Institute for Federalism & Intergovernmental Relations

IFIR WORKING PAPER SERIES

School Finance Reform: Do Equalized Expenditures Imply Equalized Teacher Salaries?

Meg Streams
J.S. Butler
Joshua Cowen
Jacob Fowles
Eugenia F. Toma

IFIR Working Paper No. 2009-13

November 23, 2009

Acknowledgments. The authors are grateful to Sean Corcoran and others for comments at the November 2009 meeting of the Association for Public Policy Analysis and Management. We also are grateful to the Spencer Foundation (Grant number 201000055) for funding this research under the project title, *Teaching Careers in Rural Schools.* We extend our thanks to the Kentucky Education Professional Standards Board for making administrative data available for research purposes. Work was conducted under IRB Approval HS2009-2269 to M. Streams at Tennessee State University and IRB Approval 07-0789-X4B to E. F. Toma at University of Kentucky.

School Finance Reform: Do Equalized Expenditures Imply Equalized Teacher Salaries?

Abstract

Kentucky is a poor, relatively rural state that contrasts greatly with the relatively urban and wealthy states that have typically been the subject of large dataset studies of individual-level teacher characteristics and student achievement. For this reason, Kentucky's experience of major school finance and curricular reform is highly salient for understanding teacher labor market dynamics. While past research suggests that the distribution of per-pupil spending did narrow following the funding changes which were part of the Kentucky Education Reform Act (KERA), impact on individual teacher compensation has not been investigated. This study examines the time path of teacher salaries in Appalachian and non-Appalachian Kentucky, using a large, novel teacher-level administrative dataset. Our results suggest that while the pre-existing gap in teacher salaries across districts narrowed following KERA, this pattern did not persist and the gap re-established itself by 2005. Our analysis is suggestive of differential investment of the per-pupil funding by the more rural, Eastern Kentucky districts: increasing per-pupil staffing rather than teacher salaries.

Meg Streams
Assistant Professor
Department of Public Administration
Tennessee State University
330 10th Ave N, Box 140
Nashville TN 37203
meg.streams@gmail.com

J.S. Butler
Professor
Martin School of Public
Policy and Administration
University of Kentucky
473 Patterson Office Tower
Lexington, KY 40506-0027
jsbutl3@email.uky.edu

Joshua Cowen
Assistant Professor
Martin School of Public
Policy and Administration
University of Kentucky
433 Patterson Office Tower
Lexington KY 40506-0027
jco223@uky.edu

Jacob Fowles
Doctoral Student
Martin School of Public
Policy and Administration
University of Kentucky
405 Patterson Office Tower
Lexington, KY 40506-0027
jacob.fowles@gmail.com

Eugenia F. Toma*
Professor
Martin School of Public
Policy and Administration
University of Kentucky
437 Patterson Office Tower
Lexington, KY 40506-0027
eugenia.toma@uky.edu

* Corresponding author

I. Introduction

Many states have adopted educational reforms designed to close the achievement gap and increase the achievement of traditionally underserved student populations. A common early approach was to reduce the variation in per pupil expenditures between the richest and poorest districts, a metric used as *prima facie* evidence of the inequality of the public schooling systems in many states.

There is a great deal of evidence that the state finance reforms were quite successful when evaluated on the criteria of reduced public fund inequality in per pupil resources (Murray, Evans, and Schwab 1998; Moser and Rubenstein, 2002). However, empirical literature illustrates that secondary, unintended effects accompanied the spending reforms.[1] Given practical realities as well as the "does money matter" studies (Coleman, 1966; Greenwald, Hedges, and Laine, 1996; Hanushek, 1986, 1989), researchers and policymakers have shifted attention beyond the simple level of available resources to the strategic expenditure choices made by schools and districts. Of these strategic expenditures, there is growing consensus that, of all categories of educational expenditures, teachers matter most.

Recent research has emphasized the importance of the link between quality teachers and student achievement (Darling-Hammond, 2000; Guarino, Santibanez, and

[1] For example, students in wealthier districts opted out of the public schools in California and attended private schools with the long run consequence of less support for public schools in the state (Downes and Shoeman, 1998). Education was also forced to compete with other state-provided services that contributed to reduced long run support for public schools (Theobald and Picus, 1991).

Daley, 2006; Johnson, 2006; Rivkin, Hanushek, and Kain, 2005; Rowan, Correnti, and Miller, 2002; Sanders and Rivers, 1996), a finding so critical that it became one of the focal points for the No Child Left Behind legislation (NCLB) enacted in 2001. Ultimately, to attract and retain high-quality teachers, schools must be able to offer sufficient pecuniary and non-pecuniary benefits to prevent teachers from choosing alternative labor market opportunities—including more lucrative teaching (or administrative) positions at other schools or in other districts (Loeb and Page, 2000; Murnane and Olsen, 1990).

Past research has not looked into the black box to examine the relationship between resources available to the schools and the salaries paid to teachers. With a rich, longitudinal, statewide data set on teacher salaries and teacher attributes, we capitalize on a finance reform that successfully reduced resource variance across districts. We find that, in the short run, the reform also reduced variance in teacher salaries across districts. But five years after the reform, districts had begun to allocate resources differently. In Kentucky, salary differentials that existed between Appalachian and non-Appalachian districts reasserted themselves with the result that current salary patterns are identical to those that existed prior to the finance reform. The findings provide potentially important insights into how school districts allocate resources and, thus, into the persistence of the achievement gap.

II. Background

Whether the gap is defined as between rich and poor, black and white, or suburban and inner city children, study after study continue to find performance differences related to student socioeconomic or geographic status. But as described above, policymakers and researchers have begun to look at the quality of teachers as a large part of the answer to this achievement gap. Most studies that have looked at teacher quality and the achievement gap from a location perspective have tended to focus on the differences between suburban and urban (and particularly inner-city) schools (Boyd, Lankford, and Loeb, 2003; Chester and Beaudin, 1996; Lankford, Loeb, and Wyckoff, 2002). Much less thoroughly studied are the challenges faced by rural schools relative to their suburban and urban counterparts (Arnold, Newman, Gaddy, and Dean, 2005; Ballou and Podgursky, 1995; Sherwood, 2000).

The majority—nearly 56 percent—of public school districts in the U.S. are located in rural areas. While city-located districts are larger in terms of total student population compared to rural districts (30.4 percent versus 21.3 percent), the number of public school students attending rural schools is non-trivial: over 10.3 million students attend rural public schools, almost half of which attend schools located in either “distant” or “remote” rural areas (Provasnik et al., 2007). Ultimately, the unique problems that these schools face in bridging the achievement gap, especially in terms of teacher quality, are much less known.

The public school system of Kentucky provides a valuable opportunity to fill this void. Compared to most states, Kentucky is relatively rural and relatively poor. It has experienced long-standing achievement gaps between the poor, rural areas and the

higher-income urban areas of the state -- gaps that many argue are at the root of the huge variation in college attendance, economic prosperity and health outcomes observed across the state. Kentucky also contains a large number of small, rural school districts. Of great interest for the purposes of this paper, the state underwent a major school finance reform in 1990, the Kentucky Education Reform Act (KERA), which (in addition to curricular and governance changes) changed the formula for state funding of schools with the goal of reducing disparities in resources between wealthier and poorer districts.

Many recent insights into teacher quality have emerged because of the increasing availability of statewide administrative data. Kentucky is now joining the earlier states in making these available for research purposes. But Kentucky is not just another state, and studies of its teachers, students and policy innovations are not just "more of the same." As Table 1 illustrates, along several critical socioeconomic and demographic characteristics, Kentucky is markedly different from Florida, New York, and North Carolina, some of the states with existing longitudinal teacher and student datasets frequently analyzed in the existing literature. Kentucky is smaller, less densely populated, less educated, and poorer than the others that have been studied extensively. The rural, poor nature of the state of Kentucky makes these data particularly valuable and should offer insights that data from wealthier states cannot provide.

