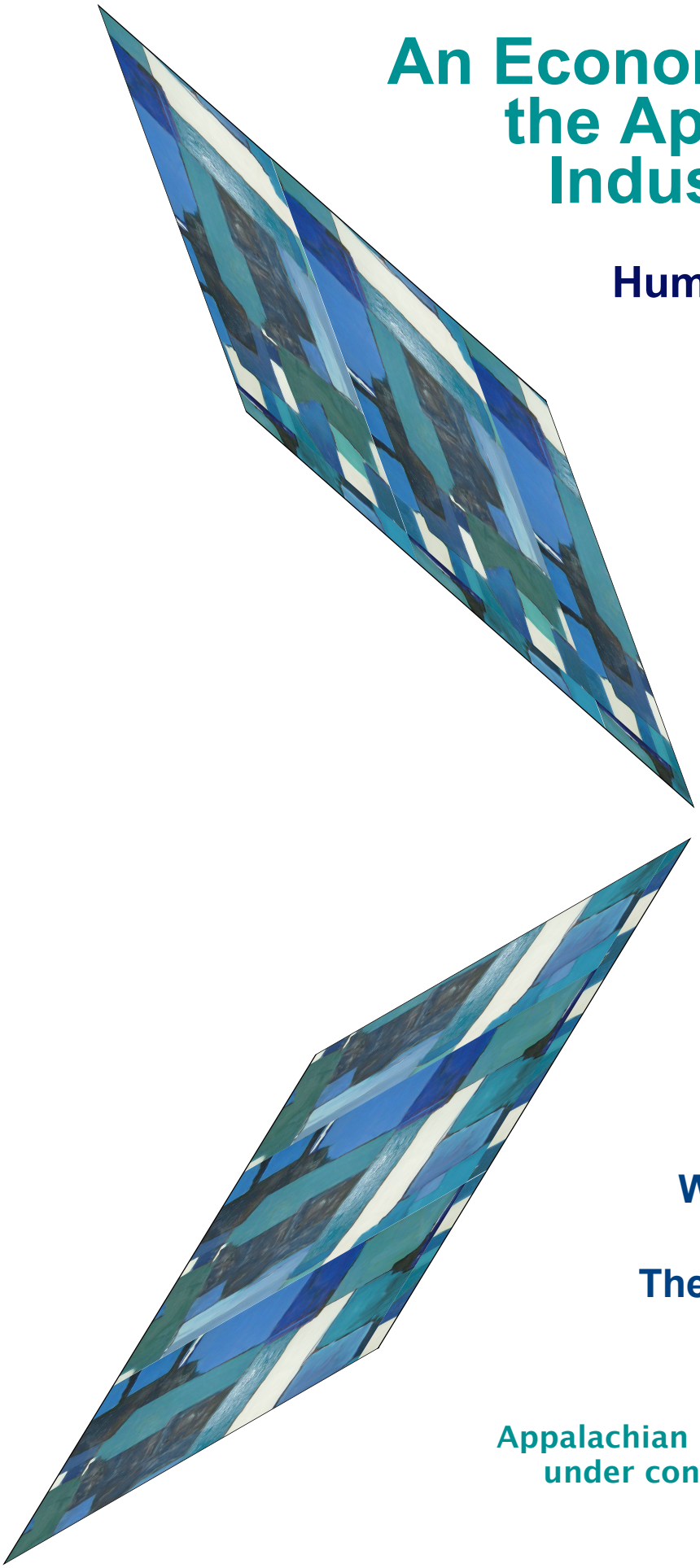

An Economic Analysis of the Appalachian Coal Industry Ecosystem

Human Capital and the CIE

West Virginia University

and

The University of Tennessee

Prepared for the
Appalachian Regional Commission
under contract # PW-18673-16
January 2018

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APPALACHIAN REGIONAL COMMISSION

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Human Capital and the CIE

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Table of Contents

List of Tables

List of Figures

Executive Summary

Task 5 of the comprehensive report has two goals. The first is to examine occupations that might be affected by employment losses in the coal industry ecosystem (CIE). The primary focus is on direct production employment in the coal sector, but some references are also made to managerial support workers and indirect workers in the coal industry supply chain. Potentially-impacted occupations are identified, as are alternative occupational opportunities in other sectors of the economy where coal workers might be absorbed. We also discuss coal worker transition time from unemployment status to employment status and identify factors that both encourage and prevent timely transitions. This discussion is framed by an overview of broad labor market conditions throughout the Appalachian Region. The second goal is to assess the state and local elementary and secondary education funding implications of a declining CIE. Considered are state funding sources and mechanisms and local funding sources for education that rely on local tax capacity and effort to complement state resources in support of elementary and secondary education. Together these various components of the analysis enable an evaluation of future employment prospects for the current coal workforce along with the funding streams that will affect the quality of the workforce of the future through the support for K-12 education.

The analysis of potentially-affected coal miner occupations begins with an overview of labor market conditions with a spotlight on mining counties within the Appalachian Region, as defined by those counties with coal employment in 2010. These counties are referred to as *coal-employment counties* or simply *coal counties* in what follows. To frame the discussion of coal-employment communities, we make comparisons to the Appalachian Region, states that are represented in the Appalachian Region, and the national economy. The analysis shows that labor markets within coal communities and the Appalachian Region itself are generally depressed relative to the states and the United States. The characteristics of these labor markets suggests that there will be difficulties creating robust new employment opportunities in the Region.

There were 129 counties in the Appalachian Region that had coal employment in 2010. Seventy-eight of these counties saw coal employment contract between 2000 and 2015. In 2015, three counties were reliant on coal employment for more than 20 percent of their employment base and another 13 counties were reliant on coal for 10-20 percent of their local employment base. Of these 16 counties, only four have experienced employment growth since 2010.

Highly-paid coal miners generally have limited re-employment opportunities within their place of residence, especially in terms of similar occupations and pay scales. We evaluate alternative employment opportunities for coal workers by isolating their occupational classifications and comparing these to equivalent occupational classifications for workers in the manufacturing, construction, and transportation sectors. This analysis is undertaken for two regional geographies: (i) an aggregation of Appalachian counties within a given state and (ii) entire state economies for Appalachian states that have coal communities. These broad regions are chosen since individual counties offer insufficient scale and diversity to absorb coal workers. One important implication is that coal miners may be required to engage in lengthy commutes or migrate from their current place of residence in pursuit of gainful employment opportunities outside of the coal industry. Commuting to jobs in another county is already a common occurrence in Appalachia. Outmigration may represent a potentially-significant hurdle since the population of the Appalachian Region is characterized by relatively low mobility rates relative to the national population. Retraining and other assistance will likely be needed for many of those displaced by declining coal production.

The coal sectors in Alabama, Pennsylvania and Ohio have relatively small numbers of occupations that are equivalent to occupations in manufacturing, construction and transportation at the state and substate regional levels. These small numbers suggest that it will be relatively easy to find employment opportunities outside the coal sector. However, digging beneath the surface shows that in these same states there are several specific occupational categories in the coal sector that have *no* equivalent occupations in other sectors. In other instances, the number of equivalent occupations in

other sectors is limited in supply. As is generally the case, individual counties may be at significant risk of hardship through coal industry transition, but this can be masked across multi-county areas.

In contrast, the coal sectors in Kentucky, Virginia and West Virginia each have relatively large numbers of occupations without equivalent occupations in the manufacturing, construction and transportation sectors. This means that it will be harder to absorb coal workers into other sectors of the economy. In Kentucky, six occupations in the coal industry representing 2,901 positions have no counterparts outside the coal sector; in Virginia, there are eight occupations with 6,048 positions that have no equivalent occupations in manufacturing, construction and transportation; and in West Virginia, there are 18 coal occupations with no counterpart occupations elsewhere in the state. For West Virginia, these occupations represent 6,580 positions and more than one-third of all occupations in the state's coal industry. Six occupations representing 4,722 positions in Kentucky have no counterparts in the state.

Funding elementary and secondary education is a core government function that helps promote economic development and individual and family wellbeing. Elementary and secondary education is funded by revenue from federal, state and local governments. Local revenue is especially important since it is so closely tied to the performance of the coal industry. Because incomes are below average in the Appalachian Region (i.e. the Region is characterized by low *tax capacity*), per capita local tax burdens are also below the national average. In 2014, nominal per capita local taxes among coal-employment counties totaled $1,298 compared to a national average of $1,875. West Virginia and Kentucky have especially low per capita burdens. However, when one accounts for differences in income, the evidence indicates that Appalachian counties choose to impose relatively low burdens on themselves and are thus characterized by low *tax effort*. While per capita income in coal communities is 94.1 percent of the national average, revenues in coal communities are just 69.2 percent of the national average.

All the Appalachian states have state funding programs that contribute significantly to local support for K-12 education. In general, these complicated formulas account for low tax capacity jurisdictions and seek to both boost funding and narrow funding disparities through foundation aid and/or equalization programs targeted to local spending or the local tax base. Nominal per pupil state funding for K-12 education was $6,639 in coal-employment Appalachian communities in 2014, which is higher than spending levels in other Appalachian counties, states in the Appalachian Region, and the United States. Per pupil spending was highest in West Virginia. Total state funding support in recent years has grown at rates that compare favorably to other regions. Total local per pupil revenue to support elementary and secondary education in coal communities has hovered near the national average. Between 2010 and 2014, local per pupil revenue growth was up 14.1 percent in coal communities versus 5.6 percent growth for localities across the country. Together these data do not reveal declining support for K-12 education in coal-employment communities in Appalachia.

