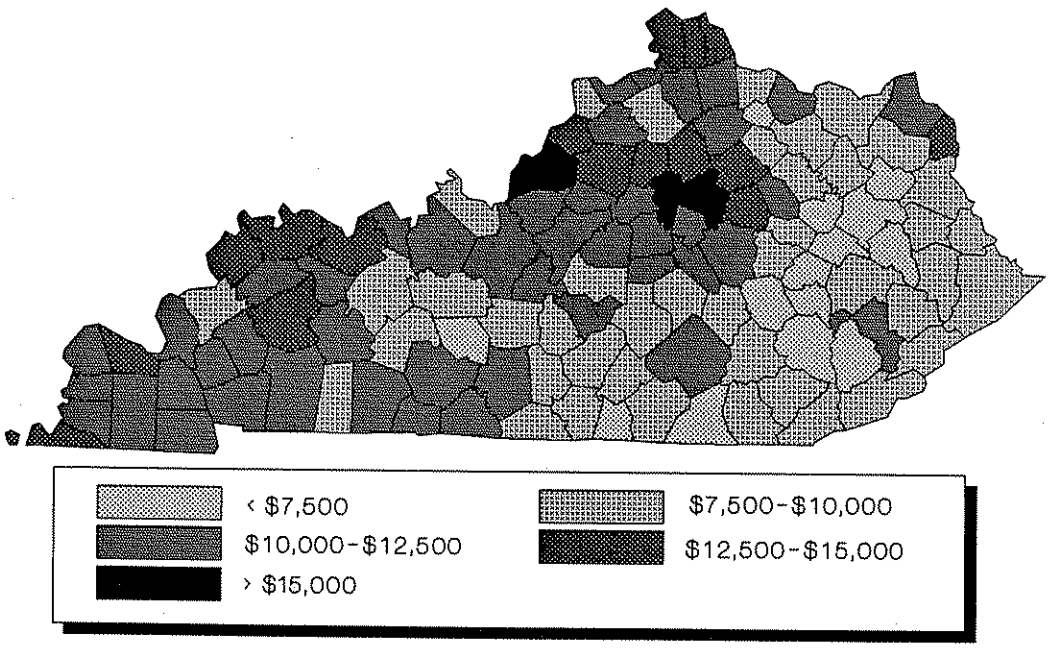


Table 4. Characteristics of Kentucky School Districts, by Region
(standard deviation)

Characteristics	Non-Metro Counties			Metro Counties	State
	Eastern	Central	Western		
Per Capita Income (1987)	8,513	10,286	12,030	13,701	10,667
	(1,349)	(1,598)	(1,412)	(2,458)	(2,414)
Percent of Counties in Poverty	58.1	28.0	5.0	na	na
Percent of Students Economically Deprived	63.2	39.4	29.6	27.8	42.1
	(13.3)	(13.3)	(9.3)	(11.4)	(18.2)
Percent of Population 25+ years of age with High School Degree	36.0	44.0	50.3	58.5	45.3
	(6.5)	(9.0)	(6.1)	(6.9)	(10.6)
Local Financial Index*	0.360	0.381	0.366	0.440	0.382
	(0.073)	(0.101)	(0.103)	(0.122)	(0.102)
Pupil Transportation Density	9.1	6.4	5.8	27.0	10.3
	(3.5)	(3.5)	(3.7)	(32.7)	(15.3)
Average Daily Attendance	3,812	2,490	2,635	10,768	4,166
	(2,508)	(1,794)	(1,840)	(17,225)	(7,681)
Pupil-Teacher Ratio	18.8	18.2	18.4	18.9	18.5
	(1.1)	(1.0)	(1.2)	(1.2)	(1.1)
Teacher Salary	23,215	23,802	24,303	24,852	23,900
	(721)	(795)	(1,013)	(1,484)	(1,101)
Achievement Score	51.0	53.7	55.5	54.6	53.5
	(2.5)	(2.6)	(3.1)	(2.4)	(3.1)
Percent of 9th Graders Graduating	62.3	72.9	73.2	70.0	69.7
	(9.4)	(7.6)	(10.4)	(6.3)	(9.6)
Percent of H.S. Graduates College-bound	44.3	42.8	48.8	55.2	46.1
	(9.3)	(8.2)	(9.1)	(6.9)	(9.6)
Number of Districts (Counties)	31	50	20	19	120

Data Source: Bureau of Census, Population Data for Kentucky; KY Department of Education, (1989a,b).
na=not available.
*This index measures local willingness to pay for education as a function of ability (property wealth); see also footnote 12.

Figure 7: Revenues/Pupil in 1989 by Local Financial Index
Epanechnikov Kernel Estimates With R=1 (Not Pooled)