[TABLE 1 ABOUT HERE]

Kentucky is interesting not only because it differs significantly from many of the other states that are currently being studied intensively but because of the significant socioeconomic and geographical variance across school districts within the state. In particular, a major impetus for school finance reform in Kentucky derived from the underlying population differences across the state, especially between the Appalachian and non-Appalachian areas. Figure 1, relying on data published by the Appalachian Regional Commission (ARC), displays the geographic divide in Kentucky between the 71 Appalachian school districts and the 112 non-Appalachian school districts.[2]

[FIGURE 1 ABOUT HERE]

Table 2 illustrates the rather dramatic differences that exist across these two regions. For instance, 63 percent of the population in Appalachia has at least a high school degree, while over 78 percent of the remaining state population has attained at least a high school degree. Similar differences across other measures of socioeconomic conditions hold. The percent of the population in poverty is over 24 percent in the Appalachian counties and approximately 14 percent in the remaining counties. As Table 2 clearly demonstrates, Kentucky is not only different from other states, but the populations within the state greatly differ by locality. These characteristics provide an excellent opportunity for study of the teacher labor market.

[2] The definitions of Appalachian and non-Appalachian presented here reflect Appalachian Regional Commission definitions in effect in 2005. Since then, 3 additional counties (Metcalfe, Nicholas and Roberts) have been reclassified by statute as Appalachian.

[TABLE 2 ABOUT HERE]

Like many states, Kentucky has adopted a statewide minimum teacher salary schedule. Districts may choose to exceed the state minimum by using local revenues but KERA placed limits on the amount of annual increases from all revenue sources. The state set a ceiling on maximum increase in revenues from own sources and, by extension, set a ceiling on salary increases beyond the state minimum. At the same time, KERA also increased per pupil funding provided to each district from state revenue sources and required minimum local contributions from all districts. The minimum requirements generally affected local districts that had relied less on local property taxation than the average district in the state. These minimum amounts were required through new laws affecting the valuation of local property as well as through the establishment of a minimum local property tax rate.[3] The net effect of KERA was an increase in the level of revenues contributed by both the state and local governments combined with a shift in relative financing responsibility to the state. The finance portion of KERA was clearly designed to reduce the inequality in per pupil expenditures and, again by extension, inequality in teacher pay between wealthier and poorer school districts.

As a result of KERA, real spending per pupil in Kentucky increased 30 percent from 1989-90 to 1995-96—the highest spending increase observed in the 50 states over this time period (Hoyt, 1999). The state increase in expenditures caused a rise in real

[3] See Appendix 1 for a description of the KERA financing changes.

salaries and a decline in expenditure variance pre- and post-KERA (Flanagan and Murray, 2003, Picus, Oddin, and Fermanich, 2004). Several studies have estimated Gini coefficients to measure the inequality of spending across districts before and after the legislation and all show decreases in inequality. Hoyt (1999) found the Gini coefficient declined from 0.10 to 0.07 between 1989-90 and 1994-95. Most recently, Hoyt, Jepsen, and Troske (2008) found that:

> the gap in current expenditures per student between metropolitan and non-metropolitan districts fell from $600 in 1987 to $10 in 2006. Over this same time period districts in the Eastern part of the state went from having the lowest level of current expenditures per student to having the highest expenditures per student. (p. vi)

These expenditures changes were brought about largely because of the funding formula in which the state contribution to localities is adjusted inversely to local revenue capacity.

An implicit goal of the KERA reforms was to not only equalize resources available to districts but to also make teaching a more attractive career option in Kentucky, especially in poorer, rural eastern Kentucky school districts that have traditionally had difficulties recruiting and retaining higher-quality teachers. This was supposed to be accomplished, in part, by giving districts in those areas additional resources through the funding formula which would make such investment in personnel possible (Appendix 1). The remainder of this paper examines salaries of instructional staff in some detail to assess whether the increased overall expenditures and the

reduced variance in per pupil expenditure were equally successful in raising teacher salaries and reducing salary variance across district locations.

III. Teacher Salary Data and Analysis

In Kentucky, like other states, teacher salaries follow a schedule based on years of experience and rank.[4] One possibility for examining salaries by type of district would be to collect all the salary schedules from each of the approximately 175 school districts each year, compare across time, and simply calculate the differences. The schedules, however, are not readily available to researchers in a longitudinal format. However, actual salary data for teachers are available in Kentucky and have been collected annually at the state level for many years.[5] The Kentucky Education Professional Standards Board has provided us a historic series of teacher data covering the period 1980-2005. In addition to each teacher's base salary and compensation for extra duties, we have the rank of the teacher, his or her years of experience, the school and district where the teacher was located, the subjects taught, and, for many teachers, other attributes that may reflect quality, including where the teacher attended college.[6]

To begin our look at teacher salaries, we examined salary means by district location over time. Initially, we calculated the mean of all individual teacher salaries by district. Because we are interested in Appalachian teacher salaries vis-à-vis other

[4] Rank is tied to both degree(s) earned as well as hours of post baccalaureate education attained.

[5] The Kentucky Education Professional Standards Board currently serves as the repository for the data on Kentucky teachers.

[6] Many of the other attributes will be examined in detail as we track the quality of teacher recruitment and retention over time.

teacher salaries in the state, we then took the average of Appalachian mean district base salaries and subtracted the average of non-Appalachian mean district salaries for each year. Figure 2 illustrates the time path of the gap between "raw" Appalachian and non-Appalachian mean district salaries, unadjusted for rank or experience. The vertical line in the figure represents the year in which KERA implementation began. The figure clearly illustrates that average district salaries were lower in Appalachian districts in the years preceding finance reform.

[FIGURE 2 ABOUT HERE]

With the passage of KERA, the average difference approaches zero, and in fact, during the post-KERA years, raw mean district salaries in the Appalachian districts have exceeded mean district salaries in the non-Appalachian districts.

However, average salaries at the district level do not provide information about the attractiveness of teaching by locality. As one important point, merely examining mean district salaries does not adjust for teacher rank and experience. Raw mean differences between Appalachian and non-Appalachian districts could reflect different mean experience levels, for example. In Kentucky, rank and experience are the *de jure* criteria for salary schedules. Therefore, we can isolate the district effect on the salary schedules by estimating the following regression equation:

$$Y_i = \beta_0 + \beta_1 \text{exp} + \beta_2(\text{exp}^2) + \beta_2(\text{rank}) + D_j + \varepsilon_i$$

where Y_i represents teacher i's real base salary; exp is experience in years, exp^2 is experience squared, rank is a categorical variable capturing teacher rank, and D is a

vector of district indicator variables[7]. The square of experience is included to reflect the diminishing returns to experience typically observed in hedonic wage estimates.

This equation is estimated separately year by year for the entire period 1980 through 2005. This strategy is adopted to help us see how the effect of a district's Appalachian status changes over the window of time that includes KERA implementation. Using district fixed effects instead of simply an Appalachian dummy allows us to achieve greater resolution than simply a dichotomous indicator, and reflects the fact that we know *a priori* that schedules may differ by district as a matter of policy design. Estimating the equation for each year—instead of estimating a pooled sample with fixed effects for years included as well as districts—means that the simultaneous effect of year on all districts (e.g., changes in overall state real funding levels) is *not* taken out of the estimate of the level of the district fixed effects as it would be in the pooled approach. Thus our fixed effect estimates reflect the time pattern as well, which is our objective.

Given the spatial nature of our research question, our focus is on the fixed effects for individual district but the coefficients on the other independent variables in Equation 1 do take the expected signs and patterns. For example, in 2005 the net effect of an additional year of experience is an increase in mean base salary of $1,223, ceteris paribus. Relative to Rank 1 teachers and holding experience and district constant, holders of Rank 2 would earn $4,253 less on average, Rank 3 teachers would earn

[7] This paper focuses strictly on base salary but other work by the authors also examines supplementary pay.