Current education spending per pupil in coal communities was $12,119 in 2014, well ahead of the $11,307 national average and the $10,798 Appalachian Region average. Coal communities have consistently spent more per pupil than the national average since 2000. However, current per pupil spending did decline between 2010 and 2014 in Kentucky, Virginia and West Virginia, as well as in a number of coal communities in Alabama, Ohio and Tennessee, despite growth in *total* state and local revenue per pupil. In addition, enrollments have declined in all coal-employment states other than Alabama, which has seen very small growth. Between 2000 and 2014, coal counties saw enrollment counts fall by 158,192. Enrollments fell most sharply in Mississippi (down 24.9 percent) and Maryland (down 18.5 percent).

Subtask 1: Existing Human Capital Stock

Our analysis of Subtask 1 begins with a high-level overview of selected characteristics of the employment base and labor force of Appalachian coal-producing communities, framed by similar data

for the nation, the Appalachian states, and the Appalachian Region.[1] The goal is to place in context the labor market conditions in coal communities relative to other relevant geographies to better understand their unique circumstances and determine their capacity to absorb workers who might choose to leave or be displaced from the coal sector. Labor markets tend to be localized, spanning single counties or broader arrays of counties in micropolitan and metropolitan areas. These regions represent the primary location for alternative employment opportunities for displaced and potentially-displaced coal workers. However, in many instances, these displaced workers may find limited job alternatives in their proximate area of residence due to small numbers of employers and/or a mismatch between occupational supply and demand. Aggravating the problem are pervasive weaknesses in local labor markets that will retard economic development and the creation of employment opportunities on the part of newly-locating firms. Thus, larger regional labor markets—including entire states—may represent prime locations for new employment opportunities for coal workers. However, this may require long commutes or outmigration from the current place of residence. Whether workers choose to stay in their place of residence or move, retraining may be required to align worker skills with the demand side of the labor market.

Following this labor market profile, the discussion turns to a detailed analysis of coal mining employment and occupations. Because of data limitations within Appalachian coal-producing regions, we rely on a blend of national and regional-specific data to broadly characterize coal industry workers. Using a number of data sources, including data from states in the Appalachian Region, we identify the occupations associated with coal production activity for the major coal producing areas of the Appalachian Region. The majority of these occupations reflect production-related work activities rather than management-related activities.

Finally, we examine employment dynamics and transitions from unemployment to re-employment. We are again compelled to rely on a variety of data and other resources to understand these dynamics. Using data for industries outside of the coal sector, specifically the manufacturing, construction, and transportation sectors, equivalent occupations are identified that might represent transition opportunities for coal workers. We present these alternative occupational measures for two geographies: individual states that are either partially or wholly located in Appalachia, and then an aggregation of Appalachian counties within a given Appalachian state. For each state, there are many equivalent occupations in the two geographies of focus that in principle offer alternative employment opportunities for management and office-related workers. However, this will not necessarily translate into rapid transition into new jobs due to competition for available openings. For production workers, the problem is more acute, especially in specific communities, specific sectors, and more generally in Kentucky, Virginia, and West Virginia. In a significant number of cases, there are simply no equivalent occupational opportunities in the state outside the coal sector. The problem is aggravated by weak

[1] For a timely and comprehensive overview of socioeconomic data for the Appalachian Region, see Pollard and Jacobsen (2016). Also see *An Overview of Coal and the Economy in Appalachia*, the first report in this series of sponsored research projects.

long-term trends in the manufacturing sector which might otherwise offer job opportunities for those employed in the coal sector. Growth opportunities in manufacturing are muted, so ongoing worker quits and terminations might yield the most significant job openings in the manufacturing sector.

1. The Region's Coal Mining Communities and Labor Force

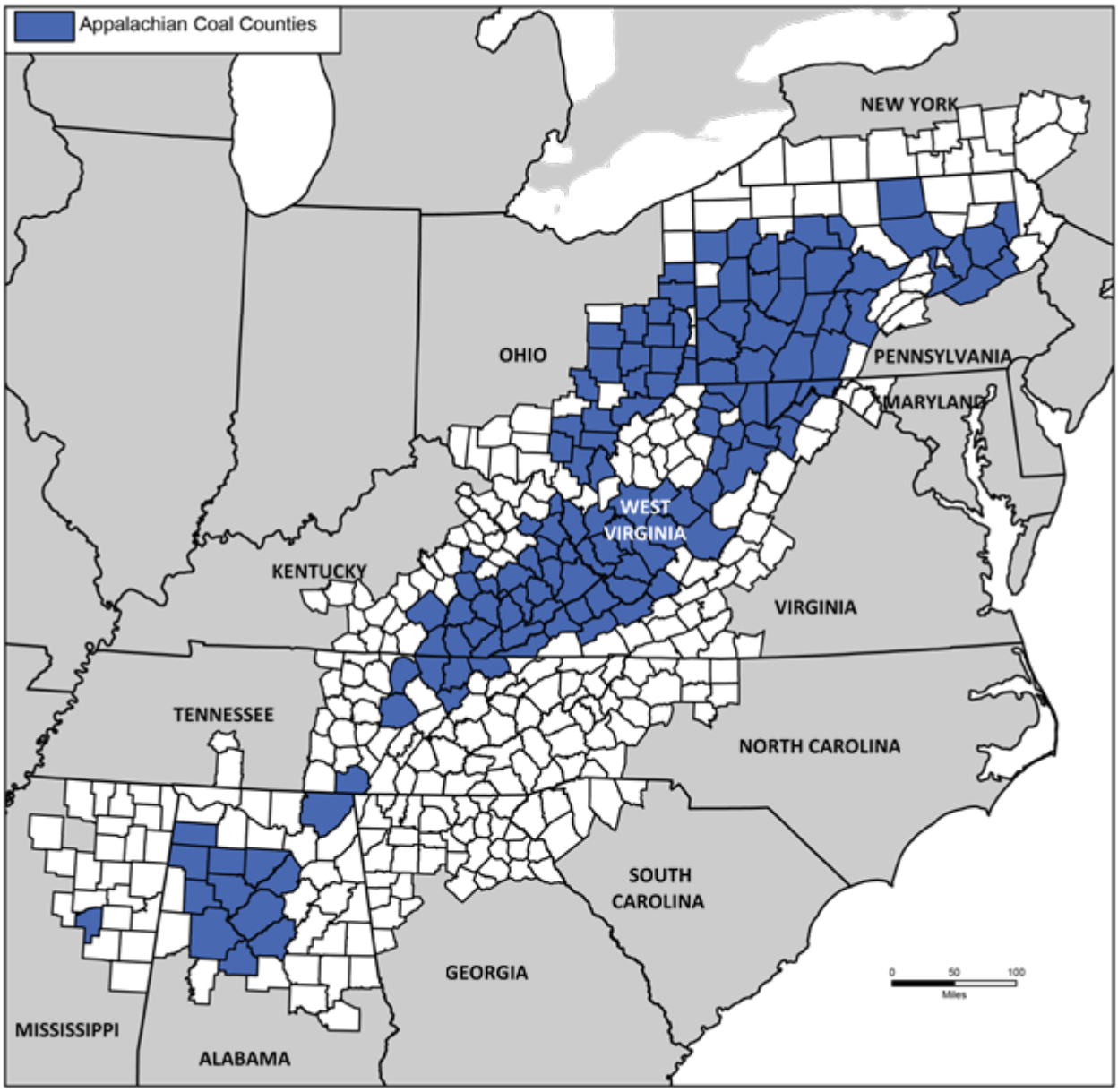
Appalachia is a large and diverse region, with substantial variation in economic prosperity both within and across the states that are represented in the Appalachian Region. To frame economic conditions in the Appalachian Region, especially those counties with coal mining employment, we begin by presenting selected data for various reference geographies, with an emphasis on the labor market. We have broken out the data for counties within the Appalachian Region based on whether or not coal employment was present in the county in 2010. Table 1 provides a listing of these 129 coal-employment counties while Figure 1 provides a map of the Region to show where these counties are located. We recognize that this county demarcation fails to take into account potentially-important linkages to other counties through commuting patterns, the coal supply chain, and the ripple effects of the multiplier. At the same time, it helps to highlight those places that may be at the greatest risk of direct production and employment losses. Many of the coal-employment communities are located in sparsely-to-moderately populated counties and regions. This heightens the impact of coal mining job losses for host communities and also constrains alternative job opportunities in the place of current employment. However, commuting into and out of coal counties helps spread the negative impacts of job losses on households across a larger region.

