

The Coal Industry and Funding Support for Elementary and Secondary Education in Appalachia: A Descriptive Analysis

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All views expressed are those of the authors

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Executive Summary

This is the first of two reports exploring the relationship between coal activity and funding for elementary and secondary education in the Appalachian Region. In this first report, patterns in funding for elementary and secondary education are explored using annual data from 1995 to 2016. Counties that had some level of coal employment over this time period (coal counties) are compared to counties that had no coal employment over the same time (non-coal counties). Through a descriptive analysis, we find that educational attainment rates in the Appalachian Region lag behind national rates, often by a significant margin. There is considerable heterogeneity in educational attainment across and within Appalachia, with coal communities within states sometimes outperforming non-coal communities and vice versa. The Appalachian region is also characterized by higher incidences of poverty, higher unemployment rates, and lower per capita incomes. These weaker economic conditions can impact communities' ability to generate taxes from their own tax base such as local tax revenues which fund education. Education is essential for economic development and prosperity, particularly in incidences where declines in coal activity has been devastating for communities that already have lower levels of educational attainment. Encouragingly, we find that coal counties generally have similar levels of spending and local revenues per student as the nation as a whole. However, there is significant variation across counties and states. This descriptive analysis is followed by a second report, which aims to isolate the impacts of coal activity, including employment and production, on local revenues for elementary and secondary education.

Introduction

This is the first phase of a two-prong research agenda exploring the pattern of funding for elementary and secondary education in Appalachian counties, specifically those that are under the umbrella of the Appalachian Regional Commission. The focus falls on counties that had some level of coal employment between 1995 and 2016 (*coal counties*) and Appalachian counties that had no coal employment (*non-coal counties*) over the same period of time (see Figure 1 and Appendix Table 1 for a map and complete list of coal counties). Our interest is the extent to which declining and variable coal activity (e.g., employment in the coal industry) at the county level has affected public school spending per pupil, state education aid per pupil and locally-generated revenue in support of public schooling.

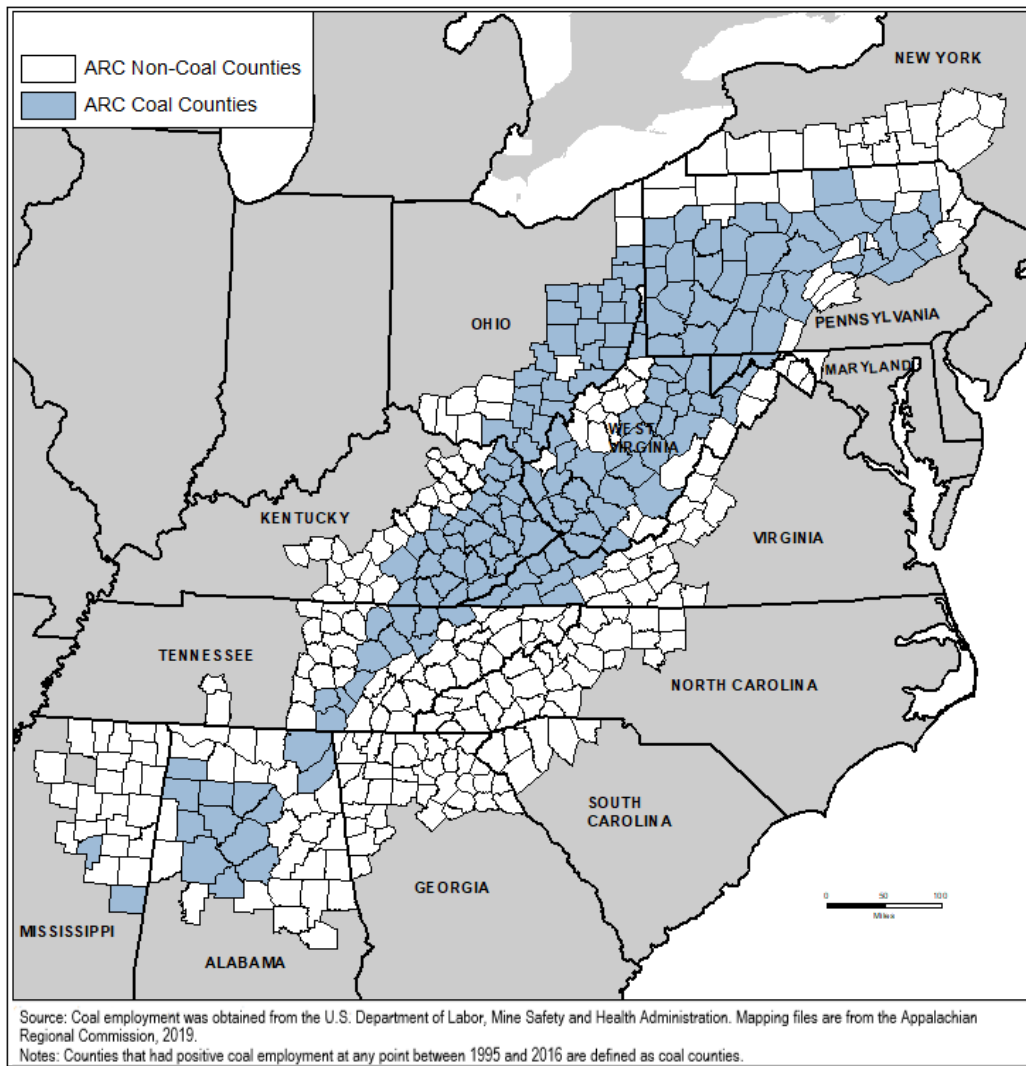
There are many reasons to be concerned about the pattern of funding support for elementary and secondary education. First, the Appalachian Region is relatively poor and educational attainment rates lag the nation. Enhancing educational attainment is critical to the future of workers and their families, along with regional economies throughout Appalachia. Absent a well-educated population, the region will continue to suffer from underdevelopment. Second, because the region is relatively poor, it has less capacity than wealthier regions to support funding for public schooling. The problem is aggravated by the coal sector. While the coal industry has had a material impact on economic wellbeing and tax base expansion, its decline evokes a greater need for critical services like education and weakens the capacity to support public service delivery.

In this first phase of research, reported here, we take a descriptive look at this problem. In the next phase, we use multivariate statistical methods to more fully understand the relationship between coal activity and local funding support for schooling. We begin here by speculating on key transmission mechanisms whereby declining coal activity, along with its variability, may hurt funding support for public schooling. The analysis turns to documentation of educational attainment levels, economic development challenges and tax generation. Next is analysis of the coal sector and its declining impact on the region. This is followed by an examination of funding patterns, state aid and locally-generated taxes that contribute to public school spending.

Our findings point to not only weak economic conditions, but by some measures, further deterioration in economic conditions for coal counties in Appalachia between 1995 and 2016. Population outflows from coal communities are alarming in isolation, but especially alarming when compared to other regions, including non-coal communities in Appalachia. Revenue-raising capacity is depressed in coal counties where per capita income in 2016 was just 69.8 percent of the national

average. Despite the many challenges confronting the region, it is encouraging that coal communities have per pupil spending levels that are roughly on par with the nation. There are exceptions, however, including coal communities in Alabama, Kentucky and Tennessee. Local revenue support for public education trails the nation by a wide margin in coal communities and in non-coal communities in Appalachia; on average, coal communities actually have higher spending from local own sources than their non-coal counterparts. The evidence presented below indicates that some of this is due to weak revenue-generating capacity because of the weak underlying economy, but some is due to communities who simply choose relatively low tax burdens.

Figure 1: Coal Counties: Appalachian Counties with Some Level of Coal Employment Between 1995 and 2016



Framing the Problem

The economic base of the Appalachian Region has long benefited from business activity tied to extractive resources, including timber and minerals, and notably, coal. The availability of export markets, both domestic and international, allowed for the creation of good quality jobs tied to resource extraction, in turn supporting a supply chain and multiplier effects within the region. This same economic activity also helped strengthen state and local tax bases. Despite the economic and fiscal benefits that this economic activity has generated, the region remains underdeveloped and suffers from a higher incidence of poverty, higher unemployment rates and lower per capita incomes than the nation as a whole. Aggravating the economic development challenges facing the region is a coal sector that is in secular decline due to the loss of easily-exploitable coal reserves, technological innovations that have diminished the need for workers, market forces and the emergence of low-cost energy alternatives (notably natural gas), environmental regulations, and growing consumer tastes for clean energy sources.

In general, the path to regional economic prosperity hinges on the capacity to create and sustain good quality jobs and a tax base that can support essential public services like education, as well as services that enhance quality of life and community livability. The basic ingredients to economic development success include private sector capital investments, quality sites for businesses to locate their facilities, infrastructure that provides access to markets and publicly-provided services that are valued by businesses and households. Arguably, the most important ingredient to individual and regional success is a vibrant labor market with a well-educated and experienced workforce.