$7,241 less, and those with lower ranks (4 or 5) would earn on average $9,654 less (see Appendix 2 for the specific coefficients associated with the independent variables by year). The percent of variation in real base salary in a given year explained by the independent variables ranged from 83% to 93%. A high level of explanatory power is expected, since we incorporated the key variables which should determine teacher salary by schedule; however, we cannot perfectly isolate teaching salary so there will be some variation that is not explained by the schedule factors. The number of teachers observed in the data varied by year, starting at 20,867 in 1980 and nearly doubling to 37,427 in 2005.

In order to look at average differences across Appalachian and non-Appalachian districts, the district fixed effects obtained from the year-by-year estimations of Equation 1 were averaged by district location, Appalachian or non-Appalachian. Figure 3 graphs the average fixed effects by year and type of district from the regressions and thus illustrates the level of Appalachian and non-Appalachian teacher pay that can be attributable to the district's location. Again, the vertical line denotes the first school year of implementation of KERA.

[FIGURE 3 ABOUT HERE]

As the figure illustrates, teachers in non-Appalachian districts consistently earned higher pay prior to the passage of KERA. For all years prior to 1990, a two-tailed t-test revealed that the mean fixed effect for Appalachian districts are statistically significantly lower than those for non-Appalachian districts ($p<0.05$). However, this relationship changed following the implementation of school finance reform, which had the

immediate effect of equalizing pay levels across the two district types. Interestingly, in the years immediately following the implementation of KERA, teachers in Appalachian districts on average received slightly higher salaries than their counterparts in non-Appalachian districts holding rank and experience constant, although for the majority of years these differences were not statistically significant. However, beginning in 2000, the salary patterns observed pre-KERA re-emerged: teachers in Appalachian districts were paid less than teachers in non-Appalachian districts on average, controlling for rank and experience. Two-tailed t-tests show that these differences are statistically significant for the years 2001 through 2005 ($p<.05$).

Figure 4 depicts the fixed effects slightly differently. This figure graphs the difference between the mean fixed effect for Appalachian districts and the mean fixed effect for non-Appalachian districts over time, controlling for rank and experience. As this figure shows, only a decade after KERA the negative impact of Appalachia on teacher salaries reasserts itself; in fact, the estimated difference in salary in 2005 is larger than the estimated differences for all years prior to KERA except 1980.[8]

[FIGURE 4 ABOUT HERE]

The figures above raise questions. First, is it possible that other studies have incorrectly concluded per pupil revenues (or, alternatively, per pupil expenditures) have equalized post-KERA? Using district-level data from the Common Core Data (CCD),

[8] There are two large urban districts in non-Appalachian Kentucky (and none similar in the state's Appalachian region). To ensure that the fixed effects of those two districts were not driving the observed pattern, the non-Appalachian fixed effect means were recalculated omitting these two districts. The overall pattern remained the same. These results are not shown here but are available upon request from the authors.

we look at per pupil total revenues for Appalachian vs. non-Appalachian districts for the post-KERA time period. Figure 5 shows the same pattern found by previous researchers: no statistically significant differences between Appalachian and non-Appalachian districts in terms of total district revenues (Hoyt, 1999; Flanagan and Murray, 2003; and Hoyt, Jepsen, and Troske, 2008). Although total revenues per student have grown significantly over time, the differences between revenues of Appalachian and non-Appalachian districts are insignificant for all years shown.[9]

[FIGURE 5 ABOUT HERE]

Since total revenues do not account for the salary schedule gap, we explore other possibilities. One possibility is that school districts in Appalachia simply allocate the increased (but equalized) revenues in ways different than the non-Appalachian districts. Rather than increasing salaries and maintaining staffing level, another way to use these revenues would be to maintain or even reduce salary schedules while hiring more personnel. Figures 6 and 7 suggest that this approach appears to have been utilized by Appalachian districts vis-à-vis their non-Appalachian counterparts.

Figure 6 graphs the non-teaching personnel hired by the district in Appalachian districts relative to non-Appalachian districts. The difference is positive over the entire period presented here, and the differences grow over time. The year effects and the Appalachian effect are both positive and significant over time.[10] The Appalachian

[9] The year effects are significant in every year after 1995. The Appalachian coefficient is statistically insignificant. These results are available from the authors upon request.

[10] Again, regression results are available from the authors upon request. Data for 1996 were omitted due to possible measurement error. Inclusion of data for this year does not substantively alter the results.

districts hire more persons in non-teaching roles, adjusted for enrollment, than do the non-Appalachian districts.

[FIGURE 6 ABOUT HERE]

Figure 7 replicates Figure 6 but estimates pupils per teacher as the dependent variable. As this figure shows, the levels and trends are almost identical to the patterns found for district non-teaching employees. Appalachian districts, throughout the post-KERA period have employed statistically significantly more teachers per pupil than non-Appalachian districts.

[FIGURE 7 ABOUT HERE]

Taken together, figures 6 and 7 suggest that local districts allocate equal resources differently. While relative teacher pay moved toward equality across districts within the state with the onset of the school finance reform, in the longer run the Appalachian districts reacted to the resource equalization by hiring disproportionately greater numbers of persons in both teaching and non-teaching positions than did the non-Appalachian districts.

IV. Concluding Comments

This paper is among the first to look at teacher salaries and school finance reform. The administrative data used in this paper are particularly rich in that they cover an extended period of time, including before and after a major education reform. With a focus on one policy variable, teacher salaries, this paper illustrates that the districts for which the reform was largely targeted, those of Appalachian Kentucky, have chosen to adjust pay scales over time so that the salary schedules today resemble the schedules

prior to KERA. The evidence is less definitive but suggestive that resources have been devoted to increasing the number of personnel rather than increased compensation in those districts, relative to the non-Appalachian districts.

As with most research, this paper calls for yet more study. This paper does not address the optimal allocation of resources by the districts. Perhaps Appalachian districts found greater payoffs either in student outcomes or in local political support from adding personnel than from maintaining the equalized salary schedules. It should be of great interest, nevertheless, to learn that a major education finance reform that equalized resources across districts resulted in equalized salary schedules only in the short run. In the longer run, teacher compensation patterns reverted to their pre-reform patterns in Appalachian and non-Appalachian school districts.

Table 1: Socioeconomic and demographic characteristics of Kentucky and selected states. Demographic data are from the US Census Bureau. Appalachian regional data are from the Appalachian Regional Commission (2009 a, 2009b).

	KY	NY	FL	NC
Population, 2007	4,241,474	19,297,729	18,251,243	9,061,032
Bachelor's Degree or higher, 2000, age 25+	17.1%	27.4%	22.3%	22.5%
High school graduates, 2000, age 25+	74.1%	79.1%	79.9%	78.1%
Population density, 2000, persons per sq mi	101.7	401.9	296.4	165.2
Median household income, 2007	40,299	53,488	47,804	44,772
Persons below poverty level	17.2%	13.8%	12.1%	14.3%
Number of Appalachian counties (ARC definition)	54	14	0	29
Number of FY 2010 Fiscally Distressed Counties (ARC definition)	40	0	N/A	0

Figure 1: Appalachian School Districts in Kentucky.