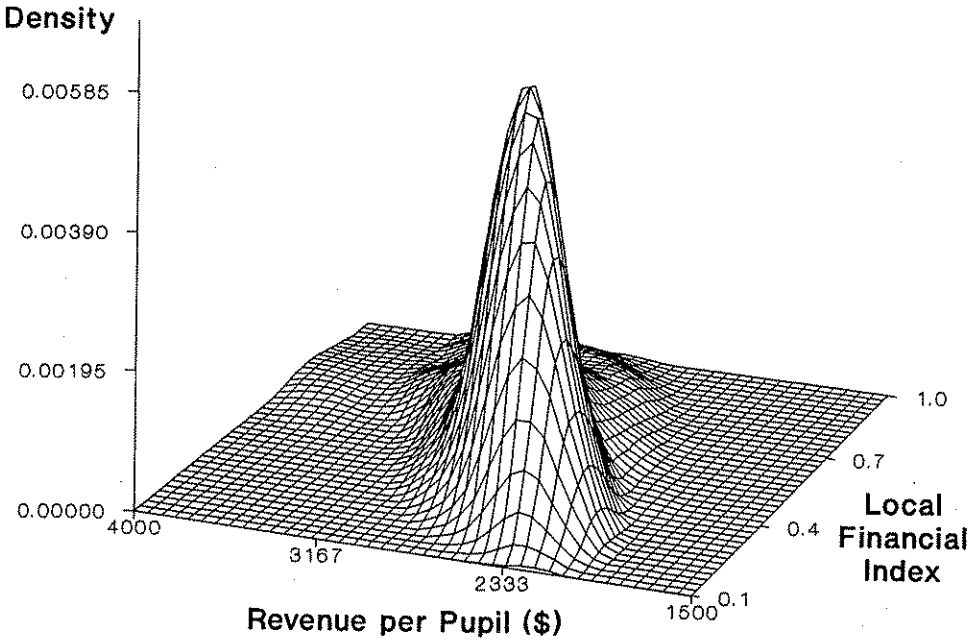
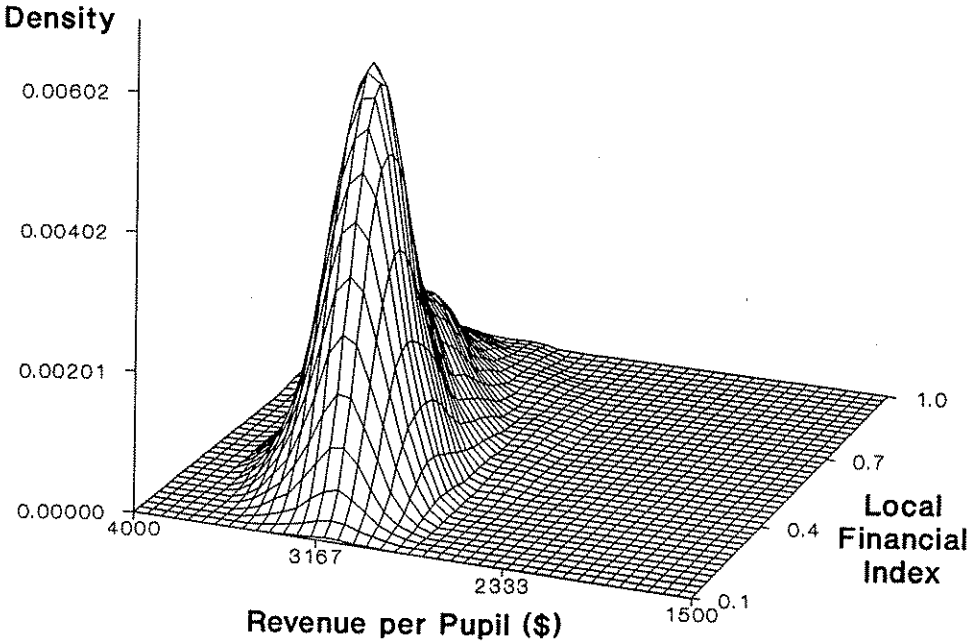


Figure 8: Revenues/Pupil in 1990 by Local Financial Index
Epanechnikov Kernel Estimates With R=1 (Not Pooled)



become less dependent on the LFI under the KERA: the slope of the revenue-LFI relationship has been reduced to near zero.

We next examine correlations between changes in per pupil spending, incomes and achievement scores. Figure 9 shows that revenue increases were concentrated to a significant degree in the southeastern part of the state. As indicated above, this reflects the new funding formula, which allocates additional funds to economically deprived or "at risk" pupils. An equation was estimated relating the percent of economically deprived students [%DEPRIVE] and pupil transportation densities [DENSITY] to the percentage increase in revenues over 1989-90 funding levels (%INCR), with t-statistics in parentheses (note that high pupil density implies low per pupil transportation costs):

$$\%INCR = 0.194 + \underset{(7.27)}{0.0228}\ \%DEPRIVE - \underset{(-3.13)}{0.00127}\ DENSITY \qquad R^2=0.383$$

To the extent that the KERA intended to increase the per pupil availability of funds in poorer school districts, it has thus been successful.

At the same time, Figure 10 shows that districts receiving more money per pupil are not necessarily those with high achievement scores. This is confirmed by Table 5 which shows that previously high correlations between income, revenue per pupil and achievement have declined with the KERA (*i.e.*, in the short run). While per capita incomes (in 1987) are negatively correlated with the percent increase in funding per pupil, they are still positively correlated with per pupil spending, although the correlation has declined (from .57 to .32). Contrarily, the percent of economically deprived students in the district and per pupil spending in 1990/91 are no longer correlated. Equally important, achievement is no longer significantly correlated with per pupil spending, but students from low income backgrounds have lower achievement scores than students in high income areas. While rural districts received a larger percent spending increase than urban districts (Table 5, last column), urban districts continue to spend more per pupil than rural districts. At the same time, achievement scores are not correlated with the degree of ruralness.

The final task is to analyze how inequality in per pupil spending has changed with the KERA. A number of measures are available for this purpose, each with different strengths and weaknesses. They are presented in Table 6 using a metro/nonmetro stratification, with the latter divided into three regions (as in Table 4). This stratification is intended to capture potential differences in the effect of the KERA not only in rural as opposed to urban areas, but also within rural areas, which differ in their socioeconomic composition.