Unfortunately, as discussed more fully below, many areas of Appalachia trail the national average in terms of educational attainment. This is especially true of many small, rural communities. While the region as a whole is on average investing new dollars in public education commensurate with the national average, there are exceptions. The region's future hinges on its ability to foster a labor force that will enable it to recruit and retain employers and create economic prosperity for workers and the region as a whole. This will require ongoing, long-term investments in human capital through the entire education pipeline, from early childhood education to adult training and retraining programs.

This research explores an important facet of the human capital challenge confronting Appalachia: how coal-related economic activity is linked to locally-generated tax support for elementary and secondary education. There are a number of possible transmission mechanisms that might influence the amount of local tax revenue that is generated to support schooling. The narrative here focuses on

how these mechanisms might work against the provision of strong, locally-provided funding streams for education, given coal industry's decline.

- Regions that are relatively poor have populations that face compelling needs like food, shelter and transportation, leaving fewer resources available to support public services through taxation, including schooling. This suggests that poor communities in particular may not have the *capacity* to invest in public education, i.e., the ability to fund education from own-source tax bases. Aggravating the problem for coal communities is a declining employment and business base that further narrows local tax bases.
- High-paying jobs in the coal industry offer an attractive employment opportunity for local residents, diminishing the perceived need to prepare young people for advanced studies through public schooling. Even as the coal industry has endured long-term decline, some regions have prospered and others have ridden a roller coaster with declining but then re-emerging job opportunities in the coal sector.
- Communities generally, and especially those with a relatively large coal sector, may be reticent to raise taxes because they fear the loss of the *mobile* business tax base, i.e., businesses that can locate in any of a number of regions to produce goods and services that are sold elsewhere. This puts downward pressure on property and sales tax rates, as well as other local taxes and fees.
- Coal employment in Appalachia is not only in long-term decline, but there has been considerable volatility as employment has trended down. This unhealthy and unstable fiscal environment may translate into caution when investing public funds in education because of the potential need to cut future spending, which would impact school staffing, capital spending and public morale. Ongoing, conservative approaches to funding locally-provided services may constrain the ability to invest adequately in public education.
- Finally, there are possible negative impacts on state-provided aid for elementary and secondary schools. If young people in coal communities drop out of high school, whether today or in the future, the amount of per pupil aid from the state will be diminished. Declining enrollments as a result of a weakening local community and population outmigration would have the same impact on state aid. While fewer students translate into lower costs, it can be problematic for class size and student-to-teacher ratios and for capital expenditures which have been previously committed.

It is important to emphasize that this narrative does not preordain a weak local commitment to funding elementary and secondary education from own sources. But it does highlight some of the prominent pressures and risks confronting coal communities in Appalachia as they seek to invest in their human capital base.

Educational Attainment, Regional Economic Performance and Tax Effort

The Appalachia Region is broadly characterized as having low levels of educational attainment, yet education is essential to promoting economic development. There is considerable heterogeneity in educational attainment across and within the Appalachian states. Table 1 provides data on two measures of educational attainment: the percent of the population aged 18-24 with at least a high school degree and the percent of the population aged 25 and above with at least a bachelor's degree. In order to highlight differences between places that have coal activity and those which do not, we distinguish between *coal counties* and *non-coal counties* within the Appalachian Region. Coal communities are defined as counties that had coal employment at any point in the window between 1995 and 2016, while non-coal counties are places that never had coal employment during this same window of time. Appalachian states that had no coal activity during this period of time are included in the analysis below, but the emphasis falls on states that had some coal presence and the non-coal and coal communities within these same states. This allows a focus on places with similar fiscal systems at the state and local levels.

Appalachian non-coal communities, Appalachian coal communities, and the Appalachian states (including all counties, not just those in the ARC-defined region) have a lower share of their population aged 18 to 24 with at least a high school degree than the national average. However, note from the bottom panel of the table that Appalachian coal counties trail the national average but nonetheless outperform non-coal counties and the set of all counties within the Appalachian states. The top performers are coal counties in Maryland, Pennsylvania and Virginia, where high school attainment rates are ahead of the national average. Coal counties in Tennessee and West Virginia are in line with the national average. The weakest performers are coal counties in Alabama, Kentucky, Mississippi and Ohio. It is interesting to note that coal counties in Kentucky, Maryland, Pennsylvania, Virginia and West Virginia show higher high school attainment rates than their in-state non-coal counterparts.

Table 1: Educational Attainment for Coal and Non-Coal Appalachian Counties*

	Percent of Population 18 to 24 with at Least a High School Diploma (including equivalency)	Percent of Population Age 25 and Over with at Least a Bachelor's Degree
Alabama non-coal counties	81.4	16.8
Alabama coal counties	80.9	17.6
Kentucky non-coal counties	82.3	14.4
Kentucky coal counties	82.5	11.9
Maryland non-coal counties	82.7	20.1
Maryland coal counties	88.4	18.6
Mississippi non-coal counties	82.2	16.5
Mississippi coal counties	77.3	13.4
Ohio non-coal counties	80.9	14.9
Ohio coal counties	80.8	14.4
Pennsylvania non-coal counties	83.2	18.6
Pennsylvania coal counties	87.1	20.4
Tennessee non-coal counties	87.8	15.5
Tennessee coal counties	86.1	13.0
Virginia non-coal counties	87.7	18.4
Virginia coal counties	88.6	14.0
West Virginia non-coal counties	83.8	15.8
West Virginia coal counties	86.2	16.0
Appalachian non-coal counties**	83.5	17.9
Appalachian coal counties	84.5	15.8
Appalachian states, all counties***	83.1	19.4
U.S.	86.2	30.3

Source: U.S. Census Bureau, American Community Survey, 2012-2016 5-year estimates.

* Counties that had positive coal employment at any point between 1995 and 2016 are defined as coal counties.

** Appalachian non-coal counties represents all non-coal counties in the ARC-defined region, including non-coal counties in non-coal states (Georgia, North Carolina, New York, and South Carolina).

*** Appalachian states includes all counties in and outside of the ARC-defined region.

Significantly greater disparities exist between the U.S. and Appalachia when considering the share of the adult population with a bachelor's degree. The bottom panel of Table 1 shows that the national attainment rate is 30.3 percent compared to just 15.8 percent for coal counties. Coal counties do slightly better than non-coal counties, while the ARC states (again accounting for all counties in the state) do a bit better than both coal and non-coal counties. Coal counties in three states—Alabama,

Pennsylvania and West Virginia—show higher college attainment rates than non-coal counties in the same states. Outcomes are especially low in coal counties in Kentucky, Mississippi, Ohio, Tennessee and Virginia, where college attainment rates are less than one-half the national average.

Together, the data paint an interesting picture. While high school attainment rates compare reasonably well to the nation as a whole, relatively small shares of the adult population have a bachelor's degree. Part of this reflects a historical legacy of low advanced attainment rates in the region, and part of it is likely due to the outmigration of young people and others with advanced degrees. In the end, this does not bode well for the recruitment of new industry that is looking for a well-educated workforce. This will be especially true in smaller communities where the diversity of degree holders is limited as well, offering businesses a limited pool of skilled workers across academic fields and occupational categories.

Measures of economic vitality in the Appalachia Region lag the nation, often by a wide margin. Two dimensions of this are especially important in the context of human capital development. First, weak economic outcomes diminish the attractiveness of advanced education opportunities. The standard economic model of individual human capital development places great importance on the market returns to education as a driving force for individual investment. Constrained earnings opportunities will discourage investments in education because returns to investment are diminished. Second, a weak economy translates into a weak tax base. Lower income households tend to own homes with relatively lower property values and spend less on sales-taxable goods and services; low incomes also limit the capacity to contribute to other local taxes and fees. The weak economy translates into weak revenue-raising capacity.

Table 2 presents selected socioeconomic characteristics to place the environment of coal counties in Appalachia in perspective. Like Table 1, the bottom panel provides summary data for a broad comparison of non-coal counties, coal counties, Appalachian states and the U.S., while the body of the table provides detail for coal and non-coal counties in each state. Inflation-adjusted per capita income for coal counties in Appalachia stood at \$34,830 in 2016, lagging non-coal communities and the Appalachian states, and representing just 69.8 percent of the national average of \$49,870. In 1995, per capita income in coal counties was 70.4 percent of the national average. Coal counties in Kentucky, Maryland, Mississippi and Pennsylvania all saw more rapid growth in per capita income between 1995 and 2016 than the nation, the strongest showing coming in Maryland (47.1 percent). None of the coal counties had per capita income above the national average in 1995 or in 2016.