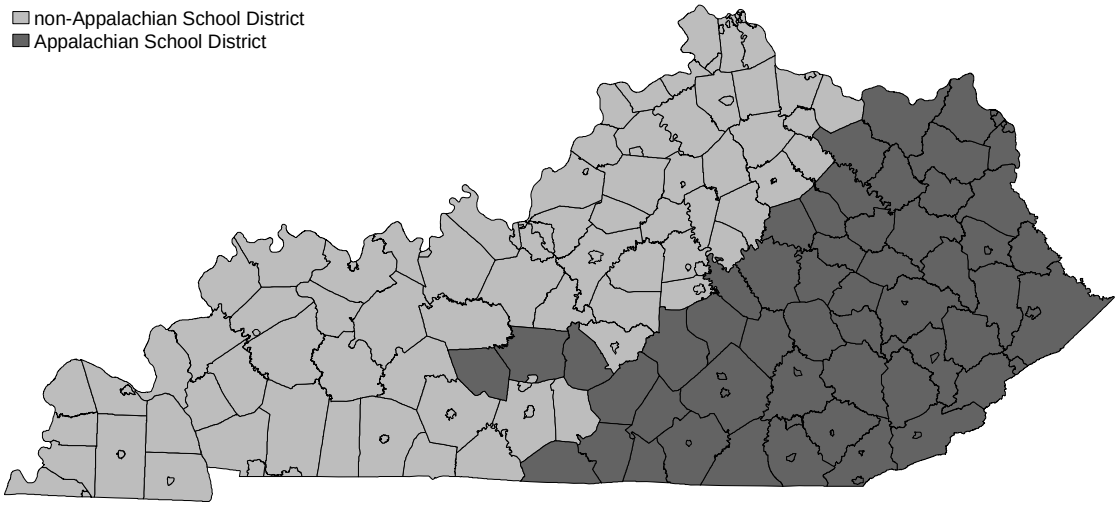


Table 2: Variation of population characteristics within Kentucky, between Appalachian and non-Appalachian counties. Data are from FedStats.gov (2009).

	Appalachian Counties (51)	Non-Appalachian Counties (69)
Educational attainment, persons 25 years and over: percent high school graduate or higher (2000)	62.9	78.8
Educational attainment, persons 25 years and over: percent bachelor's degree or higher (2000)	10.7	19.8
Median household income (2007)	$31,729	$45,352
People of all ages in poverty: percent (2007)	24.3	14.5
Population per square mile (2000)	66.3	139.5

Figure 2: Difference between mean teacher base salary by district for Appalachian and non-Appalachian counties in Kentucky in real (2005) dollars, unadjusted data. The red line indicates the passage of the Kentucky Education Reform Act.

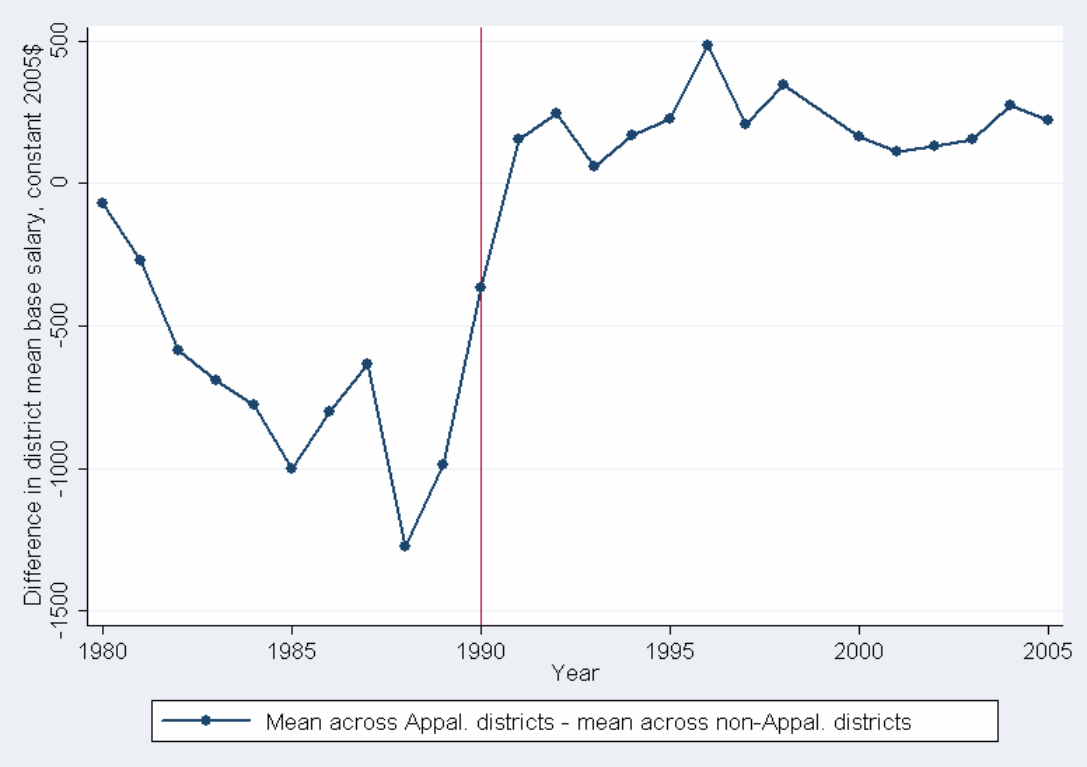


Figure 3: Mean district fixed effects vs. year by Appalachian status, controlling for rank and experience. District fixed effects are from year-by-year OLS regressions with robust standard errors; teacher-level base salary observations were regressed on rank (Rank 1 was the omitted category), experience in years, squared experience, district indicator variables and a constant. See Appendix 1 for the table summarizing the regression results. The red line indicates the passage of the Kentucky Education Reform Act.

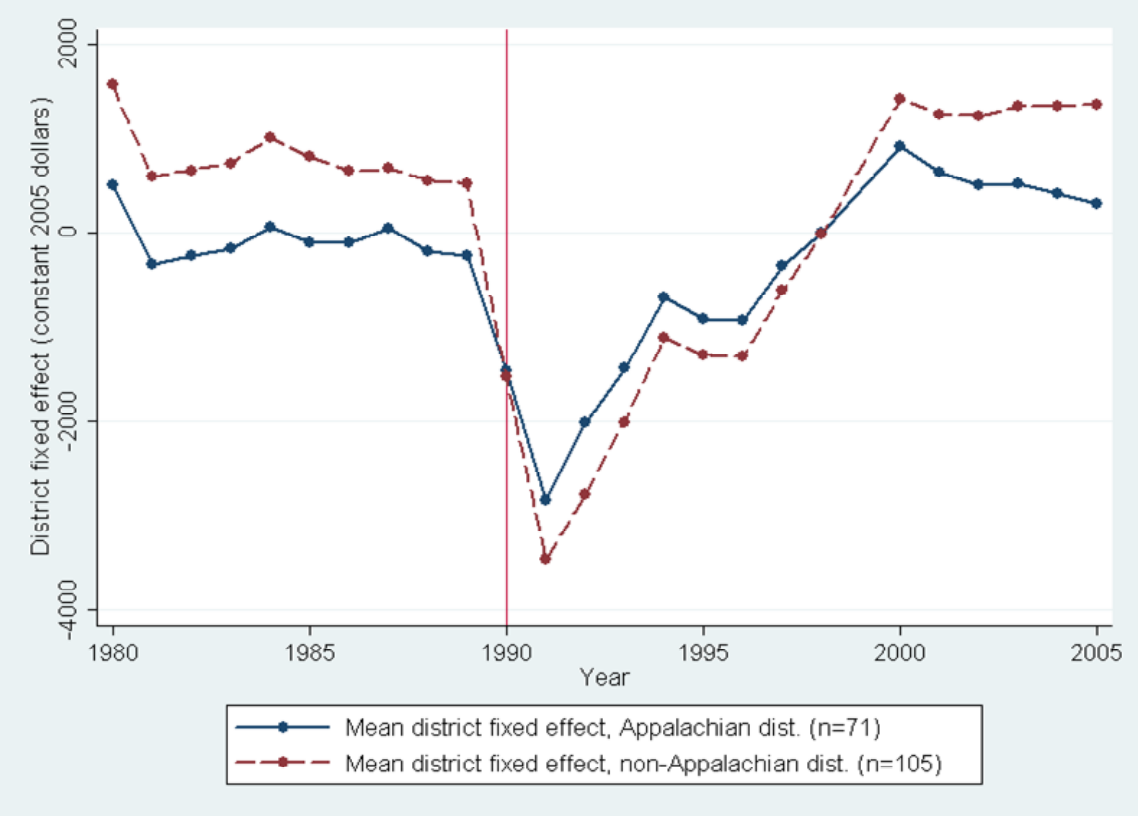


Figure 4: Difference between mean Appalachian district fixed effects and mean non-Appalachian district fixed effects vs. year. District fixed effects are from year-by-year OLS regressions with robust standard errors; teacher-level base salary observations were regressed on rank (Rank 1 was the omitted category), experience in years, squared experience, district indicator variables and a constant. See Appendix 1 for the table summarizing the regression results. The red line indicates the passage of the Kentucky Education Reform Act.