Table 1: Appalachian Counties with Coal Employment in 2010

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

Source: Mine Safety and Health Administration

Figure 1: Appalachian Counties with Coal Employment in 2010



Source: U.S. Mine Safety and Health Administration (MSHA)

The ability of coal workers to be absorbed elsewhere in the economy depends on the vitality of job markets outside of the coal sector. Table 2 provides data on manufacturing jobs and jobs in all industries for the United States, entire states within the Appalachian Region, the Appalachian Region, and Appalachian coal communities for 2000, 2010, and 2015. New York, Pennsylvania and Ohio have the largest economies as measured by jobs; West Virginia, which lies entirely within the Appalachian Region, has the smallest state economy of the 13 states, with just 757,000 jobs in 2015. On average, the Appalachian states performed more poorly than the national economy between 2000-2015 as measured by job growth. The national economy experienced 7.4 percent job growth compared to 4.9 percent growth for states that are represented in the Appalachian area. The strongest growth

occurred in Virginia, while Mississippi and Ohio each lost jobs. The Appalachian Region itself had employment growth of only 0.9 percent over the period shown. Coal-employment communities witnessed a 1.7 percent setback in employment. These broad trends point to the added challenge displaced coal workers will confront in identifying alternative job opportunities even within broader regions outside their place of residence.

Table 2: Appalachian Regional Labor Markets – All Industry and Manufacturing Employment

	All Industries					Manufacturing				
	Employment (thousands)			Growth 2000-2015	Growth 2010-2015	Employment (thuosands)			Growth 2000-2015	Growth 2010-2015
	2000	2010	2015	(%)	(%)	2000	2010	2015	(%)	(%)
Alabama	1,931.2	1,813.2	1,949.1	0.9	7.5	351.4	236.3	257.8	-26.6	9.1
Georgia	3,978.5	3,753.9	4,261.9	7.1	13.5	538.0	343.1	379.1	-29.5	10.5
Kentucky	1,816.6	1,712.2	1,886.1	3.8	10.2	310.4	209.1	241.2	-22.3	15.3
Maryland	2,458.4	2,453.2	2,674.0	8.8	9.0	173.2	114.9	104.5	-39.7	-9.0
Mississippi	1,155.0	1,074.6	1,133.7	-1.8	5.5	222.5	136.0	141.8	-36.3	4.3
New York	8,624.9	8,340.7	9,260.1	7.4	11.0	749.3	455.7	455.0	-39.3	-0.2
North Carolina	3,915.1	3,788.6	4,240.3	8.3	11.9	757.9	431.6	461.5	-39.1	6.9
Ohio	5,624.7	4,908.6	5,423.5	-3.6	10.5	1,021.3	620.3	686.8	-32.8	10.7
Pennsylvania	5,693.3	5,472.2	5,835.6	2.5	6.6	864.0	560.5	567.6	-34.3	1.3
South Carolina	1,854.0	1,758.2	2,006.7	8.2	14.1	336.3	207.8	235.9	-29.9	13.5
Tennessee	2,732.8	2,558.4	2,893.9	5.9	13.1	497.2	298.3	333.0	-33.0	11.6
Virginia	3,519.4	3,536.7	3,859.1	9.7	9.1	363.6	229.9	233.6	-35.8	1.6
West Virginia	735.5	692.4	757.0	2.9	9.3	75.9	49.1	47.7	-37.2	-2.8
United States	**132,024.0**	**127,820.4**	**141,843.0**	**7.4**	**11.0**	**17,314.4**	**11,487.5**	**12,291.7**	**-29.0**	**7.0**
Appalachian States	**44,039.4**	**41,862.9**	**46,181.0**	**4.9**	**10.3**	**6,261.0**	**3,892.5**	**4,145.5**	**-33.8**	**6.5**
Appalachian Region	**9,412.8**	**9,079.8**	**9,501.8**	**0.9**	**4.6**	**1,884.6**	**1,169.0**	**1,247.5**	**-33.8**	**6.7**
Appalachian Coal-Employment Counties	**3,802.1**	**3,679.7**	**3,736.1**	**-1.7**	**1.5**	**556.1**	**363.6**	**371.5**	**-33.2**	**2.2**

Sources: Bureau of Labor Statistics Quarterly Census of Employment and Wages

The Region's manufacturing sector is especially important since it represents a primary employment alternative for many of the occupational categories represented in the coal industry. Unfortunately, manufacturing jobs are down substantially since 2000 in all of the Appalachian states, falling 33.8 percent compared to a 29.0 percent decline for the nation. The best performance was in Kentucky, but manufacturing jobs in the state were still down 22.3 percent. Maryland suffered the steepest setback with a loss of 39.7 percent of its manufacturing job base. Heavily coal-dependent West Virginia lost more than one-third of its manufacturing base between 2000 and 2015.

The manufacturing sector has seen a modest employment rebound since the end of the Great Recession in the summer of 2009. Prior to the recession, United States manufacturing jobs had been in decline since 1997. But in 2011, the nation's manufacturing sector experienced 1.7 percent job growth, and expansions in employment have taken place every year since then. Appalachian counties suffered a fate similar to the United States between 2000 and 2015, with manufacturing jobs shrinking 33.8 percent while coal-employment counties had 33.2 percent contraction in manufacturing employment. Between 2000 and 2015, 106 of the 129 coal employment counties had contractions in manufacturing employment. However, between 2010 and 2015, 67 coal communities actually experienced employment growth in the manufacturing sector. This recent growth should help temper the loss in coal employment. However, at least nationally, the gains in manufacturing are expected to

be modest in the years ahead and employment levels are not projected to return to pre-recession levels in the foreseeable future.[2]

Traditional "headline" (or *U3*) unemployment rates in the Appalachian states roughly align with the national average as shown in the middle column of Table 3.[3] However, Appalachian counties and Appalachian coal mining communities have elevated unemployment rates. In 2000, coal mining counties had an average unemployment rate of 4.9 percent, well ahead of all other geographies shown in the table. In 2015, unemployment rates in coal mining communities averaged 6.0 percent, again higher than all other regions shown. West Virginia had the highest state rate in 2000 and 2015. Thirteen coal-producing counties had non-seasonally-adjusted rates equal to or above 10 percent in 2015; only ten coal-producing counties had lower unemployment rates in 2015 compared to 2000. (Unfortunately, seasonally-adjusted unemployment rates are not available for individual counties.)

Table 3 provides additional insight into the unemployment situation in the Appalachian states by considering alternative unemployment metrics using data for 2016. The *U1* unemployment rate shows those who are unemployed for 15 weeks or longer as a share of the labor force; the *U6* measure includes unemployed people as well as underemployed people, such as part-time workers who would prefer to be employed full-time. The rates are for the whole state, not just its Appalachian counties, since these are the only data available for these measures. Headline unemployment rates actually converged to 4.9 percent for the Appalachian states and the United States in 2016. However, the Appalachian states have slightly higher unemployment rates for both the U1 and U6 measures. West Virginia stands out as having the highest U1 measure among the states (2.7 percent) as well as the highest U6 rate (11.0 percent).

[2] IHS Economics, *U.S. Economic Outlook*, Spring 2017.

[3] For background and resources on the measurement of unemployment rates, see https://www.bls.gov/cps/cps_htgm.htm

Table 3: Statewide Average Annual Headline (U3) and Alternative Unemployment Rates, 2016

State	U1[1]	U3[2]	U6[3]
Alabama	2.0	6.0	9.6
Georgia	2.4	5.4	10.5
Kentucky	2.0	4.9	9.7
Maryland	1.8	4.2	8.1
Mississippi	2.6	5.7	10.9
New York	2.3	4.8	9.4
North Carolina	2.3	5.0	9.4
Ohio	2.0	4.9	9.7
Pennsylvania	2.1	5.6	10.6
South Carolina	2.0	2.8	9.7
Tennessee	1.8	4.7	9.4
Virginia	1.6	4.1	9.1
West Virginia	2.7	6.1	11.0
United States	**2.0**	**4.9**	**9.6**
Appalachian State Average	**2.1**	**4.9**	**9.8**

Source: Bureau of Labor Statistics

[1] Persons unemployed 15 weeks or longer as a percent of the labor force.

[2] The "headline" unemployment rate which measures the share of the adult population that is in the labor force but unemployed.

[3] Accounts for the unemployed plus all marginally attached workers and those who are employed part time for economic reasons.

Business establishment data for all industries and the manufacturing sector provide a complementary employer perspective of regional labor market conditions and are presented in Table 4 for 2000 and 2014 (the most recent year for which establishment data are available). All-industry establishments for the United States were up 7.0 percent between 2000 and 2014, versus a 1.3 percent establishment loss for counties in the Appalachian Region. Appalachian coal-employment communities, on the other hand, had significantly larger establishment losses totaling 5.7 percent. Manufacturing establishments were down for all geographies shown in Table 4 between 2000 and 2014. The Appalachian Region performed marginally better than the United States, with manufacturing establishments declining 17.3 percent, compared to 17.5 percent in the nation as a whole.