Figure 9: Increase in Revenue for County Districts 1989-90 versus 1990-91

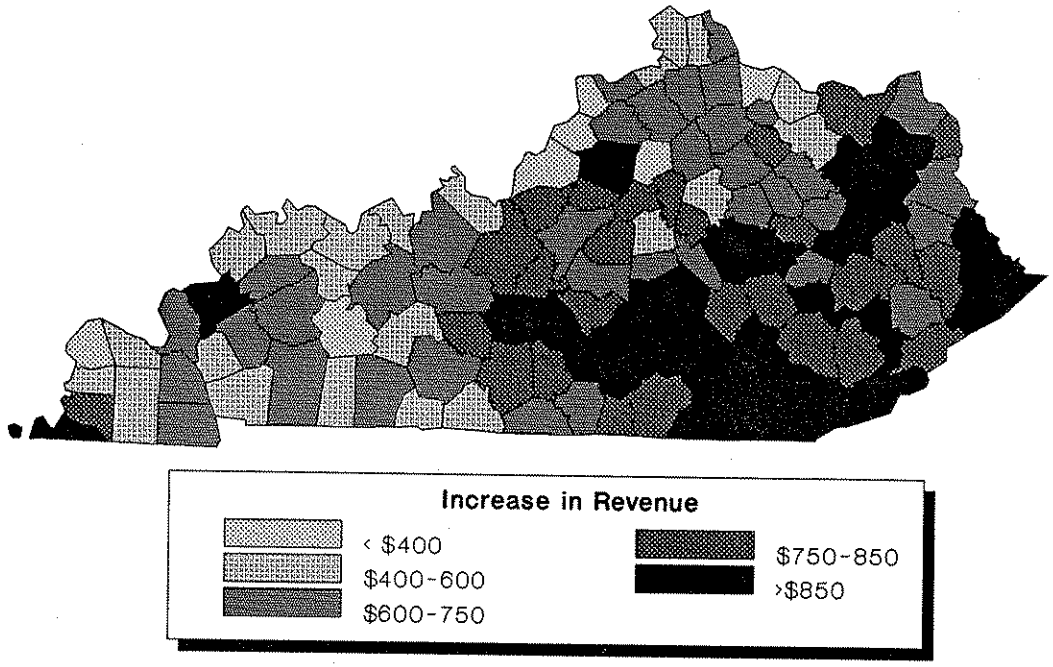


Figure 10: Achievement Scores for County Districts, Kentucky, 1989-90 School Year

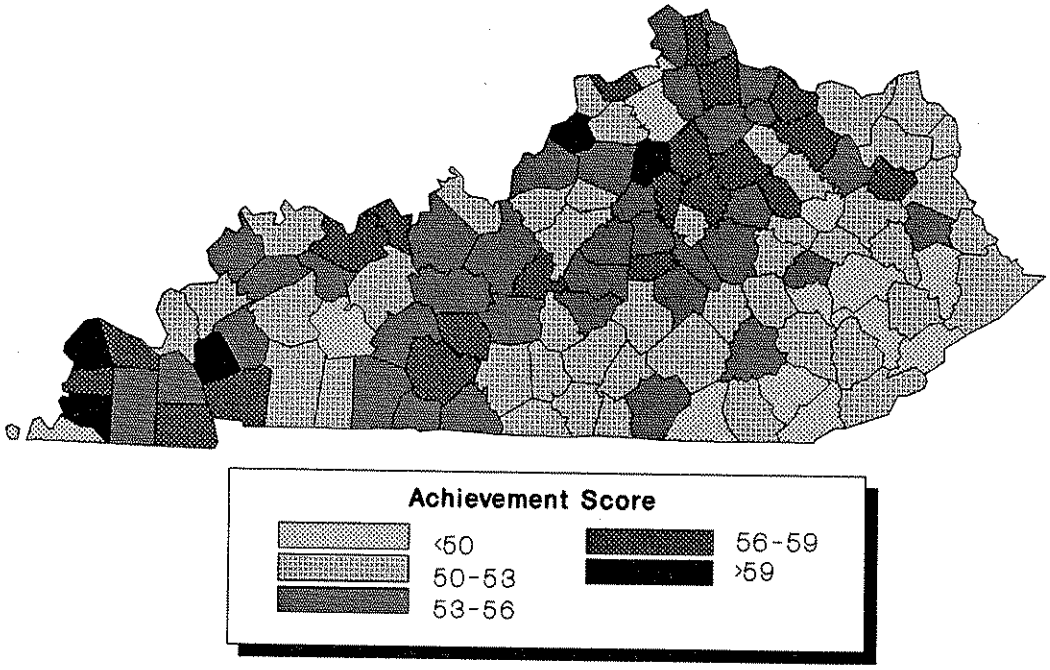


Table 5: Education Spending, Income, Poverty and Achievement: Pearson Correlation Coefficients
1989-91 Data for 120 Kentucky School District

	Per Pupil Spending in 1989/90	Per Pupil Spending in 1990/91	Percent Spending Change	Income per Capita	Percent Economically Deprived	Student Achievement Score	Rural-ness[a]
Per pupil Spending in 1989/90	1.0	0.73**	−0.71**	0.57**	−0.45**	0.42**	0.65**
1990/91		1.0	−0.04	0.32**	−0.11	0.12	0.56**
Percent Change			1.0	−0.53**	0.58**	−0.51**	−0.32**
Income/capita				1.0	−0.78**	0.49**	0.40**
% Economically Deprived					1.0	−0.60**	−0.19*
Achievement Score						1.0	0.09
Ruralness[a]							1.0

a. The number of pupils transported per square mile is used as a measure of ruralness. The greater that measure, the less rural the district.
* Denotes statistically significant difference from zero at the 10% level, ** at the 1% level or lower.