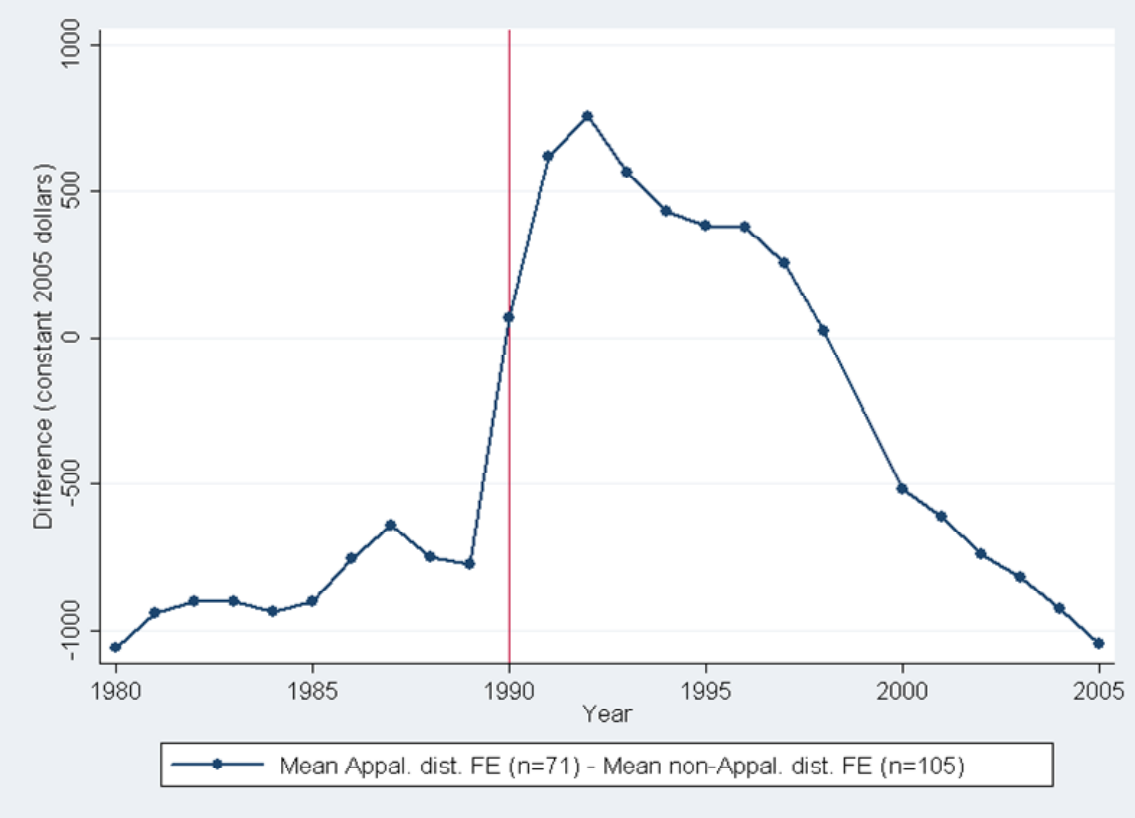


Figure 5: Total Revenue per student in Appalachian vs. non-Appalachian Kentucky school districts, 1994-2006. Data are from the NCES Common Core of Data (U.S. Department of Education, 2009).

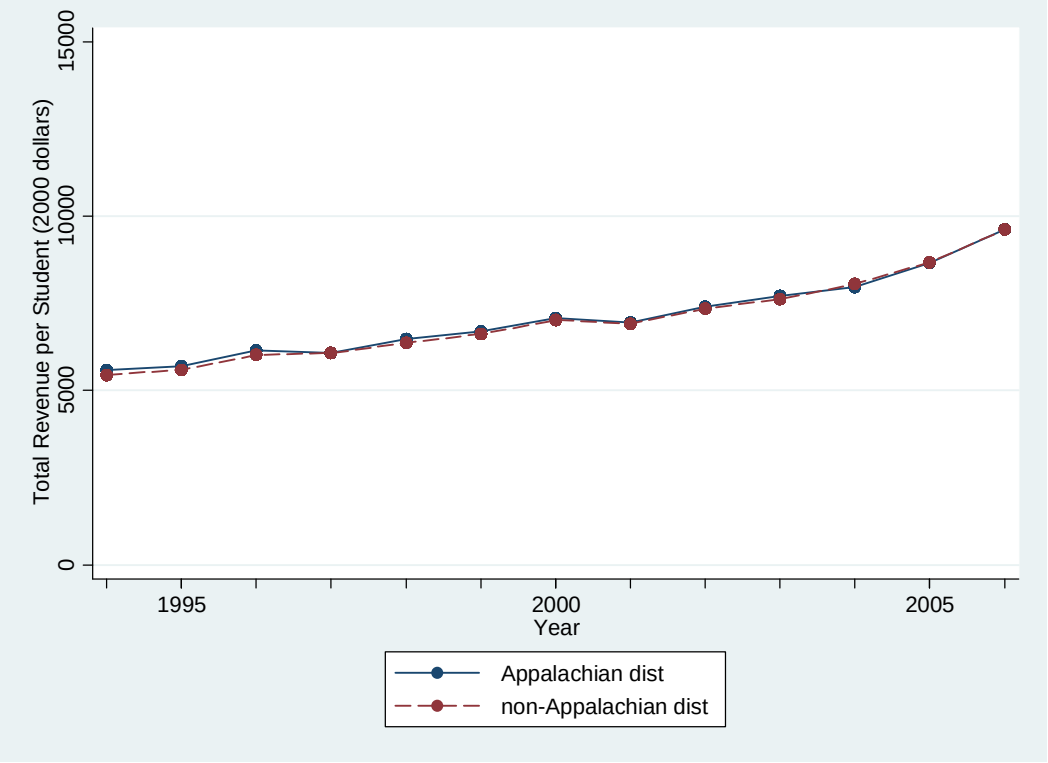


Figure 6: Non-teaching staff per student in Appalachian vs. non-Appalachian Kentucky school districts, 1994-2006. Data are from the NCES Common Core of Data (U.S. Department of Education, 2009).