Table 4: All Industry and Manufacturing Establishments for States and Other Geographies in Appalachia

	Establishments (thousands)											
	All Industries						Manufacturing					
	2000		2014		Growth (%)		2000		2014		Growth (%)	
	Appalachian Counties	Entire State	Appalachian Counties	Entire State	Appalachian Counties	Entire State	Appalachian Counties	Entire State	Appalachian Counties	Entire State	Appalachian Counties	Entire State
Alabama	63.3	99.8	62.1	97.3	-2.0	-2.4	3.7	5.3	2.8	4.2	-22.8	-20.6
Georgia	52.1	200.4	63.7	220.0	22.2	9.8	3.3	8.7	3.0	7.4	-8.3	-1.2
Kentucky	21.1	89.9	20.1	91.0	-4.8	1.3	0.9	4.2	0.8	3.8	-13.0	-0.8
Maryland	6.1	128.4	5.9	136.1	-2.6	6.0	0.3	3.9	0.2	3.0	-19.9	-1.9
Mississippi	12.7	59.7	12.1	58.3	-4.9	-2.5	1.0	2.8	0.8	2.2	-21.7	-1.9
New York	22.2	492.0	21.7	536.3	-2.0	9.0	1.3	22.1	1.1	16.1	-16.3	-2.3
North Carolina	38.0	203.9	38.1	219.4	0.1	7.6	2.2	11.0	1.7	8.7	-21.7	-1.6
Ohio	42.4	270.5	38.0	249.9	-10.4	-7.6	2.7	17.7	2.3	14.2	-15.6	-1.6
Pennsylvania	138.8	294.7	134.6	297.7	-3.0	1.0	8.0	16.8	6.6	13.7	-17.0	-1.4
South Carolina	26.3	97.1	26.5	101.9	0.6	4.9	1.6	4.4	1.3	3.8	-17.1	-1.1
Tennessee	56.1	130.8	54.7	131.0	-2.5	0.2	3.4	7.1	2.8	5.6	-19.9	-1.6
Virginia	16.4	175.5	15.0	195.1	-8.6	11.2	0.8	5.8	0.7	5.0	-14.8	-1.1
West Virginia	41.0	41.0	37.1	37.1	-9.5	-9.5	1.5	1.5	1.2	1.2	-17.1	-1.3
United States		**7,070**		**7,563**		**7.0**		**354**		**293**		**-17.5**
Appalachian States		**2,284**		**2,371**		**3.8**		**111**		**89**		**-20.3**
Appalachian Region		**537**		**530**		**-1.3**		**31**		**25**		**-17.3**
Appalachian Coal-Employment Counties		**219**		**207**		**-5.7**		**11**		**9**		**-18.9**

Source: U.S. Census Bureau County Business Patterns

The fall in manufacturing establishments was more acute in Appalachian coal-employment counties with a decline of 18.9 percent. Only 17 of the 129 coal-employment counties were able to produce growth in manufacturing establishments between 2000 and 2014. For five of these counties, there were no more than five manufacturing establishments in 2014. Six coal-employment counties had no manufacturing establishments at all in 2000, while five had no establishments in 2014. Allegheny County, Pennsylvania, with Pittsburgh as county seat, had 1,062 manufacturing establishments in 2014, more than any other coal county; there were 1,416 establishments in the county in 2000. Twenty-nine counties had more than 100 establishments in 2014, in principle offering the potential for job opportunities for coal industry workers seeking alternative employment. However, these opportunities are likely to arise primarily from quits and terminations rather than from firm expansions and new firm locations, given the long-term trend in manufacturing employment across the nation and the Region.

Table 5 provides a snapshot of the population and its age distribution for the same geographies as presented above for 2000 and 2015. These population measures are especially important since they affect the labor force and its age composition. Moreover, net population movements provide a signal regarding the health of local economies and labor markets. Of the geographies shown, population growth was strongest for the United States between 2000 and 2015 (14.2 percent), followed by the Appalachian Region (7.6 percent), and states that are either partially or wholly included in Appalachia (11.1 percent). Appalachian coal counties saw net population outflows of -0.4 percent, a reflection of poor economic prospects for workers.

Table 5: Population Counts and Age Distributions for States and Other Geographies in Appalachia

	Population			Shares 18-64		Shares 65 and older		Median Age	
	2000	2015	Growth (%)	2000	2015	2000	2015	2000	2015
Alabama	4,447,100	4,858,979	9.3	61.7	61.6	13.0	15.7	35.8	38.7
Georgia	8,186,453	10,214,860	24.8	63.9	62.7	9.6	12.8	33.4	36.3
Kentucky	4,041,769	4,425,092	9.5	62.9	61.9	12.5	15.2	35.9	38.7
Maryland	5,296,486	6,006,401	13.4	63.1	63.4	11.3	14.1	36.0	38.4
Mississippi	2,844,658	2,992,333	5.2	60.7	61.0	12.1	14.7	33.8	36.9
New York	18,976,457	19,795,791	4.3	62.4	63.8	12.9	15.0	35.9	38.3
North Carolina	8,049,313	10,042,802	24.8	63.6	62.1	12.0	15.1	35.3	38.4
Ohio	11,353,140	11,613,423	2.3	61.3	61.5	13.3	15.9	36.2	39.3
Pennsylvania	12,281,054	12,802,503	4.2	60.6	62.0	15.6	17.0	38.0	40.7
South Carolina	4,012,012	4,896,146	22.0	62.7	61.5	12.1	16.2	35.4	39.0
Tennessee	5,689,283	6,600,299	16.0	63.1	61.9	12.4	15.4	35.9	38.6
Virginia	7,078,515	8,382,993	18.4	64.2	63.5	11.2	14.2	35.7	37.8
West Virginia	1,808,344	1,844,128	2.0	62.4	61.2	15.3	18.2	38.9	42.1
United States	**281,421,906**	**321,418,820**	**14.2**	**61.9**	**62.2**	**12.4**	**14.9**	**35.3**	**37.8**
Appalachian States	**94,064,584**	**104,475,750**	**11.1**	**62.4**	**62.5**	**12.7**	**15.2**	**—**	**—**
Appalachian Counties	**23,638,289**	**25,417,532**	**8**	**61.9**	**61.9**	**14.4**	**16.3**	**—**	**—**
Appalachian Coal-Employment Counties	**9,397,124**	**9,361,350**	**-0.4**	**61.2**	**62.3**	**16.0**	**17.2**	**—**	**—**

Source: U.S. Census Bureau Decennial Census and 2015 Population Estimates

The average population size of coal-employment counties was 72,569 in 2015, with 21 of these counties having populations larger than 100,000. Seven coal-employment counties had populations less than 10,000 people. For these latter communities, alternative job prospects can be expected to be especially bleak. Only 50 of the 129 counties had population growth over the 2000 to 2015 window while 11 counties suffered population losses in excess of 10 percent. These symptoms of weak labor markets will in turn further constrain the size and diversity of future labor markets in the Region.

Of particular interest is the 18 to 64 age group since individuals in this cohort tend to have the strongest attachment to the labor force. The Appalachian states generally have older populations than the nation as a whole, with only Georgia and Mississippi having a lower median age than the nation overall. The median age in the heavy coal-producing states of Pennsylvania and West Virginia stood at 40.7 and 42.1 in 2015, compared to 37.8 for the nation. The older median population in the Appalachian states generally translates into a smaller share of the adult population in the traditional 18 to 64 working age group. This limits labor force development by constraining both the number of available workers and occupational diversity. Moreover, older workers may find it relatively more difficult to find new employment opportunities. Mississippi stands out with the smallest share of the population in the 18 to 64 cohort at 61.0 percent in 2015, followed by West Virginia at 61.2 percent. All states experienced an aging of the population between 2000 and 2015.

The population in the Appalachian Region is less mobile than the national average, which may hamper the movement of workers to new employment alternatives outside their existing places of residence. Workers with the best options may find opportunities elsewhere while those without strong, marketable labor market skills may be left behind in stagnant or contracting regional economies. Based on 2010-2014 American Community Survey data, 85.0 percent of the United States

population over the age of one did not move from their place of residence. For the population in the Appalachian Region, the comparable figure was 86.8 percent. West Virginia and the Appalachian portion of Kentucky had rates of 88.3 percent and 86.9 percent, respectively.[4]

Educational attainment is arguably the most important ingredient to regional development and individual prosperity. Unfortunately, educational attainment in the Appalachian Region lags the national average, as summarized in Table 6. These differences in attainment will constrain labor market and economic development opportunities in the Region and limit the availability and creation of high-quality jobs for workers who are displaced from the coal industry ecosystem. Employers who require well-educated workers may simply choose to locate production activities in more attractive regions. In 2000, just 17.6 percent of adults in Appalachian counties held a bachelors' degree compared to 24.4 percent for the nation; coal-employment communities trailed Appalachian counties with a 17.5 percent college degree attainment rate. The Appalachian Region saw marked improvement by 2015, with the share of adults with a bachelor's degree rising to 22.6 percent, a gain of 5.0 percentage points. However, the United States showed stronger progress with a 5.4 percentage point gain that pushed attainment to 29.8 percent of the adult population. This translates into a *widening* disparity between the Appalachian Region and the United States, from 6.8 percentage points in 2000 to 7.2 percentage points in 2012. Coal-employment communities had a slightly better outcome than the Appalachian Region in 2015, with 22.7 percent of adults holding a college degree. One implication of the time trends shown in Table 6 is that the Appalachian Region has become a relatively *less* attractive place to create jobs based on the educational attainment of the workforce.