Table 2: Socioeconomic Characteristics for Coal and Non-Coal Appalachian Counties*

	Per Capita Income (\$)			Poverty Rate			Unemployment Rate			Growth in Total Non-Farm Employment	Total Private, Non-Farm Employment	Growth in Population
	1995	2016	Percent Change	1995	2016	Percentage Point Change	1995	2016	Percentage Point Change	1995 to 2016	1995 to 2016	1995 to 2016
	Alabama non-coal counties	27,876	34,407	23.4	17.7	18.3	0.6	6.5	6.0	-0.5	-4.4	-7.4
Alabama coal counties	29,403	35,446	20.6	15.7	17.3	1.6	5.8	6.0	0.3	3.9	1.9	13.5
Kentucky non-coal counties	22,378	31,036	38.7	23.9	23.1	-0.8	7.0	6.2	-0.8	6.6	1.4	11.0
Kentucky coal counties	21,576	29,826	38.2	31.6	31.2	-0.4	9.6	9.9	0.3	-4.5	-6.5	-4.2
Maryland non-coal counties	30,604	44,355	44.9	10.2	13.2	3.0	6.1	5.2	-0.9	21.4	23.7	16.3
Maryland coal counties	27,395	40,291	47.1	16.1	15.0	-1.1	9.9	6.0	-3.9	13.4	12.2	-2.7
Mississippi non-coal counties	24,598	32,389	31.7	20.1	21.8	1.8	7.2	6.0	-1.2	-7.6	-11.6	3.4
Mississippi coal counties	21,034	29,998	42.6	23.7	25.7	2.1	8.8	7.2	-1.7	24.1	21.3	-7.2
Ohio non-coal counties	27,786	35,624	28.2	14.2	17.9	3.6	8.0	6.5	-1.6	-0.1	-0.3	5.2
Ohio coal counties	26,424	34,851	31.9	15.7	17.1	1.3	7.6	7.1	-0.5	-2.8	-3.8	0.4
Pennsylvania non-coal counties	29,859	39,216	31.3	11.4	13.3	1.9	6.7	6.0	-0.7	13.3	6.0	7.7
Pennsylvania coal counties	30,456	41,553	36.4	12.6	13.8	1.1	7.3	6.4	-1.0	3.4	4.5	-4.1
Tennessee non-coal counties	27,264	34,615	27.0	16.2	17.9	1.7	7.1	5.4	-1.6	7.1	1.2	19.2
Tennessee coal counties	24,673	31,812	28.9	20.6	20.7	0.1	7.3	6.3	-1.0	9.9	-3.7	17.6
Virginia non-coal counties	28,114	37,461	33.2	12.8	15.0	2.2	6.3	4.9	-1.4	4.3	0.3	1.0
Virginia coal counties	25,196	31,679	25.7	21.5	21.9	0.5	12.3	7.5	-4.8	-8.9	-14.0	-7.6
West Virginia non-coal counties	25,620	33,665	31.4	19.4	17.1	-2.2	9.4	6.5	-2.9	2.0	-2.3	6.0
West Virginia coal counties	25,608	33,952	32.6	22.8	20.2	-2.6	9.8	7.4	-2.4	-1.8	-3.7	-4.2
Appalachian non-coal counties**	27,659	35,074	26.8	16.1	17.5	1.4	6.6	5.7	-0.9	10.1	6.7	16.9
Appalachian coal counties	26,199	34,830	32.9	20.4	20.3	0.0	8.5	7.4	-1.1	0.1	-2.0	-0.7
Appalachian states, all counties***	29,278	37,695	28.7	17.0	18.1	1.1	6.5	5.9	-0.6	10.9	9.4	14.3
U.S.	37,177	49,870	34.1	13.8	14.0	0.2	5.6	4.9	-0.7	22.9	24.5	21.3

Source: U.S. Bureau of Economic Analysis, U.S. Census Bureau's Small Area Income and Poverty Estimates (SAIPE) Program, U.S. Bureau of Labor Statistics, and U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW) Program.

Notes: All dollars are 2016 inflation-adjusted dollars.

*Counties that had positive coal employment at any point between 1995 and 2016 are defined as coal counties.

** Appalachian non-coal counties represents all non-coal counties in the ARC-defined region, including non-coal counties in non-coal states (Georgia, North Carolina, New York, and South Carolina).

*** Appalachian states includes all counties in and outside of the ARC-defined region.

Coal counties have a much higher incidence of poverty than the nation as a whole, though the disparity has been relatively stable over the 1995 to 2016 window. Coal counties did see a small decline in the poverty rate (0.01 percentage points) while the U.S. poverty rate edged slightly higher (up 0.2 percentage points). Coal counties in Pennsylvania were the only counties with a lower incidence of poverty in 2016 compared to the U.S. as a whole. With the exception of Alabama and Ohio, poverty rates were higher in each of the states' coal communities than non-coal communities in 2016.

Unemployment rates have fallen sharply for most of the geographies shown in Table 2. The only exceptions are coal communities in Alabama and Kentucky, where rates have risen. With only one exception—Alabama in 1995—coal counties have higher unemployment rates compared to their non-coal counterparts. Data for 2016 show a coal county unemployment rate average of 7.4 percent, compared to 4.9 percent for the U.S. Jobs data provide a complementary perspective. Total nonfarm employment for coal counties grew only 0.1 percent between 1995 and 2016, compared to 10.1 percent growth in employment in non-coal communities and 22.9 percent growth for the nation. Total private non-farm employment actually slipped 2.0 percent in coal counties while the U.S. recorded a 24.5 percent gain. With the exception of Alabama and Mississippi, non-coal communities have outperformed coal communities in terms of each of the nonfarm job metrics.

The final column of Table 2 shows the change in population between 1995 and 2016. Population growth represents a composite measure of economic vitality, as places with strong economies tend to attract people while places with weak economies tend to lose people. It is especially noteworthy that coal communities suffered a 0.7 percent decline in population while non-coal communities, Appalachian states and the U.S. experienced double-digit growth in population. Coal counties in Alabama, Ohio and Tennessee saw population gains while the other six states' coal counties experienced setbacks. Declining populations tend to translate into declining enrollments in elementary and secondary education, an issue we touch on in the narrative below.

These socioeconomic data show that coal counties in particular have fundamental economic weaknesses that translate into a tax capacity problem relative to the nation. That is, their ability to generate taxes from own source tax bases is low compared the average region across the U.S. A prominent example from Table 2 is per capita income, which for coal counties was 69.8 percent of the national average in 2016. In practice this means it will be harder, given existing economic resources, to generate local tax revenues to fund the range of public services, including education.

To emphasize, tax capacity is the *ability* to generate revenue. An important related concept is *tax effort*, or the extent to which local communities choose to exploit the taxes bases that are available to them. The distinction here is very important. Capacity reflects the economic activity underlying tax bases and is largely beyond the control of communities, especially in the short run. Tax effort, on the other hand, reflects choices communities make, typically through their choice of tax rates.¹ A community that exhibits high tax effort is choosing to make greater use of its available tax base than a community that exhibits low tax effort, given its capacity. If relatively poor communities place a high value on education (or other public services) they would be expected to display relatively high effort. Most people would show sympathy toward a poor region, but the same people may not be sympathetic to places that choose low effort. State education aid programs that funnel funding from the state to local communities often require that communities demonstrate some degree of adequate effort in order to receive state funds.

State and local tax effort data are presented in Table 3 for the same regions as presented in the earlier tables. To measure capacity, we use personal income, which is a resident-based measure that accounts for all income earned by county (state) residents regardless of source and location. Actual taxes generated, which in part reflects the choice of the tax base and tax rates, is the extent to which personal income is used to generate revenue. The ratio of taxes to personal income is thus the measure of tax effort.

Appalachian non-coal counties, Appalachian coal counties, Appalachian states, and the U.S. as a whole tend to display largely similar state tax effort, hovering in the vicinity of six percent. In other words, about six percent of personal income is used to fund state services, including aid from states to local communities. West Virginia generally has the highest measure of state tax effort while Virginia has the lowest tax effort. Local tax effort is smaller because local communities fund a smaller share of the public service portfolio compared to the states. What is striking is that coal counties in Appalachia show local tax effort of just 0.9 percent. Non-coal counties, on the other hand, show tax effort of 1.6 percent, which is a difference of 77.8 percent. Local tax effort is below one percent in Alabama, Kentucky, Ohio,

¹ States may constrain the tax base and tax rate choices available to local communities, in turn limiting a community's ability to influence its own tax effort.