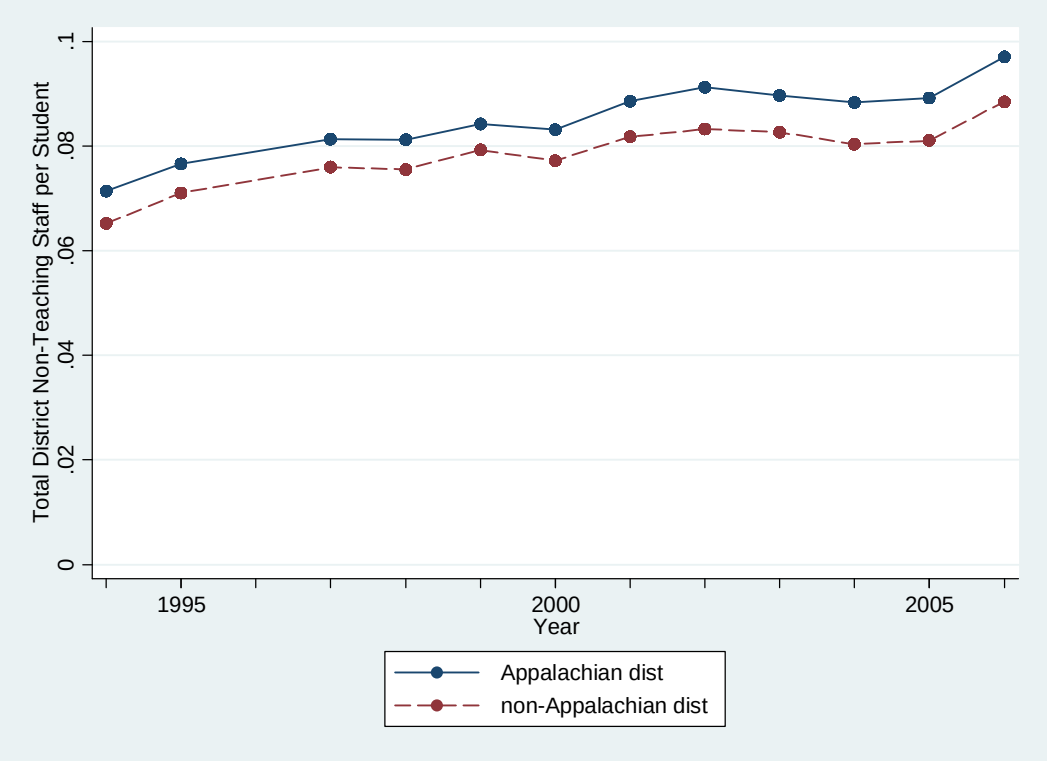
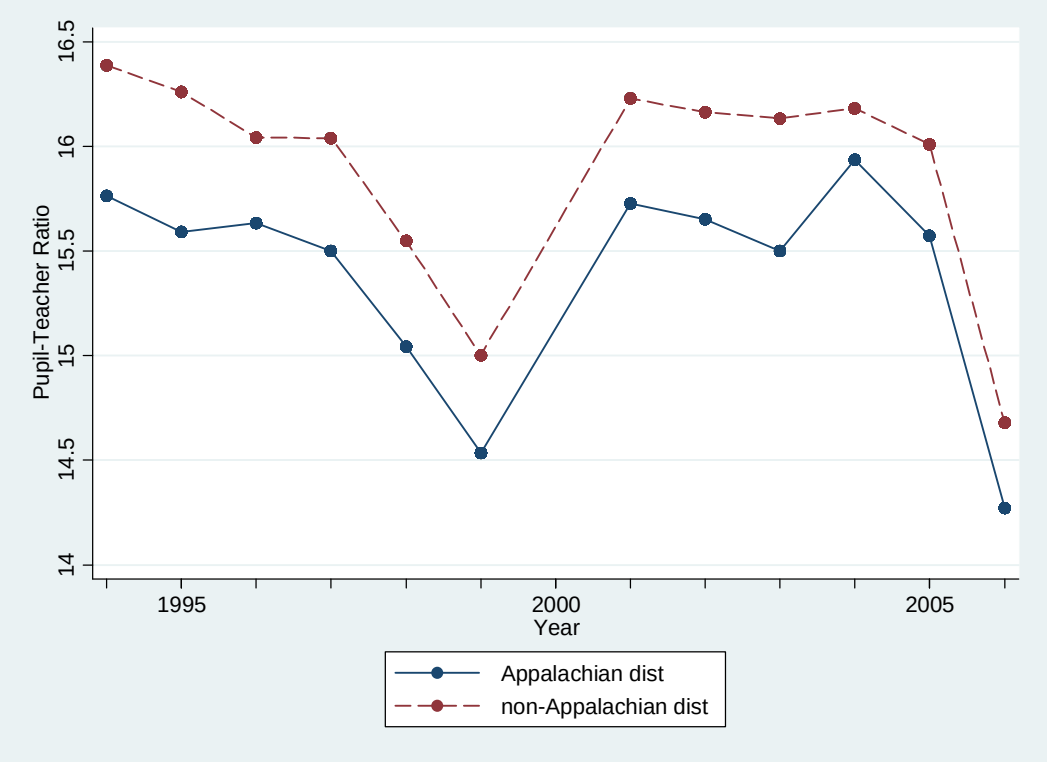


Figure 7: Pupils per teacher in Appalachian vs. non-Appalachian Kentucky school districts, 1994-2006. Data are from the NCES Common Core of Data (U.S. Department of Education, 2009).



Appendix 1: The Kentucky Funding Formula

Kentucky's school finance reform included the Support Educational Excellence in Kentucky (SEEK) formula.[11] The Kentucky Legislative Research Commission (2002) describes this policy's support and equity goals: "….to provide a minimum level of education funding for each student regardless of the wealth of the student's school district; require at least a minimum level of effort to provide funding from each school district; make spending per pupil more equal across Kentucky by basing the amount of state aid per pupil on the wealth of the local school district; and within the constraint of keeping funding per pupil relatively equal, encourage local school districts to increase education funding." The first level of funding under SEEK is a guaranteed base (which started at $2305 per pupil in the first year of implementation, 1990-1991) which is further adjusted based on factors such as student poverty and estimated transportation costs. A minimum tax effort by districts is required ($0.30 per $100 assessed value). Districts whose property value per enrolled child does not exceed a threshold of one-and-a-half times the state mean can also provide up to 15% of the base in own source revenues without jeopardizing state support ("Tier I" funding). Poorer districts whose property tax base lay below the threshold are given additional state funding to bring their revenue up to that which would be collected on such a tax base. Without state matching, districts can generate further own source revenues up to 30 percent of the base plus Tier I, if supported by the voters ("Tier II"). A "hold harmless" provision

[11]This summary of SEEK is based on the Legislative Research Commission's 1997 publication, *Kentucky Education Reform Act*, and the Commission's 2002 publication, "The SEEK formula for funding Kentucky's school districts: an evaluation of data, procedures, and budgeting".

protects districts from being worse off from their funding level in 1991-1992. Interestingly, though the formula is based on certain expectations about district costs such as transportation, once the final amount of support is given to districts they may allocate the money as desired within constraints of applicable statutes and rules – not necessarily in the way the formula anticipated.

Appendix 2: Estimation results of year-by-year regressions including district fixed effects (dependent variable = teacher base salary in 2005 dollars; see Eq. 1). Individual district fixed effects are summarized in the text above. Estimation was by ordinary least squares with robust standard errors. The reference category for rank was Rank 1, the highest teacher credential in Kentucky. Experience is measured discretely in years.

Year	N	adjusted R^2	b(Rank2)	b(Rank3)	b(Rank>3)	b(Exper.)	b(Exper.^{2})	b (cons)
1980	20867	0.827	-3763***	-6890***	-5874***	1290***	-30***	27506***
1981	21935	0.830	-3553***	-6622***	-5311***	1198***	-27***	27859***
1982	23287	0.847	-3993***	-7392***	-6398***	1123***	-26***	31915***
1983	24589	0.849	-3953***	-7364***	-6722***	1103***	-25***	32928***
1984	25673	0.853	-3852***	-7240***	-6046***	1093***	-25***	31807***
1985	27136	0.859	-3821***	-7197***	-6115***	1128***	-25***	31509***
1986	28317	0.887	-4038***	-7425***	-6615***	1209***	-26***	32686***
1987	29566	0.903	-4156***	-7392***	-6725***	1343***	-27***	32614***
1988	30415	0.907	-4084***	-7288***	-6883***	1288***	-25***	32315***
1989	31008	0.904	-4072***	-7315***	-6485***	1275***	-25***	32482***
1990	32377	0.905	-4307***	-7645***	-7618***	1300***	-24***	35991***
1991	33219	0.912	-4341***	-7623***	-7201***	1318***	-24***	38099***