[4] Pollard and Jacobsen (2016).

Table 6: Educational Attainment of the Population 25 Years and Older for States and Other Geographies in Appalachia

	Population 25 Years and Older		Percent Less than High School Diploma (or Equivalent)		Percent High School Diploma (or Equivalent)		Percent Some College (No Degree)		Percent Associate's Degree		Percent Bachelor's Degree or Higher	
	2000	2015	2000	2015	2000	2015	2000	2015	2000	2015	2000	2015
Alabama	2,887,400	3,239,351	24.7	15.7	30.4	31.0	20.5	22.0	5.4	7.8	19.0	23.5
Georgia	5,185,965	6,500,205	21.4	14.6	28.7	31.0	20.4	21.0	5.2	7.2	24.3	28.8
Kentucky	2,646,397	2,955,216	25.9	15.8	33.6	28.4	18.5	20.8	4.9	7.5	17.1	22.3
Maryland	3,495,595	4,018,459	16.2	10.6	26.7	33.6	20.3	19.5	5.3	6.4	31.4	37.9
Mississippi	1,757,517	1,940,365	27.1	17.7	29.4	25.5	20.9	22.8	5.7	8.6	16.9	20.7
New York	12,542,536	13,435,795	20.9	14.4	27.8	30.3	16.8	16.2	7.2	8.5	27.4	34.2
North Carolina	5,282,994	6,582,301	21.9	14.2	28.4	26.7	20.5	21.8	6.8	9.0	22.5	28.4
Ohio	7,411,740	7,817,508	17.0	10.9	36.1	26.7	19.9	20.7	5.9	8.2	21.1	26.1
Pennsylvania	8,266,284	8,814,112	18.1	10.8	38.1	34.1	15.5	16.3	5.9	7.9	22.4	28.6
South Carolina	2,596,010	3,210,007	23.7	14.4	30.0	36.4	19.3	21.0	6.7	8.9	20.4	25.8
Tennessee	3,744,928	4,380,036	24.1	14.5	31.6	29.8	20.0	21.0	4.7	6.6	19.6	24.9
Virginia	4,666,574	5,566,373	18.5	11.7	26.0	33.0	20.4	19.9	5.6	7.3	29.5	36.3
West Virginia	1,233,581	1,298,118	24.8	15.0	39.4	24.8	16.6	18.5	4.3	6.6	14.8	19.2
United States	**182,211,639**	**211,462,522**	**19.6**	**13.3**	**28.6**	**40.7**	**21.0**	**21.1**	**6.3**	**8.1**	**24.4**	**29.8**
Appalachian States	**61,717,521**	**69,757,846**	**20.7**	**13.3**	**31.1**	**30.1**	**18.7**	**19.4**	**6.0**	**7.9**	**23.5**	**29.3**
Appalachian Region	**15,799,129**	**17,406,203**	**23.2**	**14.5**	**35.5**	**35.5**	**17.6**	**19.3**	**5.7**	**8.2**	**17.6**	**22.6**
Appalachian Coal-Employment Counties	**6,373,871**	**6,533,244**	**21.6**	**12.9**	**38.1**	**38.3**	**16.3**	**17.9**	**5.6**	**8.2**	**17.5**	**22.8**

Source: U.S. Census Bureau Decennial Census and 2015 ACS 5-year Estimates

Another important facet of the human capital stock that has implications for economic development is the health status of the population. Like education, employers will prefer to locate in regions characterized by a healthy population since it is a barometer of workforce quality and potentially quality of life. In general, healthier individuals have greater attachment to the labor market than individuals in poor health. Moreover, large shares of the adult population with poor health status constrain labor availability and diversity. Finally, poor health status creates pressures on the health care delivery system which is strained throughout much of rural America and Appalachian coal country. Public health expenditures can crowd out other uses of public sector resources that might help foster economic development.

Table 7 presents seven different measures of health status and reveals the relatively poor standing of the states that are represented within the Appalachian Region. West Virginia has the highest incidence of coronary heart disease, depression, heart attack, kidney disease, skin cancer and stroke among the Appalachian states. Kentucky does worse than the nation in all categories except depression.

Table 7: State-Level Disease Prevalence (Crude Prevalence, Percent)

	Coronary Heart Disease	Depression	Diabetes	Heart Attack	Kidney Disease	Skin Cancer	Stroke
Alabama	5.2	22.1	13.5	5.2	2.8	8.2	4.7
Georgia	4.2	18.3	11.3	4.6	3.0	6.3	3.8
Kentucky	6.0	18.8	13.4	6.7	3.0	7.6	4.3
Maryland	3.8	16.3	10.3	3.7	2.3	5.0	2.8
Mississippi	4.9	18.2	14.7	5.6	2.9	6.1	4.5
New York	4.7	18.8	10.7	4.3	2.8	7.1	3.7
North Carolina	3.8	15.7	9.8	3.9	2.1	4.6	2.4
Ohio	4.2	19.6	11.0	4.9	3.2	6.1	3.5
Pennsylvania	4.7	18.5	10.4	5.0	2.7	5.8	3.6
South Carolina	4.3	19.5	11.8	4.7	2.9	7.0	3.9
Tennessee	4.9	21.2	12.7	6.0	3.5	7.5	4.3
Virginia	3.4	15.7	10.4	3.5	2.3	5.7	3.1
West Virginia	7.4	23.1	14.5	7.0	3.6	7.7	4.8
United States	**3.9**	**19.0**	**9.9**	**4.2**	**2.7**	**6.1**	**3.0**

Source: U.S. Centers for Disease Control

Other state-level evidence paints a similar picture. For example, the incidence of disability is relatively high in the Region, with 15.6 percent of the Appalachian population being disabled compared to 12.1 percent for the United States. For the 18 to 64 age group, the incidence of disability in the Appalachian Region was 13.6 percent while the United States' rate was 10.0 percent. In West Virginia, 197,747 individuals in the 18-64 population group were disabled in the 2010-2014 window. This represented 17.1 percent of all individuals aged 18 to 64.[5]

Table 8 summarizes six county-level health metrics for coal-employment counties, indicating the number and share of the 129 counties, by state, that have an incidence of the specific health disorder that exceeds the state average. Coal counties in Alabama and Pennsylvania do not appear to have pervasive problems relative to other counties in their states. West Virginia's coal counties are not substantially worse than other counties across the state, though the number of individuals with a body mass index (BMI) greater than 30 and adults with no leisure-time physical activity are relatively high. On the other hand, health status is especially poor for Kentucky, Maryland, Mississippi, Ohio, Tennessee, and Virginia. For most of these states and most of the indexes, coal communities perform poorly compared to the rest of their respective states and to coal communities across the country.

[5] Data based on the 2010-2014 American Community Survey drawn from Tables 2.1 and 9.1 of Pollard and Jacobsen (2016).

Table 8: 2017 County Health Rankings for Coal-Employment Counties in the Appalachian Region

Area	Percentage of Adults Reporting Fair or Poor Health	Average Number of Physically Unhealthy Days Reported in Past 30 Days	Average Number of Mentally Unhealthy Days Reported in Past 30 Days	Percentage of Adults Who Are Current Smokers	Percentage of Adults that Report a BMI ≥ 30	Percentage of Adults Aged 20 & Over Reporting No Leisure-Time Physical Activity
Alabama	21.2	4.5	4.4	21.4	34.0	27.7
Number of Counties	3	6	8	0	4	8
Percentage	25.0	50.0	66.7	0.0	33.3	66.7
Kentucky	20.9	4.7	4.4	25.9	32.9	27.8
Number of Counties	23	23	19	13	24	24
Percentage	95.8	95.8	79.2	54.2	100.0	100.0
Maryland	13.3	3.5	3.4	15.1	28.9	21.5
Number of Counties	2	2	2	2	2	2
Percentage	100.0	100.0	100.0	100.0	100.0	100.0
Mississippi	22.2	4.4	4.6	22.5	35.2	31.9
Number of Counties	1	1	0	0	0	1
Percentage	100.0	100.0	0.0	0.0	0.0	100.0
Ohio	15.3	3.7	4.0	21.6	31.4	25.3
Number of Counties	18	17	16	4	15	17
Percentage	94.7	89.5	84.2	21.1	78.9	89.5
Pennsylvania	15.3	3.5	3.9	18.1	29.3	23.1
Number of Counties	3	17	7	10	22	26
Percentage	10.0	56.7	23.3	33.3	73.3	86.7
Tennessee	19.9	4.8	4.4	21.9	31.8	29.8
Number of Counties	5	6	7	5	3	6
Percentage	71.4	85.7	100.0	71.4	42.9	85.7
Virginia	14.6	3.2	3.3	16.5	27.2	21.4
Number of Counties	7	7	7	7	6	7
Percentage	100.0	100.0	100.0	100.0	85.7	100.0
West Virginia	23.7	5.1	4.8	25.7	34.6	29.2
Number of Counties	11	13	16	7	20	19
Percentage	39.3	46.4	57.1	25.0	71.4	67.9
UNITED STATES	17.0	3.9	3.8	17.9	31.0	26.0
Number of Counties	89	90	116	109	104	107
Percentage	68.5	69.2	89.2	83.8	80.0	82.3

Source: Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute. County Health Rankings & Roadmaps Program, County Health Rankings, 2017, <countyhealthrankings.org>

Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/OpenGovernmentData/DataSets/ MinesProdYearly.zip>.