Pennsylvania and West Virginia. Maryland and Virginia, on the other hand, exhibit relatively high tax effort.²

Table 3: Tax Effort: Taxes as a Share of Personal Income for Coal and Non-Coal Appalachian Counties, 2012*

	State Taxes as a Share of Personal Income**	Local Taxes as a Share of Personal Income	State and Local Taxes as a Share of Personal Income
Alabama non-coal counties	5.2	0.6	5.8
Alabama coal counties	5.2	0.7	5.9
Kentucky non-coal counties	6.7	0.5	7.2
Kentucky coal counties	6.7	0.6	7.2
Maryland non-coal counties	5.4	3.3	8.8
Maryland coal counties	5.4	4.4	9.8
Mississippi non-coal counties	7.0	1.0	8.0
Mississippi coal counties	7.0	1.2	8.2
Ohio non-coal counties	5.5	0.9	6.4
Ohio coal counties	5.5	0.8	6.4
Pennsylvania non-coal counties	5.6	0.7	6.3
Pennsylvania coal counties	5.6	0.6	6.2
Tennessee non-coal counties	4.7	2.0	6.7
Tennessee coal counties	4.7	2.0	6.7
Virginia non-coal counties	4.5	2.8	7.3
Virginia coal counties	4.5	3.1	7.5
West Virginia non-coal counties	8.1	0.8	8.9
West Virginia coal counties	8.1	0.8	8.9
Appalachian non-coal counties***	5.7	1.6	7.3
Appalachian coal counties	6.2	0.9	7.1
Appalachian states, all counties****	5.6	1.7	7.3
U.S.	5.8	1.5	7.4

Source: U.S. Bureau of Economic Analysis and U.S. Census Bureau, Census of Governments, 2012.

* Counties that had positive coal employment at any point between 1995 and 2016 are defined as coal counties.

** State taxes were calculated as a share of state personal income, and the same percentage was assumed at the local level within the state.

*** Appalachian non-coal counties represents all non-coal counties in the ARC-defined region, including non-coal counties in non-coal states (Georgia, North Carolina, New York, and South Carolina).

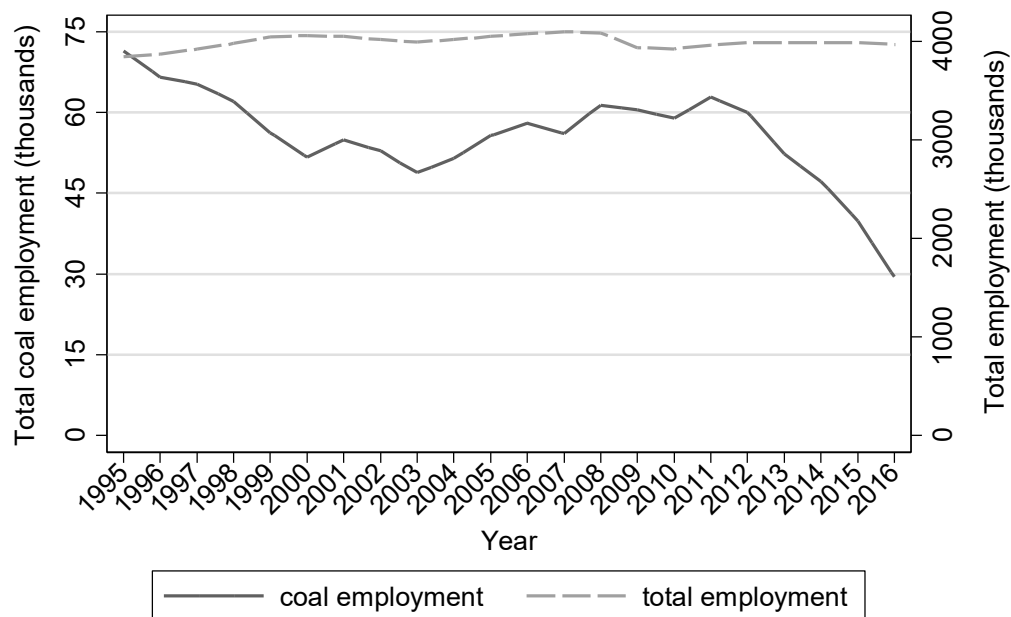
**** Appalachian states includes all counties in and outside of the ARC-defined region.

² Caution must be exercised in comparing capacity across states since the fiscal structure may differ, giving local governments differential opportunities to generate local tax revenue. For example, local communities in a state that constrains the local option sales tax rate might behave differently than local communities in a state with no limit on their ability to tax sales.

Coal Activity in Appalachia

The next step in our inquiry is to highlight selected features of coal production and coal employment patterns in the region to help frame the analysis of local school finances. Figure 2 provides a high-level view of trends in nonfarm employment and coal sector employment for coal counties in Appalachia from 1995 through 2016.³ Coal employment fell between 1995 and the early 2000s, before a brief but short-lived revival in regional coal employment. However, coal employment has been in decline since 2011. Nonfarm employment has performed better, but has nonetheless been flat. Total coal production, shown in Figure 3, has shown a more consistent downward trend since 1995.

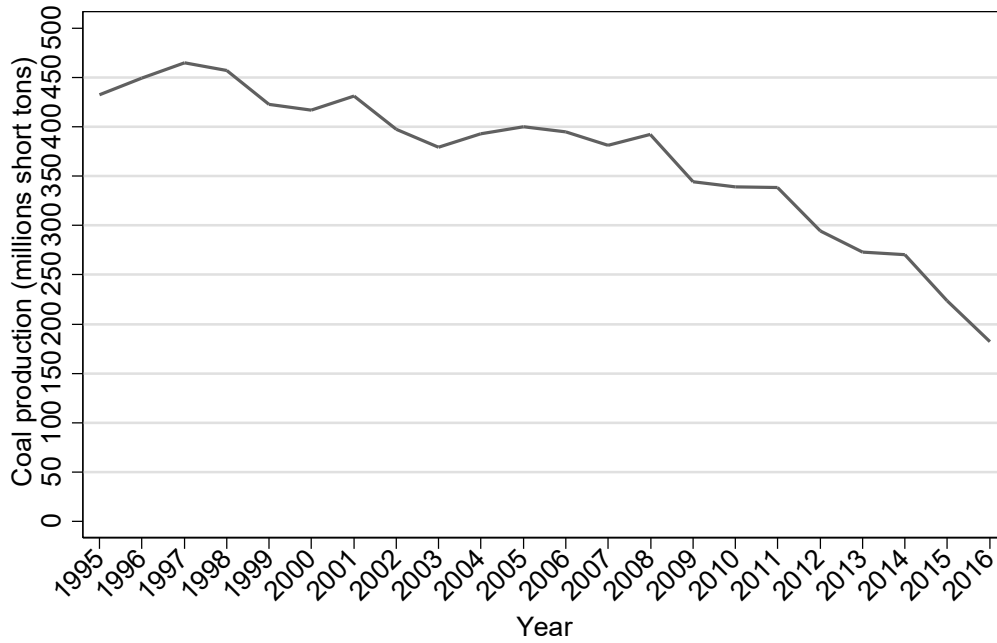
Figure 2: Coal and Total Employment for Appalachian Coal Counties, 1995-2016



Source: Mine Safety and Health Administration, BLS Quarterly Census of Employment and Wages.

³ Mine-level coal employment data was obtained from the U.S. Department of Labor, Mine Safety and Health Administration, and mine-level coal production data was obtained from the U.S. Energy Information Administration. Both coal employment and production were aggregated to produce county-level data.

Figure 3: Total Coal Production for Appalachian Counties, 1995-2016



Source: U.S. Energy Information Administration.

While there is heterogeneity in the performance of individual coal communities across Appalachian states, there is considerable conformity and large setbacks at the state level for their constituent local communities. Table 4 provides a state-by-state view. For the ARC region as a whole, coal employment was down 58.8 percent between 1995 and 2016, from 71,453 jobs to 29,473 jobs. Kentucky was the state that lost the largest share of its coal jobs, down 77.2 percent. Kentucky also held the top spot for the number of jobs lost, totaling 14,607. The smallest setback was in Maryland, where coal employment fell from 505 jobs to 358 jobs. Mississippi was the only state to see coal employment grow, from zero jobs in 1995 to 338 jobs in 2016.

Declining coal employment, coupled with flat or slightly declining nonfarm employment, translates into a coal sector that accounts for a smaller and smaller share of the local economic base across Appalachia. In 1995, coal employment averaged 0.8 percent of nonfarm employment across ARC states, slipping to 0.3 percent in 2016. All Appalachian states other than Mississippi saw large reductions in the relative contribution of coal employment to total nonfarm employment. In general, one would expect greater economic and fiscal hardship in places that have lost a large number of coal jobs and have witnessed a large reduction in the share of coal employment. Finally, while coal production is down

for the region as a whole, some areas of the region have been able to capture a larger share of the region's coal production, as shown in the last columns of Table 4.