Year	N	adjusted R^2	b(Rank2)	b(Rank3)	b(Rank>3)	b(Exper.)	b(Exper.^{2})	b (cons)
1992	33777	0.922	-4252***	-7451***	-7609***	1273***	-23***	36776***
1993	33774	0.920	-4162***	-7233***	-7695***	1240***	-22***	35560***
1994	34610	0.921	-4167***	-7219***	-7627***	1217***	-21***	34865***
1995	36068	0.919	-4136***	-7183***	-7422***	1185***	-20***	34917***
1996	33949	0.922	-4050***	-7049***	-7220***	1172***	-20***	34807***
1997	33473	0.927	-4007***	-6903***	-6849***	1159***	-19***	34041***
1998	33933	0.923	-4016***	-6894***	-7037***	1171***	-19***	33993***
2000	34465	0.891	-4194***	-7113***	-8692***	1224***	-21***	33654***
2001	35246	0.894	-4210***	-7124***	-8922***	1224***	-21***	33908***
2002	35421	0.890	-4192***	-7400***	-8863***	1243***	-22***	34402***
2003	35790	0.892	-4231***	-7415***	-8373***	1248***	-21***	34391***
2004	36438	0.895	-4207***	-7279***	-8314***	1236***	-21***	34261***
2005	37427	0.896	-4253***	-7241***	-9564***	1244***	-21***	34621***

*** p<0.001.

References

Allegretto, S., Corcoran, S., and Mishel, L. (2004). *How Does Teacher Pay Compare?: Methodological Challenges and Answers*. Washington, DC: Economic Policy Institute.

Appalachian Regional Commission. (2009a). Counties in Appalachia. Available at URL: http://www.arc.gov/index.do?nodeId=27.

Appalachian Regional Commission. (2009b). ARC-designated Distressed Counties, Fiscal Year 2010. Available at URL: http://www.arc.gov/index.do?nodeId=3355. Accessed November 30, 2009.

Arnold, M., Newman, J., Gaddy, B., and Dean, C. (2005). A look at the condition of rural education research: Setting a direction for future research. *Journal of Research in Rural Education, 20*(6), 20-26.

Ballou, D. and Podgursky, M. (1995). Rural Schools. *Rural Development Perspectives,* 10(3), 1-16.

Boyd, D., Lankford, H., Loeb, S., and Wyckoff, J. (2005). The Draw of Home: How Teachers' Preferences for Proximity Disadvantage Urban Schools. *Journal of Policy Analysis and Management, 24*(1), 113-132.

Chester, M., and Beaudin, B. (1996). Efficacy Beliefs of Newly Hired Teachers in Urban Schools. *American Educational Research Journal, 33*(1), 233.

Chevalier, A. (2004). *Parental Education and Child's Education: A Natural Experiment*. Bonn, Germany: Institute for the Study of Labor.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M.,

Weinfield, F. D., et al. (1966). *Equality of Opportunity*. Washington, D.C.: Government Printing Office.

Cseh, A., Troske, K., and Ziliak, J. P. (2006). Poverty Trends in Kentucky: A Return to Normal? In R. A. Sigafus (Ed.), *Kentucky Annual Economic Report*. Lexington, KY: Center for Business and Economic Research.

Darling-Hammond, L. (1999). *Teacher Quality and Student Achievement: A Review of State Policy Evidence*: Center for the Study of Teaching and Policy, University of Washington.

Downes, T. and Shoeman, D. (1988). School Financing Reform and Private School Enrollment: Evidence from California. *Journal of Urban Economics,* 43, 418-43.

Eissa, N. (2002). Taxation and Labor Supply of Married Women: The Tax Reform Act of 1986 as a Natural Experiment. *NBER working paper*.

Fedstats.gov. (2009). Kentucky MapStats. Available at URL: http://www.fedstats.gov/qf/states/21000.html. Last updated July 10, 2009. Accessed October 16, 2009.

Fischel, W.A. (1996). How Serrano Caused Proposition 13. Journal of Law and Politics, 12, 607-45.

Flanagan, A. E., and Murray, S. E. (2004). A Decade of Reform: The Impact of School Reform in Kentucky. In J. Yinger (Ed.), *Helping Children Left Behind: State Aid and the Pursuit of Educational Equity*. Boston, MA: The MIT Press.

Flyer, F., and Rosen, S. (1997). The New Economics of Teachers and Education.

Journal of Labor Economics, 14, 104-139.

Gould, E., Lavy, V., and Paserman, M. (2004). Immigrating to Opportunity: Estimating the Effect of School Quality Using a Natural Experiment on Ethiopians in Israel. *Quarterly Journal of Economics, 119*(2), 489-526.

Greenwald, R., Hedges, L. V., and Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research, 66*(3), 361-396.

Guarino, C. M., Santibanez, L., and Daley, G. A. (2006). Teacher Recruitment and Retention: A Review of the Recent Empirical Literature. *Review of Educational Research, 76*(2), 173-173.

Hanushek, E. A. (1986). The Economics of Schooling: Production and Efficiency in Public Schools. *Journal of Economic Literature, 24*(3), 1141-1177.

Hanushek, E. A. (1989). The Impact of Differential Expenditures on School Performance. *Educational Researcher, 18*(4).

Hoyt, W.H. (1999). An Evaluation of the Kentucky Education Reform Act. *Kentucky Annual Report* Lexington, KY: University of Kentucky Center for Business and Economic Research, 21-36.

Hoyt, W. H., Jepsen, C., and Troske, K. R. (2008). Educational Spending: Kentucky vs. Other States. Lexington, KY: University of Kentucky Center for Business and Economic Research.

Johnson, S. (2006). *The Workplace Matters: Teacher Quality, Retention and Effectiveness*. Washington, DC: National Education Association of the United States.

Lankford, H., Loeb, S., and Wyckoff, J. (2002). Teacher Sorting and the Plight of Urban Schools: A Descriptive Analysis. *Educational Evaluation and Policy Analysis, 24*(1), 37.

Lankford, H., and Wyckoff, J. (1997). The Changing Structure of Teacher Compensation, 1970-94. *Economics of Education Review, 16*, 371-384.

Legislative Research Commission (1997). *Kentucky Education Reform Act*. Frankfort, KY: Legislative Research Commission.

Legislative Research Commission (2000). *Teacher Quality Issues in Kentucky*. Frankfort, KY: Legislative Research Commission..

Legislative Research Commission (2002). The SEEK formula for funding Kentucky's school districts: an evaluation of data, procedures, and budgeting. Frankfort, KY: Legislative Research Commission.

Loeb, S., and Page, M. E. (2000). Examining the Link between Teacher Wages and Student Outcomes: The Importance of Alternative Labor Market Opportunities and Non-Pecuniary Variation. *The Review of Economics and Statistics, 82*(3), 393-408.

Moser, M., and Rubinstein, R. (2002). The Equality of Public School District Funding in the United States: A National Status Report. Public Administration Review. 62, 63-72.

Murnane, R., and Olsen, R. (1990). The Effects of Salaries and Opportunity Costs on Length of Stay in Teaching: Evidence from North Carolina. *Journal of Human Resources, 25*(1), 106-124.

Murray, S.E., Evans, W.N. and Schwab, R. M. (1998). Education-Finance

Reform and the Distribution of Education Resources. American Economic Review, 88, 789-812.

Provasnik, S., KewalRamani, A., Coleman, M., Gilbertson, L., Herring, W., and Xie, Q. (2007). *Status of Education in Rural America*. Washington, DC: National Center for Education Statistics.

Rivkin, S. G., Hanushek, E. A., and Kain, J. F. (2005). Teachers, Schools, and Academic Achievement. *Econometrica, 73*(2), 417-458.

Rowan, B., Correnti, R., and Miller, R. (2002). What Large Scale Survey Research Tells Us About Teacher Effects on Student Achievement: Insights From the Prospects Study of Elementary Schools. *The Teachers College Record, 104*(8), 1525-1567.