The discussion above documents the relatively weaker standing of labor markets in the Appalachian Region compared to the overall national economy. These patterns translate into poorer economic outcomes using other measures of economic wellbeing. Table 9 provides per capita income data for 2000 and 2015 in 2009 dollars. Inflation-adjusted per capita income across Appalachian counties averaged $42,272 in 2015 compared to per capita income of $48,131 for the nation as a whole. Coal-employment counties in the Region had an average per capita income of $45,268, benefiting from the relatively high-wage jobs tied to the coal industry. Nonetheless, 12 Appalachian coal counties had inflation-adjusted per capita incomes below $30,000 in 2015, the poorest being Elliott County, Kentucky ($23,817). Inflation-adjusted per capita income declined in 12 coal counties between 2000 and 2015.

Table 9: Per Capita Personal Income (2009 Inflation-Adjusted Dollars) for State and Other Geographies in Appalachia

	Appalachian Portions			Entire State		
	2000	2015	Growth Rate (%)	2000	2015	Growth Rate (%)
Alabama	$ 20,938	$ 43,066	4.9	$ 20,166	$ 41,655	5.0
Georgia	22,442	39,915	3.9	23,892	44,148	4.2
Kentucky	15,530	34,274	5.4	20,632	42,266	4.9
Maryland	19,682	44,559	5.6	29,500	61,307	5.0
Mississippi	16,501	35,182	5.2	17,902	38,085	5.2
New York	20,078	42,192	5.1	29,864	64,262	5.2
North Carolina	21,206	40,238	4.4	22,756	44,645	4.6
Ohio	19,060	40,358	5.1	23,700	47,719	4.8
Pennsylvania	22,356	48,331	5.3	25,256	54,486	5.3
South Carolina	21,629	42,687	4.6	20,717	41,953	4.8
Tennessee	20,265	41,311	4.9	22,574	46,106	4.9
Virginia	17,812	38,071	5.2	23,196	48,169	5.0
West Virginia	18,522	40,262	5.3	18,522	40,262	5.3
United States		—		**30,585**	**48,131**	**3.1**
Appalachian States		—		**24,435**	**50,261**	**4.9**
Appalachian Counties	**20,525**	**42,272**	**4.9**		—	
Appalachian Coal-Employment Counties	**21,080**	**45,268**	**5.2**		—	

Source: Bureau of Economic Analysis

Poverty rates are also higher in the Appalachian Region, as reported in Table 10. The Appalachian Region had a poverty rate of 17.1 percent in 2015 compared to a national figure of 15.5 percent. Despite relatively strong per capita incomes in mining-employment counties, poverty rates in these counties (averaging 17.1 percent) nonetheless exceed the regional average. Thirteen of the counties in the Appalachian Region with coal employment had poverty rates equal to or above 30 percent in 2015. The highest rate was in McCreary County, Kentucky (41.0 percent). Poverty rates increased in 88 of the 129 counties between 2000 and 2015.

Table 10: Regional Poverty Rates (Percent) for States and Other Geographies in Appalachia

	2000	2015
Alabama	16.1	18.8
Georgia	13.0	18.4
Kentucky	15.8	18.9
Maryland	8.5	10.0
Mississippi	19.9	22.5
New York	14.6	15.7
North Carolina	12.3	17.4
Ohio	10.6	15.8
Pennsylvania	11.0	13.5
South Carolina	14.1	17.9
Tennessee	13.5	17.6
Virginia	9.6	11.5
West Virginia	17.9	18.0
United States	**12.4**	**15.5**
Appalachian States	**12.8**	**15.9**
Appalachian Region	**13.6**	**17.1**
Appalachian Coal-Employment Counties	**14.6**	**16.7**

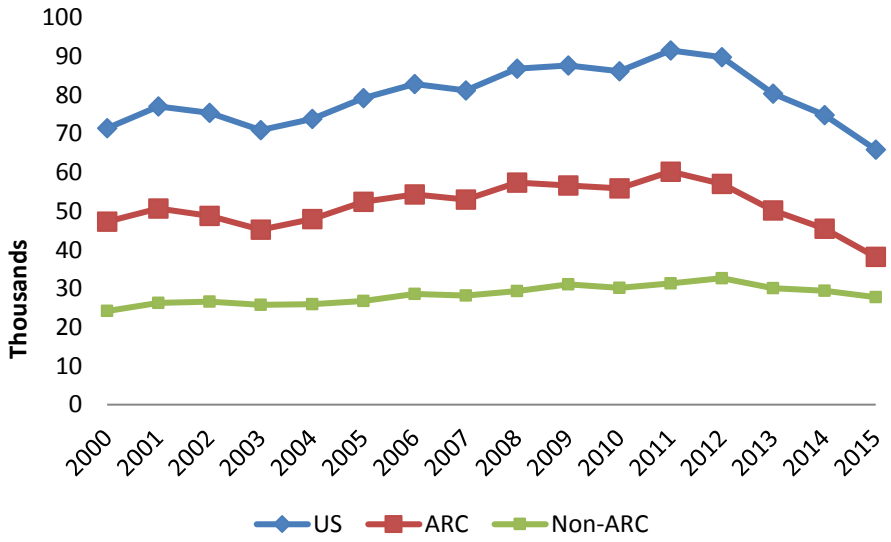
Source: U.S. Census Bureau Decennial Census and 2015 ACS 5-Year Estimates

2. Coal Industry Labor Force and Employment

2.1. Coal Mining Employment

Monthly data maintained by the Federal Reserve Bank of St. Louis show, first, that coal production does not follow seasonal cycles and, second, that national coal mining employment has been in long-term decline with only occasional upswings. Employment declined from a monthly average of 173,700 workers in 1985 to 54,700 in 2016. A more recent snapshot of coal employment trends is shown in Figure 2 using Mine Safety and Health Administration (MSHA) data. National employment trended upward over the period shown, peaking at 91,611 jobs in 2011; by 2015, employment had slipped to just 65,971 jobs. Coal employment in the Appalachian Region also peaked in 2011 with a job count of 60,267. The decline in coal employment has been particularly steep in Appalachia since 2011, with employment in 2015 totaling only 38,193, reflecting a loss of 22,074 jobs since the 2011 peak. Non-Appalachian coal-producing regions have fared better than the Appalachian Region, with 2015 employment levels (27,778) exceeding 2000 levels (24,211).

Figure 2: Coal Employment Trends Since 2000



Source: Mine Safety and Health Administration and U.S. Energy Information Administration

Table 11 provides detail on coal employment and coal production for the Appalachian states for 2000 and 2015. Coal production for all the Appalachian states is down 46.9 percent over this period compared to just a 16.5 percent contraction for the nation. Appalachian coal production accounted for 28.3 percent of all United States coal production in 2000 but fell to 20.1 percent of total production in 2015. Coal employment has contracted as well, but the declines have not been as steep as the declines in output. The decline for Appalachian states was 19.3 percent, compared to a 7.8 percent decline for the nation. For the Appalachian Region, this translates into a loss of 9,118 coal jobs. This is more than the loss in employment for the national coal industry, indicating employment growth in other coal-producing regions outside of the Appalachian Region.

Table 11: Appalachian States and Regional Coal Employment and Coal Production, 2000 and 2015

	Employment			Production (million tons)		
	2000	**2015**	**Growth (%)**	**2000**	**2015**	**Growth (%)**
Alabama	3,365	3,228	-4.1	19.5	13.2	-32.3
Georgia	—	—	—	—	—	—
Kentucky	12,130	5,916	-51.2	105.9	27.9	-73.6
Maryland	470	362	-23	4.5	1.9	-57.9
Mississippi	108	330	205.6	0.9	3.1	248.5
N. Carolina	—	—	—	—	—	—
New York	—	—	—	—	—	—
Ohio	2,681	2,328	-13.2	21.6	17	-21.2
Pennsylvania	7,953	6,477	-18.6	70.5	47.9	-32.1
S. Carolina	—	—	—	—	—	—
Tennessee	439	287	-34.6	2.7	0.9	-66.7
Virginia	5,032	3,065	-39.1	33.1	14.1	-57.3
W. Virginia	15,133	16,200	7.1	164.7	99	-39.9
Appalachian States	**47,311**	**38,193**	**-19.3**	**423.4**	**225**	**-46.9**
United States	**71,522**	**65,971**	**-7.8**	**1,073.60**	**896.9**	**-16.5**

Source: NMA 2016, Map: Economic Impact of Mining (http://nma.org/map/, downloaded March 14, 2017)

[1] We rounded the numbers to the closest full percentage point

Note: The number in this table are for the states. The MMA does not report them by county and we can, therefore, not extract the Appalachian portion of each state.