Table 6. Changes in Inequality of Estimated per Pupil Revenue by Region

Inequality Measure	Non-Metro Counties						Metro Counties		State	
	Eastern		Central		Western					
	89/89	90/91	89/89	90/91	89/89	90/91	89/89	90/91	89/89	90/91
ADA-Weighted moments										
Mean Revenue per Pupil ($)	2,389	3,239	2,563	3,251	2,566	3,150	3,351	3,811	2,845	3,467
Standard Deviation ($)	5,063	7,130	7,443	6,150	6,407	8,837	67,202	50,303	38,515	27,784
Coefficient of Variation (%)	212	220	290	189	250	281	2005	1,320	1,354	802
Unweighted moments										
Mean Revenue per Pupil ($)	2,402	3,239	2,583	3,265	2,598	3,205	2,802	3,428	2,573	3,274
Standard Deviation ($)	88	133	162	140	127	164	425	326	243	194
Coefficient of Variation (%)	3.6	4.1	6.3	4.3	5.0	2.1	15.2	9.5	9.4	5.9
Skewness	0.809	0.383	1.43	0.45	0.63	-0.56	2.08	2.25	3.08	2.19
Kurtosis	0.667	0.214	3.99	0.79	1.80	0.12	3.90	3.64	14.5	10.2
Mean Difference in Rev's. ($)	837		682		607		626		701	
Standard Deviation ($)	77		158		131		183		166	
Other Indicators										
Maximum Value ($)	2,646	3,579	3,228	3,682	2,939	3,475	3,957	4,310	3,957	4,310
Minimum Value ($)	2,261	3,016	2,312	2,967	2,365	2,812	2,399	3,041	2,261	2,812
Range: Max. − Min. ($)	385	563	916	715	574	663	1,558	1,269	1,696	1,498
Restricted Range ($) R_{05}¶					Not reported				2,320	3,023
R_{95}					because of				2,940	3,551
Federal Range Ratio R_{95}/R_{05}					small cell size				1.27	1.18
Quartile 3 − Quartile 1 ($)	132	188	185	153	142	225	380	223	224	159
Relative Mean Deviation ($)	65	89	121	95	101	144	686	500	409	294
Standard Deviation of Log	.0147	.0152	.0246	.0163	.0212	.0247	.1123	.0705	.0905	.0555
McLoone Index†	1.000	1.319	1.009	1,349	.996	1.179	1.294	1.295	.952	.946
Gini Coefficient‡	.0198	.0176	.0327	.0065	.0255	.0192	.0651	.0324	.0432	.0292
Theil Inequality Index*	.00056	.00061	.00160	.00070	.00112	.00145	.01859	.00787	.01931	.00709
Percent of Students (ADA)	23.6		24.9		10.5		40.9		100.0	
Percent of all Funds	19.9	22.1	22.4	23.3	9.5	9.6	48.2	45.0	100.0	100.0

Data Source: LHL, Sept. 13, 1990, p. B2.

Notes:

¶. The symbol R_{05} denotes the fifth percentile of the distibution of per pupil revenues, R_{95} the 95th.

If y_i (y_j) is per pupil revenue in district i (j), there are n districts, and y^b is average revenue per pupil, y^m=median per pupil revenue and P_i=number of pupils in district i, then:

†the McLoone Index is: $MI=(\Sigma P_i y_i)/y^m \Sigma P_i$, where the summation is over households in the lower half of the distribuition; a higher value indicates greater *equality*;

‡the Gini coefficient is: $G=(n^2 y^b)^{-1} \Sigma_i \Sigma_j |y_i - y_j|$; while

*Theil's index is: $T=(ny^b)^{-1} \Sigma y_i \log(y_i/y^b)$.

See Cohn and Geske for a discussion of these and other equality measures.

While per pupil funding inequality has unambiguously declined for the state as a whole, the same is not necessarily true for individual regions. In Eastern and Western Kentucky funding disparities actually increased with the reform, as measured by the (weighted and unweighted) standard deviations and coefficients of variation, while the opposite occurred in the central part of the state and in metro counties. The skewness and kurtosis coefficients are unreliable because of the small sample sizes involved, but they are reported because of their potential usefulness in revealing major departures of the underlying distributions from normality. For example, the kurtosis coefficient of 14.5 for the entire state is relatively large, but it declined to 10.2 in 1990/91.

Not surprisingly, Eastern Kentucky districts on average received the largest increase in per pupil spending; this increase was associated with the smallest standard deviation ($77). Data reported for the maximum to minimum range, differences in quartiles 1 and 3, relative mean deviation, standard deviation of the log, and Theil index confirm the notion that per pupil spending inequality within the Eastern and Western regions of the state has increased rather than narrowed with the reform. It is noteworthy that neither the McLoone Index nor the Gini coefficient (calculated using unweighted data) pick up this effect. The McLoone Index captures the degree to which per pupil revenues in the bottom half of the revenue distribution depart from the median revenue (Cohn and Geske, p. 332). This index suggests that inequality *increased* for the state as a whole, while it decreased in the nonmetro counties and remained unchanged in metro counties.

Another question is how total school expenditures are divided up among the four "regions" of the state. Using Theil's measure, average inequality *between* the Eastern, Central, Western and metro areas declined from 0.0111 to 0.0034 over the two years. Also, the last two rows of Table 6 show that even though the percent of total funds is still not allocated in accordance with the percent of students in each region (*i.e.*, metro districts continue to receive a larger share of the total funds than their share of the student population), the divergence between the two percentages has narrowed with the reform.