Table 4: Appalachian Coal Employment and Production by State, 1995 and 2016

	Coal Employment			Coal Employment as Share of Total Non-Farm Employment*			Coal Production as a Share of Total ARC Coal Production		
	1995	2016	Percent Change	1995	2016	Percentage Point Change	1995	2016	Percentage Point Change
Alabama	6,076	2,162	-64.4	0.54	0.18	-0.4	5.70	5.28	-0.4
Kentucky	18,922	4,315	-77.2	5.87	1.28	-4.6	27.42	9.19	-18.2
Maryland	505	358	-29.1	0.54	0.33	-0.2	0.85	0.89	0.0
Mississippi	0	338	-	0.00	0.15	0.2	0.00	1.57	1.6
Ohio	3,691	1,556	-57.8	0.55	0.24	-0.3	5.97	6.89	0.9
Pennsylvania	10,688	5,275	-50.6	0.47	0.22	-0.3	13.72	25.05	11.3
Tennessee	726	229	-68.5	0.07	0.02	-0.1	0.75	0.35	-0.4
Virginia	7,724	2,591	-66.5	2.81	0.99	-1.8	7.89	7.07	-0.8
West Virginia	23,121	12,649	-45.3	3.60	1.92	-1.7	37.71	43.71	6.0
Appalachian Region	71,453	29,473	-58.8	0.82	0.31	-0.5	100	100	0.0

Source: Coal employment was obtained from U.S. Department of Labor, Mine Safety and Health Administration. Coal production is from the U.S. Energy Information Administration (EIA).

Notes: Employment shares were calculated by the authors using total employment from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages program.

* Total non-farm employment includes employment for coal and non-coal counties.

While there are 420 counties in the Appalachian Region, only 138 had coal employment present in 1995, falling to 109 counties in 2016. (See Table 5.) This understates the regional impacts of coal activity since it does not capture coal industry supply chain jobs or the ripple effects of the multiplier that are not constrained by jurisdictional boundaries. The number of counties with coal production was 126 in 1995, falling to 86 in 2016. Mississippi showed a gain, Maryland saw no change and other states saw a loss in the number of coal producing counties.

Table 5: Number of Appalachian Counties with Positive Coal Employment and Production, 1995 and 2016

	Number of Counties with Positive Coal Employment			Number of Counties with Positive Coal Production		
	1995	2016	Percent Change	1995	2016	Percent Change
Alabama	10	8	-20.0	10	7	-30.0
Kentucky	28	20	-28.6	21	16	-23.8
Maryland	2	2	0.0	2	2	0.0
Mississippi	0	2	-	0	2	-
Ohio	22	13	-40.9	21	10	-52.4
Pennsylvania	30	26	-13.3	28	22	-21.4
Tennessee	8	5	-37.5	9	1	-88.9
Virginia	7	6	-14.3	7	6	-14.3
West Virginia	31	27	-12.9	28	20	-28.6
Total	138	109	-21.0	126	86	-31.7

Source: Coal employment was obtained from U.S. Department of Labor, Mine Safety and Health Administration. Coal production is from the U.S. Energy Information Administration (EIA).

Table 6 shows the 20 counties with the largest shares of coal employment relative to nonfarm employment in 2016. Wyoming County and Boone County in West Virginia, along with Dickenson County in Virginia, each have a coal employment base that is greater than one-fifth of the overall local employment base. Knott County in Kentucky places 20th, with coal employment representing 7.7 percent of nonfarm employment.

Table 6: Appalachian Counties with the Highest Ratio of Coal Employment to Total Employment, 2016

Rank	State	County	Coal Employment as a Share of Total Non-Farm Employment	Coal Employment as a Share of Total ARC coal employment
1	West Virginia	Wyoming County	21.9	3.2
2	Virginia	Dickenson County	21.8	2.5
3	West Virginia	Boone County	21.7	3.6
4	West Virginia	McDowell County	18.1	2.7
5	Virginia	Buchanan County	17.9	3.9
6	Pennsylvania	Greene County	15.7	7.0
7	West Virginia	Logan County	15.1	5.0
8	Kentucky	Harlan County	14.8	3.0
9	West Virginia	Taylor County	14.3	1.6
10	Ohio	Monroe County	12.9	1.2
11	West Virginia	Marshall County	11.8	4.1
12	Kentucky	Leslie County	11.3	0.6
13	West Virginia	Mingo County	10.6	1.7
14	Mississippi	Choctaw County	10.0	0.7
15	Kentucky	Martin County	9.2	0.8
16	West Virginia	Webster County	8.5	0.5
17	West Virginia	Tucker County	8.1	0.7
18	West Virginia	Barbour County	7.9	0.9
19	Ohio	Harrison County	7.8	1.0
20	Kentucky	Knott County	7.7	0.6

Source: Coal employment was obtained from U.S. Department of Labor, Mine Safety and Health Administration.

Notes: Employment shares were calculated by the authors using total employment from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages program.

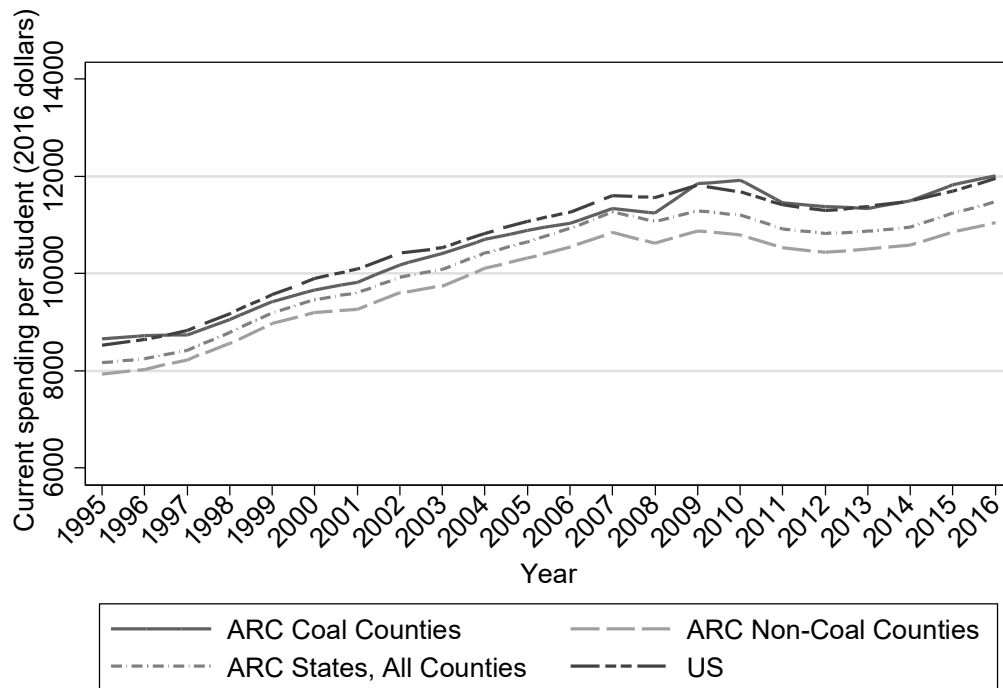
Coal Activity and Local School Finances

The educational attainment data from Table 1 show significant disparities in outcomes between coal counties in Appalachia and the nation, especially in terms of the share of the population that holds a bachelor’s degree. However, as shown in Figure 4, coal counties generally have higher inflation-adjusted *current* per pupil spending than non-coal counties and the full set of counties in Appalachian states.⁴ (Current spending per pupil accounts for funding that supports instruction, whereas total

⁴ Education finance data was obtained from the U.S. Census Bureau, Annual Survey of School System Finances. Data is reported for school districts and was aggregated to produce county-level data. Year represents fall of the academic year (e.g., 2016 represents education finance data for the 2016-2017 academic year).

spending per pupil includes other expenditures, including those for capital projects.) In fact, in a small number of instances over time, average current spending per pupil in coal counties exceeded the national average rate of per pupil spending. In 2016, current spending per pupil for the nation as a whole was \$11,949, and total spending per pupil was \$14,097. To place these figures in context, the average share of funding in 2016 that was from the federal, state, and local governments was 11, 53, and 33 percent, respectively, and these percentages were consistent across coal and non-coal Appalachian counties.

Figure 4: Current Spending per Student, 1995-2016 (2016 dollars)



Source: U.S. Census Bureau, Annual Survey of School System Finances.