Within the Appalachian Region, there is significant variation in the performance of the various coal-producing states. Kentucky experienced the largest percentage setback, with coal employment falling 51.2 percent. Kentucky also experienced the largest setback in the number of jobs lost (6,214). West Virginia and Mississippi saw net employment gains between 2000 and 2015. For West Virginia, the gain was 7.1 percent. Coal employment in Mississippi jumped 205.6 percent, building from a small base of only 108 jobs in 2000. Coal production was down in all Appalachian states other than Mississippi between 2000 and 2015. The production setback in Kentucky was the worst in the Region, with coal output falling 73.6 percent.

Table 12 provides coal mining employment data, along with data on related support employment, provided by the National Mining Association (NMA). A comparison of Tables 11 and 12 shows significant discrepancies in the number of coal mining employees reported by MSHA versus the NMA. We place greater confidence in the MSHA and Energy Information Agency EIA numbers because the NMA's implied job multipliers are uncommonly large, particularly in the case of states with small coal mining employment. A study conducted for the coal industry in southwestern Virginia, encompassing only the Appalachian part of the state, estimated that each coal mining job supports 1.27 jobs in other

industries and each dollar in wage earnings generates $0.64 in additional earnings (Evans, 2013). Based on other industry studies, these are more realistic multipliers.

Table 12: State Coal Mining and Related Transportation and Support Employment, 2015

State	Direct Employment			Coal Mining Support Activities as Percent of Direct Employment[1]	Indirect and Induced Employment
	Coal Mining	Transportation	Coal Mining Support Activities		
Alabama	4,332	2,197	65	1	11,015
Georgia	76	0	0	0	3,753
Kentucky	14,524	4,075	1,229	7	26,077
Maryland	2,008	126	251	12	8,443
Mississippi	368	307	0	0	3,471
New York	22	0	0	0	9,026
North Carolina	104	31	0	0	8,154
Ohio	4,393	1,421	392	7	17,645
Pennsylvania	11,727	7,127	494	3	40,193
South Carolina	55	0	0	0	4,048
Tennessee	646	69	29	4	3,345
Virginia	5,316	2,543	274	3	16,626
West Virginia	22,750	4,848	908	3	27,667
Total	66,321	22,744	3,642	4	179,463

Source: NMA 2016, Map: Economic Impact of Mining (http://nma.org/map/, downloaded March 14, 2017); State level data only

[1] Rounded to the nearest percentage point.

Not all employment associated with mining is located on or near the coal fields. Some engineering and many management functions are located at the coal company's headquarters or back offices, which are often in a large city where alternative employment opportunities are more abundant. For example, the two largest United States coal companies, Peabody and Arch Coal, which together account for one-third of total national coal production, are headquartered in St. Louis. Additionally, related activities such as the production of heavy equipment, specialized trucks and vehicles, etc., are usually located away from coal field regions, as well. Therefore, the impact of changes in coal production and coal industry employment is also felt outside the coal fields. The coal fields themselves will see direct production and employment losses and this will give rise to ripples that will spread broadly across regions and occupations (for empirical evidence of the ripple effect, see Gebremariam, Gebremedhin, and Schaeffer, 2011).

Table 13 shows coal employment and production data for Appalachian coal-employment counties with active coal employment in 2010 for the years 2000, 2010, and 2015, while Figure 3 shows changes in coal employment for counties in the Region that had coal employment in 2010. Within the

Appalachian Region, 126 of the 129 counties reported coal employment in 2000 and 111 counties reported coal employment in 2015, based on data from MSHA. Seventy-eight counties experienced coal employment losses between 2000 and 2015, including 19 counties that lost all coal employment. The largest coal employment base in the Region in 2000 was Pike County, Kentucky with 3,642 jobs; by 2015, employment had fallen nearly 57 percent to 1,571 jobs in the county. The highest level of reported coal employment in 2015 was in Greene County, Pennsylvania, with 2,476 jobs, an increase of 22.8 percent since 2000. In 2015, there were a number of counties with relatively large shares of local employment directly tied to coal production. Three counties relied on coal for more than 20 percent of their employment base: Dickenson County, Virginia (23.4 percent); Boone County, West Virginia (28.4 percent); and Wyoming, West Virginia (22.4 percent). Dickenson County is the only one of the three to see growth in coal employment between 2010 and 2015. Thirteen additional counties had coal employment shares between 10 and 20 percent of the local job base in 2015. Of this set of counties, only three experienced employment growth since 2010: Harrison County, Ohio; Greene County, Pennsylvania; and Marshall County, West Virginia. The lack of diversification places these communities at heightened risk since there are so few alternative employment opportunities outside the coal sector.

The coal production data tell an equally devastating story. For the Appalachian Region as a whole, production was down 46.9 percent between 2000 and 2015, and the Region experienced a 33.8 percent contraction over the shorter 2010 to 2015 window. Only 21 counties in the Region had coal production output growth between 2010 and 2015.

Table 13: Coal Employment and Coal Production by Appalachian County for Counties with Coal Employment in 2010