V. Implications for Research by Economists

The KERA was successful in achieving the objective of allocating more funds per pupil to school districts where funding was notoriously low. The main reasons for the success lie in the redefinition of allotment units from classrooms to individual students and the incorporation of an allowance for pupils from economically deprived backgrounds in the funding formula. This has removed a degree of "lumpiness" from the funding process and has provided schools with more lee-

way for local decision-making. The use of a weight of 1.15 for economically "at risk" pupils means significantly more funds are directed towards districts with lower per capita incomes. At the same time, while all schools receive more dollars per pupil, funding disparities have widened rather than narrowed in the Eastern and Western regions of the state. Other research questions remain within this subject area of human capital creation that can be addressed by economists, including the following.

1. *How were additional funds spent (allocated) among alternative uses within schools?* The analysis of how scarce means (in this case funds) are allocated to competing uses (school inputs) is at the heart of economics. The allocation issue is particularly important in districts where per pupil spending was low relative to the state average. Were the funds used to increase teacher salaries, to reduce pupil/teacher ratios, to construct new buildings, to purchase more buses, or for other uses? Did school districts "waste" new funds by spending them in ways that did not (directly) improve the "quality" of the education offered by the school? So far, salaries of all certified personnel were raised by 10% in 1990-91, and will be increased by another 5% in the following year. Combined over the two years, this amounts to about 19% of the $950 million raised in new taxes for schools. How will the remaining funds be spent and, more generally, which variables influence(d) the allocation of funds to alternative uses in school districts facing different types of constraints?

2. *Has the performance of students improved as a result of the spending increases?* This is a classic issue in educational finance; since it centers on production function analysis, economists have an important contribution to make. State legislators appear to be aware that educational funding plans cannot produce instant results, but require a multi-year planning horizon. A baseline 1991-92 survey will be administered and followed-up with a survey in 1993-94 to determine whether reform goals are being met. How will rural school districts, including those in agricultural areas, fare relative to those in metro areas? Do the educational production functions differ across districts with different socioeconomic characteristics (such as parental income, education and occupation), and will that be taken into account in the assessment of school performance? What will be the effect of students transferring from "schools in crisis" to successful schools, and will transportation be provided for such students? Equally important, what lags are involved between the time educational inputs are changed and the time a measurable effect on performance occurs?

3. *Compensatory education issues.* This is a critical issue raised in the earlier Coleman Report. Can additional funding partially compensate for home life in a family that, for a variety of reasons, does not highly value education? More generally, in the context of production function analysis, where school performance is determined by school-related and community-level inputs, which

inputs are most cost-effective in achieving the various goals of the reforms? Does the KERA have enough flexibility to provide funds to low-income parents so that they may acquire items such as encyclopedias or (perhaps through subsidized loans) labor-saving appliances such as dishwashers, which increase the time available for parent-child interaction? Past research suggests these non-school inputs can make important differences in student performance (*e.g.*, Leibowitz; Datcher-Loury).

4. *Issues related to and evaluation of site-based management.* A key component of the educational reform package is the implementation of a "site-based" management plan. This means considerable control over the educational program is returned to local administrators and teachers, and to some degree even parents and students. Site-based management is broadly consistent with the belief that local people are best able to evaluate community needs and construct educational programs consistent with these identified needs. However, local people in different districts will have different perceptions about educational "needs" and returns to education in the form of global (rather than only local) opportunities available to their children once they receive a diploma. To the extent that this is an information problem, it is also an economic problem. Obviously, inequities in the curriculum available to pupils in different districts can be interpreted as "unequal protection of the law." Another important economic question: what is the optimal decision-making unit, or where in the school system hierarchy should different types of decisions (*e.g.*, with respect to hiring of teachers; selection of textbooks; timing, frequency and location of PTA meetings, etc.) be made?

5. *Impacts of anti-nepotism provisions.* Another component of the reform package included restrictions on the hiring of relatives in local school districts. For example, relatives of individuals employed by the school district are ineligible for election to the school board. Furthermore, a teacher who is a relative of a school board member cannot be employed in the same district, which *may* mean that a less-qualified teacher is hired in place of a more-qualified teacher simply because the latter is related to a school board member. Hence, an apparently promising rule for dealing with the hiring of under-qualified staff may have undesirable side effects. More generally, these provisions represent an extreme form of wage discrimination along kinship lines, which affects the local demand schedule for teachers. Economists have devoted considerable effort to analyzing the effects of various types of wage discrimination (*e.g.*, Hammermesh and Rees) and can, therefore, contribute to an understanding of the consequences of the anti-nepotism provision on the functioning of the market for teachers.

6. *Property tax implementation issues.* Political support for the school reform package from urban legislators was in part conditioned on the implementation of a system that improved equity of assessments across districts. Economists can play a role in predicting more precisely which counties

are more likely to undervalue property as determined by local socioeconomic characteristics, including income, mill rates, occupational structure, etc. Economists can also forecast the expected consequences for taxpayer welfare and equity of raising the value of property to fair market values, and changes in the relative importance of local vs. state schools funding.

7. *Choice of Funding Base.* A final set of issues arises in the choice of the unit which is funded (*i.e.*, the classroom vs. the ADA basis). Rural areas with declining birth rates (*e.g.*, Eastern Kentucky, according to the 1990 National Census) face serious problems in offering a broad curriculum or set of programs which ensure that rural children are afforded the same opportunities as urban children. This raises the question of whether funds should be allocated on a program basis, so that each pupil in the state has equal access to a minimum set of educational programs. Economists have the tools to estimate the costs involved in such a change as well as the subsidies that would be involved from districts with higher pupil enrollments to those with lower enrollments.