Digging beneath the surface reveals substantial variation in our preferred measure of expenditures, current spending per pupil, as well as total spending per pupil, as shown in Table 7. Counties in Pennsylvania had the highest inflation-adjusted per pupil spending levels for both current and total spending in 1995 and 2016 for coal and non-coal communities. Expenditures per pupil in Pennsylvania were about twice the expenditures per pupil in Mississippi and Tennessee in 1995 and still about twice the spending in Tennessee in 2016.

Table 7: Total Expenditures and Current Spending per Student for Coal and Non-Coal Counties, 1995 and 2016*

	Total Elementary-Secondary Expenditure per Student (\$)			Total Current Spending per Student (\$)		
	1995	2016	Percent Change	1995	2016	Percent Change
Alabama non-coal counties	7,473	10,616	42.1	6,790	9,379	38.1
Alabama coal counties	7,260	10,625	46.4	6,643	9,524	43.4
Kentucky non-coal counties	9,189	11,598	26.2	8,293	9,739	17.4
Kentucky coal counties	10,000	11,926	19.3	8,741	10,150	16.1
Maryland non-coal counties	9,887	13,883	40.4	9,200	13,303	44.6
Maryland coal counties	10,590	16,149	52.5	9,833	14,316	45.6
Mississippi non-coal counties	6,944	9,619	38.5	6,260	8,905	42.2
Mississippi coal counties	7,609	12,614	65.8	6,820	11,666	71.0
Ohio non-coal counties	9,172	14,049	53.2	8,023	12,170	51.7
Ohio coal counties	8,536	14,136	65.6	7,888	12,624	60.0
Pennsylvania non-coal counties	12,165	19,019	56.3	10,293	16,519	60.5
Pennsylvania coal counties	12,530	18,748	49.6	10,205	15,884	55.6
Tennessee non-coal counties	7,143	9,485	32.8	6,228	8,809	41.5
Tennessee coal counties	7,649	9,573	25.2	6,315	8,858	40.3
Virginia non-coal counties	9,324	12,409	33.1	8,357	11,634	39.2
Virginia coal counties	8,752	10,706	22.3	8,063	10,247	27.1
West Virginia non-coal counties	9,950	12,742	28.1	9,231	11,997	30.0
West Virginia coal counties	9,902	12,685	28.1	9,246	11,621	25.7
Appalachian non-coal counties**	8,941	12,302	37.6	7,926	11,046	39.4
Appalachian coal counties	9,834	13,619	38.5	8,654	12,008	38.8
Appalachian states, all counties***	9,303	12,858	38.2	8,165	11,469	40.5

Source: U.S. Census Bureau, Annual Survey of School System Finances.

Notes: All dollars are 2016 inflation-adjusted dollars.

* Counties that had positive coal employment at any point between 1995 and 2016 are defined as coal counties.

** Appalachian non-coal counties represents all non-coal counties in the ARC-defined region, including non-coal counties in non-coal states (Georgia, North Carolina, New York, and South Carolina).

*** Appalachian states includes all counties in and outside of the ARC-defined region.

Between 1995 and 2016, total spending per pupil was up 38.5 percent in coal counties compared to 37.6 percent growth in non-coal counties; current spending per pupil grew 39.4 percent in non-coal counties versus 38.8 percent growth in coal counties. The U.S. average of total spending per pupil was up 41.1 percent and current spending per pupil was up 40.2 percent. These roughly commensurate growth rates suggest parity for coal and non-coal communities in terms of their support for elementary and secondary education. Yet some states showed relatively slow growth in spending,

most notably Kentucky. While both coal and non-coal counties in Kentucky saw weak spending growth, expenditure growth was the weakest in coal counties. Kentucky, Virginia and West Virginia each lost ground relative to the regional average spending levels for both coal and non-coal communities between 1995 and 2016. Coal counties in Mississippi showed the strongest growth in total and current per pupil spending of any of the states in Appalachia, up 65.8 percent and 71.0 percent, respectively. Current spending per pupil in Mississippi rose from 78.8 percent of the average for all coal counties in Appalachia in 1995 to 97.2 percent of the average in 2016.

A primary focus of this research is the extent of local support for elementary and secondary education. This depends on a core number of factors: the economic base that supports the generation of taxes (including the coal sector); local resident funding support for public schooling as reflected through local political institutions; and aid from the state which may require a local funding commitment. While it is not possible to disentangle these factors using descriptive data, it is possible to observe local revenue that is generated to support public schooling.

Table 8 shows local revenue per pupil for coal and non-coal communities in the various Appalachian states. Local revenue per pupil was higher for coal counties in Appalachia compared to non-coal counties, with a difference of \$238 in 1995 and \$501 in 2016. At the same time, local revenues per pupil were smaller for coal communities compared to the full set of counties in the Appalachian states and the nation as a whole. The U.S. average local revenue per student in 2016 was \$5,892 versus \$4,822 for coal counties. The difference in revenues in 1995 was about the same as the difference in 2016. In dollar terms, the average coal county is not losing ground relative to the nation and has seen marginal improvement compared to non-coal counties.

Similar to findings for total and current per pupil spending, there is a significant amount of variation in local revenues per pupil between counties. Both coal and non-coal counties in Pennsylvania had the highest inflation-adjusted local revenues per pupil in 1995 and 2016. In 2016, coal counties in Alabama, Maryland, Mississippi and Ohio had higher local revenues than non-coal counties, while non-coal counties in Kentucky, Pennsylvania, Tennessee, Virginia and West Virginia had higher local revenues than coal counties. The disparity was the largest for Mississippi, followed by Virginia. Coal counties in Mississippi experienced the largest growth in local revenues per pupil, which increased from \$1,462 to \$7,927 from 1995 to 2016. U.S. average local revenues per pupil increased by 43.6 percent over the same time period. Several counties, such as those in West Virginia and Alabama, experienced a higher

rate of growth than the U.S. average, but local revenues per student still lagged behind the U.S. average in 2016.

Table 8: Local Revenue per Student and Local per Pupil Revenue Effort for Coal and Non-Coal Counties, 1995 and 2016*

	Local Revenue Per Student (\$)			Local Per Pupil Revenue Effort **		
	1995	2016	Percent Change	1995	2016	Percent Change
Alabama non-coal counties	1,588	3,029	90.7	0.16	0.28	75.7
Alabama coal counties	1,677	3,163	88.6	0.12	0.19	56.6
Kentucky non-coal counties	1,713	2,289	33.6	0.74	0.69	-5.9
Kentucky coal counties	1,501	1,985	32.3	0.42	0.42	-2.1
Maryland non-coal counties	4,478	4,692	4.8	0.11	0.07	-37.8
Maryland coal counties	3,930	5,719	45.5	0.35	0.38	6.8
Mississippi non-coal counties	1,561	2,632	68.6	0.30	0.38	28.1
Mississippi coal counties	1,462	7,927	442.3	0.69	2.90	323.9
Ohio non-coal counties	3,998	5,338	33.5	0.35	0.34	-2.5
Ohio coal counties	3,806	6,477	70.2	0.45	0.63	40.4
Pennsylvania non-coal counties	5,861	9,416	60.6	0.87	1.04	19.0
Pennsylvania coal counties	5,542	8,524	53.8	0.41	0.51	26.0
Tennessee non-coal counties	2,445	3,068	25.5	0.40	0.34	-14.6
Tennessee coal counties	2,140	2,525	18.0	0.45	0.31	-30.7
Virginia non-coal counties	3,590	5,315	48.1	1.27	1.60	26.7
Virginia coal counties	2,697	2,854	5.8	0.37	0.33	-11.2
West Virginia non-coal counties	2,763	5,379	94.7	0.81	1.46	80.0
West Virginia coal counties	2,545	4,106	61.3	0.41	0.52	28.2
Appalachian non-coal counties ***	2,853	4,321	51.5	0.50	0.60	18.9
Appalachian coal counties	3,091	4,822	56.0	0.40	0.49	24.0
Appalachian states, all counties ****	3,300	4,917	49.0	0.48	0.58	21.3

Source: U.S. Census Bureau, Annual Survey of School System Finances and Bureau of Economic Analysis.

Notes: All dollars are 2016 inflation-adjusted dollars.

* Counties that had positive coal employment at any point between 1995 and 2016 are defined as coal counties.

** Local per pupil revenue effort is calculated by the author and is the ratio of local revenue per student to total personal income (percent scaled by 1000).

*** Appalachian non-coal counties represents all non-coal counties in the ARC-defined region, including non-coal counties in non-coal states (Georgia, North Carolina, New York, and South Carolina).