Sanders, W. L., and Rivers, J. C. (1996). *Cumulative and residual effects of teachers on future student academic achievement*. Knoxville, TN: University of Tennessee Value-Added Research and Assessment Center

Sherwood, T. (2000). Where Has All the" Rural" Gone? Rural Education Research and Current Federal Reform. *Journal of Research in Rural Education, 16*(3), 159-167.

Stinebrickner, T. (2001). A Dynamic Model of Teacher Labor Supply. *Journal of Labor Economics, 19*(1), 196-230.

Streams, M., and Toma, E. (2008). Teacher compensation in high poverty, rural schools: An intrastate comparison of Appalachian and non-Appalachian Kentucky. *University of Kentucky working paper*.

Theobald, N., and Picus, L. (1991). Living with equal amounts of less. *Journal of*

Educational Finance, 17, 7-32.

U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. 2009. Build-a-Table tool, Common Core of Data. Available at URL: http://nces.ed.gov/ccd/bat/.

The IFIR Working Papers Series

Other titles in the series:

No. 2005-01: "MSA Location and the Impact of State Taxes on Employment and Population: A Comparison of Border and Interior MSA's," William H. Hoyt and J. William Harden.

No. 2005-02: "Estimating the Effect of Elite Communications on Public Opinion Using Instrumental Variables," Matthew Gabel and Kenneth Scheve.

No. 2005-03: "The Dynamics of Municipal Fiscal Adjustment," Thiess Buettner and David E. Wildasin.

No. 2005-04: "National Party Politics and Supranational Politics in the European Union: New Evidence from the European Parliament," Clifford J. Carrubba, Matthew Gabel, Lacey Murrah, Ryan Clough, Elizabeth Montgomery and Rebecca Schambach.

No. 2005-05: "Fiscal Competition," David E. Wildasin.

No. 2005-06: "Do Governments Sway European Court of Justice Decision-making?: Evidence from Government Court Briefs," Clifford J. Carrubba and Matthew Gabel.

No. 2005-07: "The Assignment and Division of the Tax Base in a System of Hierarchical Governments," William H. Hoyt.

No. 2005-08: "Global Competition for Mobile Resources: Implications for Equity, Efficiency, and Political Economy," David E. Wildasin.

No. 2006-01: "State Government Cash and In-kind Benefits: Intergovernmental Fiscal Transfers and Cross-Program Substitution," James Marton and David E. Wildasin.

No. 2006-02: "Decentralization and Electoral Accountability: Incentives, Separation, and Voter Welfare," Jean Hindriks and Ben Lockwood.

No. 2006-03: "Bureaucratic Advice and Political Governance," Robin Boadway and Motohiro Sato.

No. 2006-04: "A Theory of Vertical Fiscal Imbalance," Robin Boadway and Jean-Francois Tremblay.

No. 2006-05: "On the Theory and Practice of Fiscal Decentralization," Wallace E. Oates.

No. 2006-06: "The Impact of Thin-Capitalization Rules on Multinationals' Financing and Investment Decisions," Thiess Buettner, Michael Overesch, Ulrich Schreiber, and Georg Wamser.

No. 2006-07: "Disasters: Issues for State and Federal Government Finances," David E. Wildasin.

No. 2006-08: "Tax competition, location, and horizontal foreign direct investment," Kristian Behrens and Pierre M. Picard.

No. 2006-09: "The effects of partisan alignment on the allocation of intergovernmental transfers. Differences-in-differences estimates for Spain," Albert Solé-Ollé and Pilar Sorribas-Navarro.

No. 2006-10: "Reforming the taxation of Multijurisdictional Enterprises in Europe, "Coopetition" in a Bottom-up Federation," Marcel Gerard.

No. 2006-11: "The Dilemmas of Tax Coordination in the Enlarged European Union," Jens Brøchner, Jesper Jensen, Patrik Svensson, and Peter Birch Sørensen.

No. 2006-12: "Using a discontinuous grant rule to identify the effect of grants on local taxes and spending," Matz Dahlberg, Eva Mörk, Jørn Rattsø, and Hanna Ågren.

No. 2006-13: "Size and Soft Budget Constraints," Ernesto Crivelli and Klaas Staalz.

No. 2006-14: "On the Optimal Design of Disaster Insurance in a Federation," Timothy Goodspeed and Andrew Haughwout.

No. 2006-15: "Fiscal Equalization and Yardstick Competition," Christos Kotsogiannis and Robert Schwager.

No. 2007-01: "Disaster Policy in the US Federation: Intergovernmental Incentives and Institutional Reform," David E. Wildasin.

No. 2007-02: "Local Government Finance in Kentucky: Time for Reform?" David E. Wildasin.

No. 2007-03: "Davis v. Department of Revenue of Kentucky: A Preliminary Impact Assessment," Dwight Denison, Merl Hackbart, and Michael Moody.

No. 2007-04: "Medicaid Expenditures and State Budgets: Past, Present, and Future," James Marton and David E. Wildasin.

No. 2007-05: "Pre-Emption: Federal Statutory Intervention in State Taxation," David E. Wildasin.

No. 2007-06: "Think Locally, Act Locally: Spillovers, Spillbacks, and Efficient Decentralized Policymaking," Hikaru Ogawa and David E. Wildasin.

No. 2007-07: "Equalization Transfers and Dynamic Fiscal Adjustment: Results for German Municipalities and a US-German Comparison," Thiess Buettner.

No. 2008-01: "Civic Virtue, the American Founding, and Federalism," Stephen Lange.

No. 2008-02: "Public Finance in an Era of Global Demographic Change: Fertility Busts, Migration Booms, and Public Policy," David E. Wildasin.

No. 2009-01: "Decentralized Tax and Public Service Policies with Differential Mobility of Residents," William H. Hoyt.

No. 2009-02: "Business Incentives and Employment: What Incentives Work and Where?" William H. Hoyt, Christopher Jepsen and Kenneth R. Troske.

No. 2009-03: "Tax Limits, Houses, and Schools: Seemingly Unrelated and Offsetting Effects," William H. Hoyt, Paul A.Coomes and Amelia M. Biehl.

No. 2009-04: "The Taxpayer Relief Act of 1997 and Homeownership: Is Smaller Now Better?" Amelia M. Biehl and William H. Hoyt.

No. 2009-05: "Is the Grass Greener on the Other Side of the River?: The Choice of Where to Work and Where to Live for Movers," Ken Sanford and William H. Hoyt.

No. 2009-06: "The Value of a College Education: Estimating the Effect of Teacher Preparation on Student Achievement," Sharon Kukla-Acevedo and Eugenia F. Toma.

No. 2009-07: "State and Local Government Finance in the Current Crisis: Time for Emergency Federal Relief?" David E. Wildasin.

No. 2009-08: "State Corporation Income Taxation; An Economic Perspective on Nexus," David E. Wildasin.

No. 2009-09: "Evaluation of Teacher Preparation Programs: A Reality Show in Kentucky," Sharon Kukla-Acevedo, Megan Streams and Eugenia F. Toma.

No. 2009-10: "Evidence-Based Practice and the Use of Information in State Agency Decision-Making," Edward T. Jennings, Jr. and Jeremy L. Hall.

No. 2009-11: "Intergovernmental Transfers to Local Governments," David E. Wildasin.

No. 2009-12: "Fiscal Competition for Imperfectly-Mobile Labor and Capital: A Comparative Dynamic Analysis," David E. Wildasin.

No. 2009-13: "School Finance Reform: Do Equalized Expenditures Imply Equalized Teacher Salaries?," Meg, Streams, J.S. Butler, Joshua Cowen, Jacob Fowles and Eugenia F. Toma.

IFIR Working Papers contain original research contributed by scholars affiliated with the Institute for Federalism and Intergovernmental Relations at the Martin School of Public Policy and Administration at the University of Kentucky, Lexington, Kentucky. Visit the IFIR web site at http://www.ifigr.org to download IFIR Working Papers and for other information about IFIR.