Notes

1. Goetz is Assistant Professor, Debertin is Professor, Department of Agricultural Economics, University of Kentucky. We are thankful, without implication, for valuable comments by Barry Bobst, Harry Hall, Larry Jones, Richard Ready, Eldon Smith and William Snell. Paper presented at the Southern Regional Development Center Conference held at Atlanta, Georgia, May 7 & 8, 1991.

2. The suit was known as "The Council for Better Education, et al. v. Martha Layne Collins, et al." Plaintiffs included 66 school districts, seven boards of education, and 22 students in the public school system. Defendants listed were the Governor, the Superintendent of Public Instruction, the Treasurer, the Senate President Pro Tem, the Speaker of the House of Representatives, and the State Board of Education as well as its members.

3. Initial hearings were held in Franklin County Circuit Court. The districts include Beechwood Ind., Fayette Co., Woodford Co., Jefferson Co., Bardstown Ind., Boone Co., Lyon Co., Ft. Thomas Ind., Campbell Co., Franklin Co., Paintsville Ind., Morgan Co., Harlan Ind., Knox Co., Elliott Co., Wolfe Co., Dayton Ind., McCreary Co. Personal income per pupil ranged from $4,537 in McCreary County to $14,317 in Woodford County.

4. The balance of funds (25%) is to be spent on a workforce development program and higher education. The Supreme Court did not instruct the legislature how it should increase school funding. It stipulated, however, that if the funding scheme continued to rely on local property taxes, a uniform tax or mill rate (effort) should be required throughout the state. At the same time, this would not prevent some districts from raising tax rates above the minimum rates, if desired by local voters. The $1,267 million will be raised as follows over the years 1990-1992 (based on Office of Educational Accountability): 1. corporate income tax rate increase: $83 mn.; 2. sales and use tax rate increase from 5% to 6%: $403 mn.; and 3. individual income tax conformity/reform, consisting of the following: conformity: $251 mn.; federal tax deduction: $554 mn.; additional withholding (in 1990/91 only) $100 mn.; and low income tax credit of −$124 mn.

5. According to NEA (1987), both methods have been successful, and both have failed in the past in bringing about changes in school funding. A key determinant of success appears to be that the court must find that education is a basic right under the state's constitution. In that case it applies the legal standard of "strict scrutiny" (instead of "rational base"), and it is more likely to rule in favor of a reform of the funding system.

6. In the education literature the term *levy* refers to tax rate.

7. Hawaii's 164,000 students are enrolled in a single school district; Washington, D.C., similarly consists of a single district (Cohn & Geske, pp. 321 and 326).

8. This compares with expenditures ranging from $4,841 to $7,079/pupil in New Jersey school districts (*U.S. News & World Report*, June 25, 1990, p.58). According to *The Economist* (Mar. 23, 1991), the U.S. at this time spends more per pupil than any other country in the world except for Switzerland.

9. "School-based decision making" is explained as follows (LRC, 1990b, p. 22): "By January 1, 1991, each local board must adopt a policy for school-based decision making and must provide that each participating school form a council composed of two parents, three teachers, and the principal or administrator. The council is to adopt policies relating to instructional materials, student support services, personnel assignments, curriculum, extracurricular programs, and other aspects of school management.

The principal administrator and the instructional leader of the school, and with the assistance of the total school staff will administer the policies established by the school council and the local board."

10. The numbers are 24 pupils for primary school classes, 28 for grade four, 29 for grades five and six, and 31 in grades seven to 12 (Acts, Ch. 476).

11. Prior to the KERA, transportation services were "fully funded subject to availability of funds." In practice, funds were available to cover only about 80-85% of transport costs in each district.

12. The LFI is the ratio of local school revenues per pupil to the per pupil assessed property value, and is intended to measure a community's *willingness* to pay for education as a function of its *ability* to pay. The ratio has to be interpreted with care since assessed values used in the calculations may not reflect actual property values.

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APPENDIX TABLE A-1:

Characteristics of an Efficient System of Common Schools (as interpreted by the Kentucky Supreme Court; based on LRC, 1990, p. 2)

1. Its establishment, maintenance, and funding are the sole responsibility of the General Assembly.
2. It is free to all.
3. It is available to all Kentucky children.
4. It is substantially uniform throughout the state.
5. It provides equal educational opportunities to all Kentucky children.
6. It is monitored by the General Assembly to assure that there is no waste, no duplication, no mismanagement, and no political influence.
7. Schools are operated under the premise that an adequate education is a constitutional right.
8. Sufficient funding provides each child an adequate education.
9. An "adequate education" is defined as one which develops the following seven capacities:
   a. Communication skills necessary to function in a complex and changing civilization.
   b. Knowledge to make economic, social, and political choices.
   c. Understanding of governmental processes as they affect the community, state and nation.
   d. Sufficient self-knowledge and knowledge of one's mental and physical wellness.
   e. Sufficient grounding in the arts to enable each student to appreciate his or her cultural and historical heritage.
   f. Sufficient preparation to choose and pursue one's life's work intelligently.
   g. Skills enabling students to compete favorably with students in other states.