**** Appalachian states includes all counties in and outside of the ARC-defined region.

One of the issues in making comparisons across local communities is that local tax capacity varies across counties both within and across states. Because of this issue, Table 8 also shows *local per pupil revenue effort* data. This includes actual locally-generated revenue per pupil as a share of county

personal income. In these calculations of tax effort, personal income again represents the measure of local tax capacity. While local communities may not be able to directly tax personal income, it is the source from which household property taxes, sales taxes and other taxes and fees are financed.

On average, local revenue effort per pupil is lower in coal counties than in non-coal counties and all of the counties in the Appalachian states. Local revenue effort per pupil was highest in non-coal counties in Kentucky, Pennsylvania, Virginia and West Virginia and coal counties in Mississippi. Local effort was especially low in Alabama and non-coal counties in Maryland. While local effort rose at a healthy pace for Appalachian coal counties, many regions had declining effort.

Digging further, Table 9 presents county-level detail for local revenue effort per pupil by presenting the five counties that experienced the greatest declines in effort and the five counties that experienced the largest gains in effort. Sequatchie County, which is a coal county in Tennessee, had the largest decline in local revenue effort from 1995 to 2016. While enrollments and total local revenues increased, local revenues declined on a per pupil basis. This is an example of a county whose personal income or capacity increased yet their tax effort lagged behind. A similar story describes Berkeley County in West Virginia, which encountered the second-largest decline in local revenue effort at 56 percent. Trends were different for Lincoln County, a non-coal county in Kentucky, that experienced a 53 percent decline in local revenue effort. There were no significant changes to enrollment in Lincoln County from 1995 to 2016, but total and per pupil local revenues declined even though personal income and their ability to raise revenues increased.

The county that experienced the greatest growth in local revenue effort is Wetzel County, a non-coal county in West Virginia. Enrollments declined, but local revenue per pupil significantly increased from 1995 to 2016 even though there was a reduction in personal income and capacity. Choctaw County, a coal county in Mississippi, experienced an increase in their ability to raise revenues as personal income went up and an increase in tax effort as local revenues per pupil increased as well.

Table 9 demonstrates some of the multiple, moving factors that determine local revenues per pupil. Additionally, there are numerous components of local revenues. Property taxes are the largest contributor to local funding, but other sources such as sales, public utility, and income taxes that vary by jurisdiction can make up local revenues as well. While descriptive analyses like those presented here are informative, it is difficult to determine the causal influence of specific factors on local revenues. This

provides motivation for the second part of this research project, which will use econometric analyses to determine the impact of changes in coal employment on local funding for public education.

State aid is an important complement to local and federal dollars that support elementary and secondary education. The amount of aid, as well as the amount of aid per pupil, depends on many factors within each state-specific aid model. Local tax capacity is often one of the factors that affects aid, with more funding going to places that have relatively low capacity to generate funding from own sources. State aid per pupil data for non-coal and coal communities are presented in Table 10 by state, along with the average for non-coal and coal communities in the ARC region. Comparison of Tables 7 and 10 reveal that state aid is a large and significant component of overall spending for elementary and secondary education in every state, as noted above.

State aid per pupil grew at a slightly faster rate for coal communities relative to non-coal communities between 1995 and 2016. A careful look at Table 10 shows that aid growth was especially weak in Kentucky and West Virginia, for both coal and non-coal communities. Maryland, Ohio and Pennsylvania displayed relatively high rates of growth.

For much of modern history, school districts around the country have had to expand capacity to accommodate a growing school-aged population. However, demographic patterns—including the aging of the Baby Boom generation and declining fertility rates—have contributed to falling enrollments. In rural places across the country today, outmigration is common as households pursue better economic opportunity elsewhere. While declining enrollments translate into reduced schooling costs, many inputs are lumpy and are not easy to adjust as the school-aged population declines. Class size is one issue; the loss of just a few students does not translate into an easy merger of classrooms to save classroom instructional costs. Capital spending is another important consideration since existing capital cannot easily be relinquished to save costs in the face of declining enrollments.

Table 9: Local Revenue, Enrollment, Local Revenue per Pupil, Personal Income, and Local per Pupil Revenue Effort for the Five Counties with the Greatest Gains and Losses in Effort, 1995 and 2016

State	County	Coal County	Total Local Revenue (\$1000)			Enrollment			Local Revenue per Pupil (\$)			Personal Income (\$1000)			Local Per Pupil Revenue Effort**		
			1995	2016	Percent Change	1995	2016	Percent Change	1995	2016	Percent Change	1995	2016	Percent Change	1995	2016	Percent Change
Bottom Five:																	
Tennessee	Sequatchie County	Yes	4,485	5,647	25.9	1,658	2,276	37.3	2,705	2,481	-8.3	248,778	520,821	109.4	1.09	0.48	-56.2
West Virginia	Berkeley County	No	42,981	69,018	60.6	11,666	19,000	62.9	3,684	3,633	-1.4	1,952,781	4,364,933	123.5	0.19	0.08	-55.9
Kentucky	Lincoln County	No	11,629	8,110	-30.3	3,907	3,936	0.7	2,976	2,060	-30.8	493,487	725,203	47.0	0.60	0.28	-52.9
Kentucky	Menifee County	No	1,828	1,698	-7.1	1,042	1,027	-1.4	1,755	1,653	-5.8	101,483	186,767	84.0	1.73	0.89	-48.8
Virginia	Scott County	Yes	9,996	6,646	-33.5	3,863	3,732	-3.4	2,588	1,781	-31.2	563,440	694,494	23.3	0.46	0.26	-44.2
Top Five:																	
Mississippi	Kemper County	Yes	2,976	8,569	187.9	1,561	1,100	-29.5	1,907	7,790	308.5	237,012	285,920	20.6	0.80	2.72	238.7
Alabama	Cleburne County	No	2,129	10,965	415.0	2,488	2,614	5.1	856	4,195	390.2	355,426	500,661	40.9	0.24	0.84	247.9
West Virginia	Doddridge County	No	3,857	24,776	542.4	1,366	1,180	-13.6	2,823	20,997	643.7	151,094	214,502	42.0	1.87	9.79	423.8
Mississippi	Choctaw County	Yes	1,958	11,047	464.3	1,926	1,370	-28.9	1,016	8,064	693.4	179,725	261,602	45.6	0.57	3.08	445.1
West Virginia	Wetzel County	No	9,852	35,168	257.0	3,798	2,554	-32.8	2,594	13,770	430.8	510,168	474,658	-7.0	0.51	2.90	470.5

Source: U.S. Census Bureau, Annual Survey of School System Finances and Bureau of Economic Analysis.

Notes: All dollars are 2016 inflation-adjusted dollars.

*Counties that had positive coal employment at any point between 1995 and 2016 are defined as coal counties.

**Local per pupil revenue effort is calculated by the author and is the ratio of local revenue per student to total personal income (percent scaled by 1000).

Table 10: State Aid per Student for Coal and Non-Coal Counties, 1995 and 2016*

	State Aid per Student (\$)		
	1995	2016	Percent Change
Alabama non-coal counties	4,702	6,185	31.5
Alabama coal counties	4,614	6,224	34.9
Kentucky non-coal counties	6,255	7,670	22.6
Kentucky coal counties	6,647	7,759	16.7
Maryland non-coal counties	4,662	8,059	72.9
Maryland coal counties	5,648	9,433	67.0
Mississippi non-coal counties	4,391	5,576	27.0
Mississippi coal counties	4,563	5,302	16.2
Ohio non-coal counties	4,676	8,129	73.9
Ohio coal counties	4,619	7,544	63.3
Pennsylvania non-coal counties	5,467	9,041	65.4
Pennsylvania coal counties	5,831	9,297	59.4
Tennessee non-coal counties	3,946	5,434	37.7
Tennessee coal counties	4,271	5,894	38.0
Virginia non-coal counties	4,662	6,281	34.7
Virginia coal counties	5,086	6,848	34.6
West Virginia non-coal counties	6,459	6,752	4.5
West Virginia coal counties	6,535	7,197	10.1
Appalachian non-coal counties**	5,273	6,917	31.2
Appalachian coal counties	5,695	7,625	33.9
Appalachian states, all counties***	5,131	6,768	31.9

Source: U.S. Census Bureau, Annual Survey of School System Finances.

Notes: All dollars are 2016 inflation-adjusted dollars.

* Counties that had positive coal employment at any point between 1995 and 2016 are defined as coal counties.

** Appalachian non-coal counties represents all non-coal counties in the ARC-defined region, including non-coal counties in non-coal states (Georgia, North Carolina, New York, and South Carolina).