Goals of the Education Reform Act of 1990 (as set by the General Assembly; based on LRC, 1990, p. 20)

* Schools must expect a high level of achievement of all students.
* Schools must develop their students' ability to:
   a. use basic communication and math skills for situations they will encounter throughout their lives;
   b. apply principles from math, sciences, arts, humanities, social studies and practical living studies to situations they will encounter throughout their lives;
   c. become self-sufficient individuals;
   d. become responsible members of a family, work group or community;
   e. think and solve problems in school situations and in life;
   f. connect and integrate experiences and new knowledge with what they have previously learned and build on past learning experiences to acquire new information through various sources.
* Schools are to improve their students' rate of school attendance.
* Schools are to reduce their students' dropout and retention (*sic*) rates.
* Schools are to reduce physical and mental health barriers to learning.
* Schools are to be measured on the proportion of students who make a successful transition to work, post-secondary education and the military.

Appendix Table A-2: Comparison of School Spending Indicators for Select Countries; Various Years*

Country	Spending as a % of all Public Spending	School Spending as a % of GNP	Spending per Pupil ($)**
Australia	12.6	5.8	2,050
Canada	15.4[7]	7.2[7]	3,665
Chile	15.3[5]	3.6[7]	--
France	18.0[3]	5.7	2,084
Germany	9.2	4.4	1,941
Hungary	6.3[7]	5.6[7]	--
Italy	8.6	4.0	1,212
Japan	17.7	5.0	1,922
Mexico	16.2[5]	3.4[7]	--
Netherlands	16.4[5]	--	2,059
Nigeria	12.0	1.4	--
Norway	13.6	6.8	3,307
Sweden	12.8[7]	7.4[7]	4,181
Thailand	17.9[7]	3.6[7]	--
United Kingdom	11.3[4]	5.0	2,502
United States	**17.5[7]**	**5.7[7]**	**3,232**
U.S.S.R.	--	7.3[7]	--
Yugoslavia	--	3.8	--

Source: NCES Public. No. 91-660 (1991, pp. 379, 381 and 382).

--. not available

*. Data are for 1986, except where indicated (7=1987; 5=1985; 4=1984; 3=1983).

**. Includes public and private schools; based on enrollment and current expenditures. When private schools are excluded, the amount is $4,295.

Appendix Table A-3: Aid Programs used by States

State	Foundation Program	Guaranteed Tax Base	Guaranteed Tax Yield	Percentage Equalizing	Flat Grants	Full State Funding
Alabama	X					
Alaska	X					
Arizona	X					
Arkansas	X					
California	X					
Colorado			X			
Connecticut		X				
Delaware				X	X	
Florida	X					
Georgia	X					
Hawaii						X
Idaho	X					
Illinois	X	X			X	
Indiana	X					
Iowa	X					
Kansas			X			
Kentucky	X		X			
Louisiana	X					
Maine	X	X				
Maryland	X					
Massachusetts	X					
Michigan			X			
Minnesota	X					
Mississippi	X	X				
Missouri	X					
Montana	X		X			
Nebraska	X					
Nevada	X					
New Hampshire	X					
New Jersey		X				
New Mexico	X					
New York				X		
North Carolina	X					
North Dakota	X					
Ohio	X					
Oklahoma	X		X			
Oregon	X					
Pennsylvania	X			X		
Rhode Island				X		
South Carolina	X					
South Dakota	X					
Tennessee	X					
Texas	X					
Utah	X		X			
Vermont				X		
Virginia	X					
Washington	X					
West Virginia	X					
Wisconsin		X				
Wyoming	X					

Source: NEA (1987)

Appendix Table A-4. Percentage of Teachers Involved in Making Selected Decisions, by Southeastern State: 1987

State	Choosing textbooks	Shaping the curriculum	Tracking students into special classes	Setting promotion & retention policies	Deciding school budgets	Evaluating teacher performance	Selecting new teachers	Selecting new administrators
				in %				
Southeast								
Alabama	71	51	47	38	19	8	4	3
Arkansas	88	51	44	39	9	12	4	3
Florida	64	42	39	21	20	6	5	3
Georgia	74	54	52	35	19	20	3	4
Kentucky	**85**	**64**	**53**	**45**	**16**	**13**	**3**	**6**
Louisiana	63	40	36	27	10	8	1	6
Mississippi	81	59	50	36	11	17	4	5
North Carolina	76	53	43	36	28	17	4	4
South Carolina	87	61	46	30	23	16	4	3
Tennessee	71	55	45	38	16	13	3	4
Virginia	82	61	41	30	16	14	4	3
West Virginia	67	43	39	27	12	11	4	2
United States	79	63	45	34	20	10	7	7

Source: NCES Public. No. 91-660 (p. 80)

Appendix Table A-5:
Budgetary Details

Final Foundation Program Calculations
Based on KY Dept. of Education, May 1990.

1. Total Units Employed (REF: KRS 157.360)

a. Basic	20,933.1
b. Vocational	2,538.0
c. Exceptional Children	4,357.0
d. Admin. & Special Instructional Service Personnel (ASIS)	3,091.5
e. Superintendent	176.0
f. Supervisor of Instruction	259.0
g. Director of Personnel	203.2
h. Growth Factor [KRS 157.360(3)]	127.7
i. Loss Factor [KRS 157.360(4)]	.0
j. Less Contract Vocational	−438.4
Total Units (U) {Sum of Items a through i minus j}	**31,247.1**