*** Appalachian states includes all counties in and outside of the ARC-defined region.

Table 11 shows that enrollment declines are especially pronounced in coal communities compared to non-coal communities and the Appalachian states as a whole (including all counties in the states). Between 1995 and 2016, total enrollments in coal communities fell from 1,633,029 to 1,384,036, a loss of 248,993 students, or 15.2 percent of the 1995 enrollment level. In sharp contrast, non-coal communities experienced a growth in enrollment of 11.2 percent, and enrollment increased by 4.1 percent for all counties in Appalachian states. Coal communities in each state consistently

performed more poorly than their non-coal counterparts. While its levels are small, Mississippi had the largest percentage reduction in enrollments at 29.2 percent. Large numerical losses took place in Kentucky, Ohio, Pennsylvania and West Virginia. Bleak economic opportunities are certainly a major driver in this outflow of students.

Table 11: Enrollment for Coal and Non-Coal Counties by State, 1995 and 2016*

	Enrollment		
	1995	2016	Percent Change
Alabama non-coal counties	234,409	244,631	4.4
Alabama coal counties	229,174	235,657	2.8
Kentucky non-coal counties	63,883	68,830	7.7
Kentucky coal counties	143,214	124,076	-13.4
Maryland non-coal counties	19,824	22,545	13.7
Maryland coal counties	16,490	12,535	-24.0
Mississippi non-coal counties	105,939	96,831	-8.6
Mississippi coal counties	3,487	2,470	-29.2
Ohio non-coal counties	127,470	103,688	-18.7
Ohio coal counties	223,088	170,253	-23.7
Pennsylvania non-coal counties	165,264	139,345	-15.7
Pennsylvania coal counties	700,359	565,939	-19.2
Tennessee non-coal counties	329,336	356,352	8.2
Tennessee coal counties	50,613	49,716	-1.8
Virginia non-coal counties	67,982	62,325	-8.3
Virginia coal counties	48,001	38,284	-20.2
West Virginia non-coal counties	87,848	88,064	0.2
West Virginia coal counties	218,603	185,106	-15.3
Appalachian non-coal counties**	2,094,302	2,329,604	11.2
Appalachian coal counties	1,633,029	1,384,036	-15.2
Appalachian states, all counties***	14,471,135	15,060,631	4.1

Source: U.S. Census Bureau, Annual Survey of School System Finances.

* Counties that had positive coal employment at any point between 1995 and 2016 are defined as coal counties.

** Appalachian non-coal counties represents all non-coal counties in the ARC-defined region, including non-coal counties in non-coal states (Georgia, North Carolina, New York, and South Carolina).

*** Appalachian states includes all counties in and outside of the ARC-defined region.

Conclusion

In this paper, we have provided a descriptive analysis of the impact of the economic environment, including the coal industry, on funding for elementary and secondary education in the Appalachian Region. It is encouraging that coal counties have average spending levels that are roughly commensurate with the nation as a whole. However, spending levels are relatively low in Alabama, Kentucky and Tennessee. Locally-generated revenue per pupil is substantially higher in coal counties than in non-coal counties, but nonetheless trailed the national average by a wide margin in 2016: \$4,822 versus \$5,892. Local revenue per pupil is especially low in Alabama, Kentucky and Tennessee, along with coal counties in Virginia. The relatively modest local contribution in funding support for public schooling is consistent with the low tax effort exhibited generally by coal counties and non-coal counties throughout the region. While Appalachia is relatively poor, it has also chosen to commit fewer of its own resources to fund schooling than other places around the country.

The primary challenge of this descriptive analysis is isolating the impacts of factors like the tax base, state aid and enrollments on education finance outcomes, specifically revenues and spending. The second prong of this research agenda will seek to resolve this puzzle through multivariate statistical methods. In this extended application, we will use regression models to better understand what leads to variation in overall spending for public education, but especially locally-generated revenues used for elementary and secondary schooling.

Appendix

Appendix Table 1: Coal Counties: Appalachian Counties with Some Level of Coal Employment Between 1995 and 2016

State	County	State	County	State	County
Alabama	Bibb County	Ohio	Guernsey County	Tennessee	Campbell County
Alabama	Blount County	Ohio	Harrison County	Tennessee	Claiborne County
Alabama	Cullman County	Ohio	Hocking County	Tennessee	Cumberland County
Alabama	DeKalb County	Ohio	Holmes County	Tennessee	Fentress County
Alabama	Fayette County	Ohio	Jackson County	Tennessee	Grundy County
Alabama	Franklin County	Ohio	Jefferson County	Tennessee	Marion County
Alabama	Jackson County	Ohio	Lawrence County	Tennessee	Morgan County
Alabama	Jefferson County	Ohio	Mahoning County	Tennessee	Scott County
Alabama	Marion County	Ohio	Meigs County	Tennessee	Sequatchie County
Alabama	Shelby County	Ohio	Monroe County	Virginia	Buchanan County
Alabama	Tuscaloosa County	Ohio	Muskingum County	Virginia	Dickenson County
Alabama	Walker County	Ohio	Noble County	Virginia	Lee County
Alabama	Winston County	Ohio	Perry County	Virginia	Russell County
Kentucky	Bell County	Ohio	Scioto County	Virginia	Scott County
Kentucky	Boyd County	Ohio	Tuscarawas County	Virginia	Tazewell County
Kentucky	Breathitt County	Ohio	Vinton County	Virginia	Washington (+ Bristol city) County
Kentucky	Carter County	Ohio	Washington County	Virginia	Wise (+ Norton city) County
Kentucky	Clay County	Pennsylvania	Allegheny County	West Virginia	Barbour County
Kentucky	Elliott County	Pennsylvania	Armstrong County	West Virginia	Boone County
Kentucky	Estill County	Pennsylvania	Beaver County	West Virginia	Braxton County
Kentucky	Floyd County	Pennsylvania	Bedford County	West Virginia	Brooke County
Kentucky	Greenup County	Pennsylvania	Blair County	West Virginia	Clay County
Kentucky	Harlan County	Pennsylvania	Butler County	West Virginia	Fayette County
Kentucky	Jackson County	Pennsylvania	Cambria County	West Virginia	Gilmer County
Kentucky	Johnson County	Pennsylvania	Cameron County	West Virginia	Grant County
Kentucky	Knott County	Pennsylvania	Carbon County	West Virginia	Greenbrier County
Kentucky	Knox County	Pennsylvania	Centre County	West Virginia	Harrison County
Kentucky	Laurel County	Pennsylvania	Clarion County	West Virginia	Kanawha County
Kentucky	Lawrence County	Pennsylvania	Clearfield County	West Virginia	Lewis County
Kentucky	Lee County	Pennsylvania	Clinton County	West Virginia	Lincoln County
Kentucky	Leslie County	Pennsylvania	Columbia County	West Virginia	Logan County
Kentucky	Letcher County	Pennsylvania	Elk County	West Virginia	McDowell County
Kentucky	McCreary County	Pennsylvania	Fayette County	West Virginia	Marion County
Kentucky	Magoffin County	Pennsylvania	Greene County	West Virginia	Marshall County
Kentucky	Martin County	Pennsylvania	Huntingdon County	West Virginia	Mason County
Kentucky	Morgan County	Pennsylvania	Indiana County	West Virginia	Mercer County
Kentucky	Owsley County	Pennsylvania	Jefferson County	West Virginia	Mineral County
Kentucky	Perry County	Pennsylvania	Lackawanna County	West Virginia	Mingo County
Kentucky	Pike County	Pennsylvania	Lawrence County	West Virginia	Monongalia County
Kentucky	Pulaski County	Pennsylvania	Luzerne County	West Virginia	Nicholas County
Kentucky	Rockcastle County	Pennsylvania	Lycoming County	West Virginia	Ohio County
Kentucky	Whitley County	Pennsylvania	Mercer County	West Virginia	Preston County
Kentucky	Wolfe County	Pennsylvania	Northumberland County	West Virginia	Putnam County
Maryland	Allegany County	Pennsylvania	Schuylkill County	West Virginia	Raleigh County
Maryland	Garrett County	Pennsylvania	Snyder County	West Virginia	Randolph County
Mississippi	Choctaw County	Pennsylvania	Somerset County	West Virginia	Taylor County
Mississippi	Kemper County	Pennsylvania	Sullivan County	West Virginia	Tucker County
Ohio	Athens County	Pennsylvania	Tioga County	West Virginia	Upshur County
Ohio	Belmont County	Pennsylvania	Venango County	West Virginia	Wayne County
Ohio	Carroll County	Pennsylvania	Washington County	West Virginia	Webster County
Ohio	Columbiana County	Pennsylvania	Westmoreland County	West Virginia	Wyoming County
Ohio	Coshocton County	Tennessee	Anderson County		
Ohio	Gallia County	Tennessee	Bledsoe County		

Source: Coal employment was obtained from U.S. Department of Labor, Mine Safety and Health Administration.