2. Instructional Salaries: 185 Days [KRS 157.390 and HB 398]	$760,493,933.0
3. Instructional Salaries: Extended [KRS 157.390, subsection 2]	$24,324,372.0
4. Other Current Expenses: U*5,421$ [KRS 157.390(3) and HB 398]	$169,390,539.0
5. Capital Outlay: U-(M+H)*1,800$ [KRS 157.390(4) and HB 398]	$56,090,520.0
6. Transportation: [KRS 157.390(4) and HB 398] (*cf.* KRS 157.370)	$86,805,000.0
7. District 1989-90 Foundation Program Allotment (Items 2+3+4+5+6)	**$1,097,104,364.0**
8. End-of-Year ADA (1988-89; certified by Div. of Pupil Attendance)	572,807.2
9. ADA deduction for vocat. and spec. children units alloted [KRS 157.360] (minus 9.6 for ea. voc., 7.2 for ea. spec. child. unit alloted)	$55,735.6
10. Adjustment for previous year's allotments	$2,959,012.1
11. Kindergarten Aides [KRS 157.360] (1 tcher aide/kindergrtn. unit alloted)	$6,348,437.0
12. District 1989-90 Foundation Program Final Allotment (6±10+11)	$1,106,411,813.1
13. Plus Found. Prog. Allotment for Contract Voc. Units [705 KAR2:030(7)&(8)]	$13,766,209.0
14. 1989-90 Final Foundation Program Cost to State (Items 12+13)	**$1,120,178,022.1**

Notes: h. Adjustment for gain in the first two months ADA during the current school year over the first two months of the prior year. i. Adjustment for loss in percentage of more than two percent the previous year. j. These units are not staffed by the local school district. The funds go to the office of vocational education for public school students attending state-owned and/or operated area vocational school extension centers. 2. Obtained using the total number of classroom units (U) and training with years of experience for personnel employed in 1989-90. 4. Obtained by multiplying the number of classroom units (U) minus home (M) and hospital (H) units by $1,800. 13. Funds go to the office of vocational education for public school student vocational services under contract with state-owned and/or operated area vocational school extension centers. 20% is sent to school districts owning the facility. Contract vocational units times rank II, 4 to 9 years salary, extended employment, current expense and capital outlay allotment.

Appendix Table A-5: Continued

Teacher salaries by rank and experience; 185-day school term, 1989-90

Years Experience	Rank I	II	III	IV	V
0 - 3	21,820	19,540	17,240	14,850	13,690
4 - 9	24,100	21,820	19,540	14,850	13,690
10 - 14	27,060	24,760	22,460	14,850	13,690
15 - 19	27,930	25,640	23,340	14,850	13,690
20 and more	28,360	26,070	23,760	14,850	13,690

Source: KY Dept. of Education, May 1990.
Experience is determined as of September 15.

Classification of Ranks (based on HR Bill No. 940, Vol. I, Part III; 90 RS BR 4645, p 239 ff).:

Rank I — Those holding regular certificates, and a master's degree in a subject field approved by the State Board for Elementary and Secondary Education (SBESE) or equivalent preparation plus 30 semester hours of approved graduate work or its equivalent; and those teachers who, as of Sept. 1, 1962, were included in Rank I, having earned 24 semester hours of additional approved graduate work.

Rank II — Those holding regular certificates and who have a master's degree in a subject field approved by the SBESE or equivalent preparation.

Rank III — Regular certificate holders and approved 4-year college degree or the equivalent.

Rank IV — Regular certificate holders and 96-128 semester hourse of approved college training or the equivalent.

Rank V — Regular certificate holders and 64-95 semester hourse of approved college training or the equivalent.

Appendix Table A-5 (cont.): 1990-92 Final Enacted Budget Memorandum General Fund Summary

Function: Education and Humanities

Line Item		FY 1989-90 Budget	FY 1990-91 General Fund General Assembly	FY 1991-92 General Fund General Assembly
Department of Education				
a.	School Foundation Program	1,123,955,500	1,172,521,700	1,213,958,900
b.	Power Equalization	111,278,300	111,278,300	111,278,300
c.	Executive Policy and Management	989,500	1,100,800	1,107,000
d.	School Administration and Finance	21,042,200	18,862,500	23,164,300
e.	Local District Health & Life Insurance	84,689,300	95,965,100	116,248,900
f.	Internal Administration	4,504,900	4,544,900	5,234,900
g.	Instruction	30,063,700	29,864,000	30,118,200
h.	Education for Exceptional Children	10,485,000	11,293,200	12,046,700
i.	Research and Planning	3,211,800	2,662,000	2,766,300
j.	Communication Services	1,034,800	1,063,900	1,111,800
k.	Secondary Vocational Education	6,360,700	6,635,900	6,834,000
l.	Community Education	1,269,200	2,202,000	2,211,000
m.	Teacher Retirement Employer Contribution Match	2,162,100	2,022,700	2,123,900
n.	School Equity and Reform Initiatives		260,563,800	341,590,200
	Subtotal	1,401,047,000	1,720,580,800	1,869,794,400

Source: Kentucky Acts, Vol. II., Ch. 514 (HB 799)

Appendix Table A-6: Sample Calculations: Impact of KERA on Two Districts

	Assessed Property Value/Pupil	
	High	Low
Assessment/pupil	341,700	39,100
S.E.E.K.		
Base	2,305	2,305
At-Risk Child.	92	308
Except. Child.	357	370
Transport	146	204
Subtotal	2,900	3,187
Local Effort (30¢/$100)	1,025	117
Calc. State Aid/pupil	1,875	3,070
Adjustmt. [8%-25%]*	+176	−103
Total State Aid	2,051	2,967
Total $ per pupil	3,076	3,084
Local Funds as a % of total	33%	4%
Percent Increase in SEEK funds	8%	25%

Source: Legislative Research Commission, (1991) [personal communication]
* The percent increase in SEEK funds was restricted to between 8% and 25%, hence the adjustment.