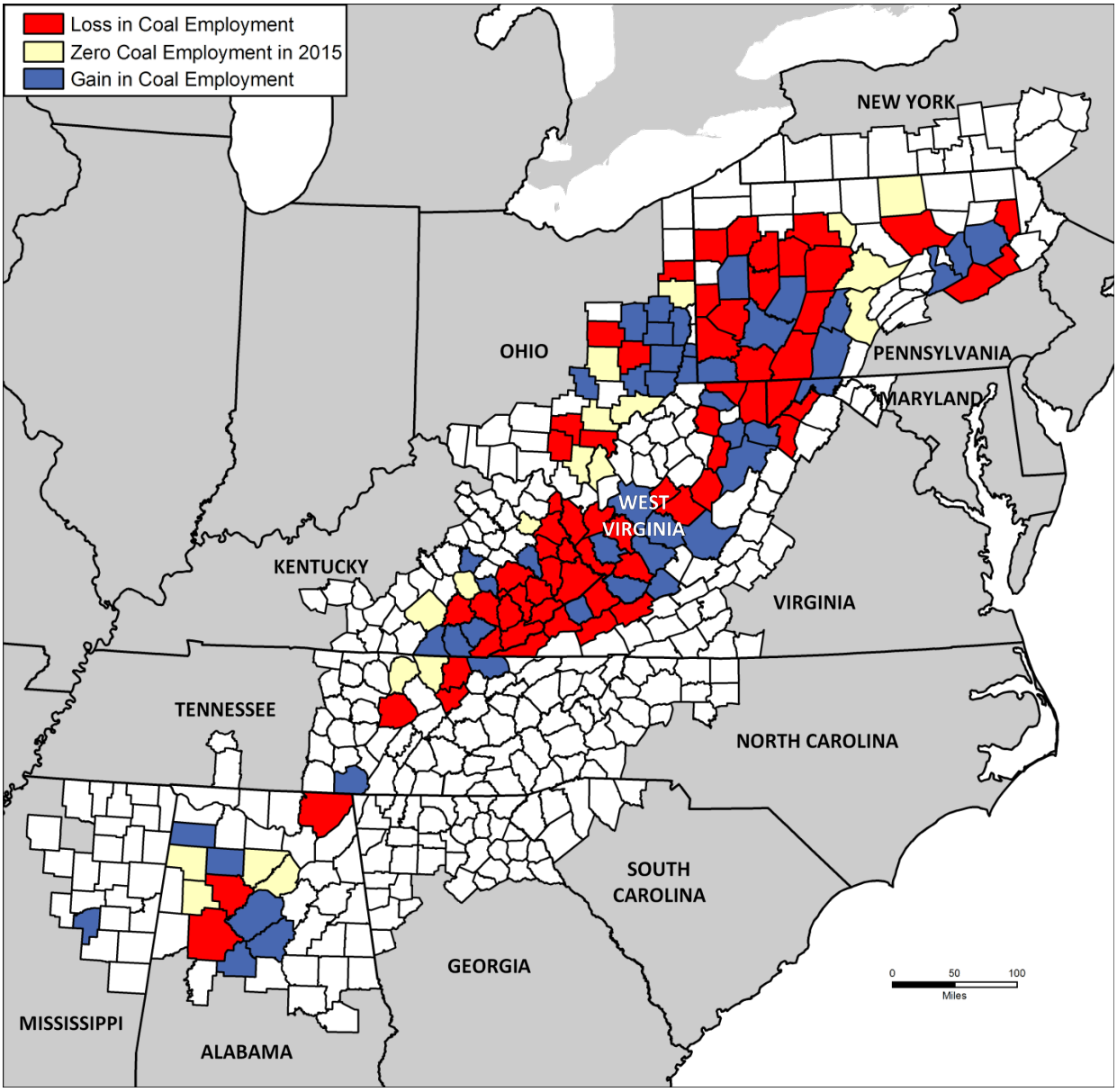
		Coal Employment							Coal Production				
State	County	2000	2010	2015	Growth 2000-2015 (%)	Growth 2010-2015 (%)	2015 Total Covered Employment	% Total Covered Employment 2015	2000	2010	2015	Growth 2000-2015 (%)	Growth 2010-2015 (%)
AL	Bibb	4	13	6	50.0	-53.8	4,075	0.1	65,510	127,667	62,598	-4.4	-51.0
AL	Blount	0	45	0	—	-100.0	8,066	0.0	0	148,994	0	—	-100.0
AL	Cullman	9	17	0	-100.0	-100.0	27,683	0.0	17,006	69,035	0	-100.0	-100.0
AL	Fayette	334	372	0	-100.0	-100.0	3,916	0.0	2,603,898	3,037,170	0	-100.0	-100.0
AL	Franklin	0	23	28	—	21.7	10,248	0.3	0	109,530	146,955	—	34.2
AL	Jackson	6	17	5	-16.7	-70.6	16,286	0.0	4,719	33,623	3,939	-16.5	-88.3
AL	Jefferson	1,053	1,403	1,553	47.5	10.7	338,154	0.5	5,235,850	5,834,058	6,570,101	25.5	12.6
AL	Marion	16	18	0	-100.0	-100.0	9,606	0.0	80,298	79,174	0	-100.0	-100.0
AL	Shelby	20	140	137	585.0	-2.1	83,420	0.2	24,500	323,000	276,798	1,029.8	-14.3
AL	Tuscaloosa	945	1,144	668	-29.3	-41.6	91,535	0.7	4,887,332	5,538,415	2,518,567	-48.5	-54.5
AL	Walker	954	1,123	764	-19.9	-32.0	18,293	4.2	6,273,641	4,709,373	3,321,332	-47.1	-29.5
AL	Winston	24	103	67	179.2	-35.0	7,255	0.9	279,760	685,481	292,252	4.5	-57.4
KY	Bell	614	760	371	-39.6	-51.2	8,465	4.4	3,499,158	2,185,176	1,476,947	-57.8	-32.4
KY	Boyd	153	71	44	-71.2	-38.0	25,002	0.2	0	0	0	—	—
KY	Breathitt	108	173	48	-55.6	-72.3	3,149	1.5	1,035,156	953,143	251,064	-75.7	-73.7
KY	Clay	19	129	17	-10.5	-86.8	3,981	0.4	9,224	488,874	0	-100.0	-100.0
KY	Elliott	0	1	0	—	-100.0	906	0.0	0	0	0	—	—
KY	Estill	32	1	35	9.4	3,400.0	2,341	1.5	42,073	0	0	-100.0	—
KY	Floyd	525	303	481	-8.4	58.7	10,977	4.4	2,952,340	1,688,117	2,393,667	-18.9	41.8
KY	Harlan	1,426	2,265	860	-39.7	-62.0	6,227	13.8	10,113,302	10,467,335	3,793,465	-62.5	-63.8
KY	Jackson	3	5	0	-100.0	-100.0	1,736	0.0	22,355	27,462	0	-100.0	-100.0
KY	Johnson	78	63	51	-34.6	-19.0	5,579	0.9	562,368	156,849	122,908	-78.1	-21.6
KY	Knott	1,364	1,030	334	-75.5	-67.6	2,432	13.7	13,757,716	5,408,479	2,416,596	-82.4	-55.3
KY	Knox	122	138	137	12.3	-0.7	7,637	1.8	389,061	640,539	392,630	0.9	-38.7
KY	Laurel	14	3	8	-42.9	166.7	25,648	0.0	29,300	0	6,637	-77.3	—
KY	Lawrence	81	38	73	-9.9	92.1	3,205	2.3	576,904	158,632	373,375	-35.3	135.4
KY	Leslie	608	748	238	-60.9	-68.2	1,685	14.1	6,719,920	3,667,325	1,361,768	-79.7	-62.9
KY	Letcher	1,249	894	182	-85.4	-79.6	4,470	4.1	9,819,215	4,320,891	549,959	-94.4	-87.3
KY	McCreary	0	7	4	—	-42.9	2,620	0.2	0	0	0	—	—
KY	Magoffin	0	297	51	—	-82.8	1,884	2.7	0	2,726,080	258,011	—	-90.5
KY	Martin	863	985	325	-62.3	-67.0	2,569	12.7	10,451,298	5,543,738	1,199,069	-88.5	-78.4
KY	Owsley	0	5	3	—	-40.0	665	0.5	0	4,363	0	—	-100.0
KY	Perry	1,071	1,887	900	-16.0	-52.3	12,008	7.5	11,096,869	13,105,447	6,291,210	-43.3	-52.0
KY	Pike	3,642	3,076	1,571	-56.9	-48.9	21,488	7.3	34,612,427	15,906,793	6,610,826	-80.9	-58.4
KY	Pulaski	36	11	0	-100.0	-100.0	25,502	0.0	0	0	0	—	—
KY	Whitley	114	153	173	51.8	13.1	11,620	1.5	187,628	460,729	394,235	110.1	-14.4
MD	Allegany	149	224	179	20.1	-20.1	28,969	0.6	1,261,709	1,702,652	1,128,963	-10.5	-33.7
MD	Garrett	321	206	183	-43.0	-11.2	11,789	1.6	3,284,533	812,814	785,728	-76.1	-3.3
MS	Choctaw	108	232	218	101.9	-6.0	2,123	10.3	901,951	4,003,505	2,976,276	230.0	-25.7
OH	Athens	53	3	0	-100.0	-100.0	20,634	0.0	543,824	26,725	0	-100.0	-100.0
OH	Belmont	537	747	676	25.9	-9.5	23,615	2.9	5,517,742	7,559,272	5,401,211	-2.1	-28.5
OH	Carroll	11	41	54	390.9	31.7	6,823	0.8	45,051	135,948	185,852	312.5	36.7
OH	Columbiana	91	42	0	-100.0	-100.0	30,659	0.0	498,237	91,628	0	-100.0	-100.0
OH	Coshocton	45	90	32	-28.9	-64.4	10,998	0.3	57,531	294,832	0	-100.0	-100.0
OH	Gallia	22	4	0	-100.0	-100.0	10,904	0.0	202,762	0	0	-100.0	—
OH	Guernsey	153	39	11	-92.8	-71.8	15,610	0.1	1,070,817	236,939	17,391	-98.4	-92.7
OH	Harrison	311	349	388	24.8	11.2	3,875	10.0	3,014,702	3,915,324	2,738,850	-9.2	-30.0
OH	Jackson	153	66	15	-90.2	-77.3	10,323	0.1	1,424,921	370,004	155,115	-89.1	-58.1
OH	Jefferson	81	167	94	16.0	-43.7	20,824	0.5	674,171	1,537,382	393,566	-41.6	-74.4
OH	Mahoning	4	7	3	-25.0	-57.1	97,706	0.0	7,515	3,252	0	-100.0	-100.0
OH	Meigs	761	95	2	-99.7	-97.9	3,557	0.1	4,317,564	735,167	0	-100.0	-100.0
OH	Monroe	4	486	481	11,925.0	-1.0	2,886	16.7	0	6,214,246	5,248,702	—	-15.5
OH	Muskingum	54	20	0	-100.0	-100.0	32,130	0.0	684,698	6,651	0	-100.0	-100.0
OH	Noble	39	73	44	12.8	-39.7	3,161	1.4	369,513	774,608	430,225	16.4	-44.5
OH	Perry	70	268	329	370.0	22.8	5,548	5.9	971,046	2,774,670	1,355,758	39.6	-51.1
OH	Tuscarawas	108	211	153	41.7	-27.5	36,608	0.4	793,044	1,841,499	890,009	12.2	-51.7
OH	Vinton	167	115	46	-72.5	-60.0	2,241	2.1	1,198,860	707,864	163,595	-86.4	-76.9
OH	Washington	0	5	0	—	-100.0	25,154	0.0	0	0	0	—	—
PA	Allegheny	41	36	14	-65.9	-61.1	685,508	0.0	100	224,542	5,440	5,340.0	-97.6
PA	Armstrong	408	381	270	-33.8	-29.1	17,132	1.6	4,286,113	3,400,420	1,275,449	-70.2	-62.5
PA	Beaver	65	20	18	-72.3	-10.0	52,103	0.0	591,231	200,135	309,110	-47.7	54.5
PA	Bedford	2	6	14	600.0	133.3	15,330	0.1	2,219	37,939	119,238	5,273.5	214.3
PA	Blair	3	15	8	166.7	-46.7	58,506	0.0	28,643	718	17,050	-40.5	2,274.7
PA	Butler	44	83	57	29.5	-31.3	85,050	0.1	481,630	478,159	448,549	-6.9	-6.2

Table 13: Coal Employment and Coal Production by Appalachian County for Counties with Coal Employment in 2010, (continued)

		Coal Employment							Coal Production				
State	County	2000	2010	2015	Growth 2000-2015 (%)	Growth 2010-2015 (%)	2015 Total Covered Employment	% Total Covered Employment 2015	2000	2010	2015	Growth 2000-2015 (%)	Growth 2010-2015 (%)
PA	Cambria	253	278	198	-21.7	-28.8	53,349	0.4	1,460,543	1,653,646	859,354	-41.2	-48.0
PA	Cameron	0	9	0	—	-100.0	1,985	0.0	0	39,412	0	—	-100.0
PA	Carbon	19	19	15	-21.1	-21.1	16,937	0.1	8,084	0	31,170	285.6	—
PA	Centre	0	12	0	—	-100.0	67,563	0.0	0	98,436	0	—	-100.0
PA	Clarion	97	76	3	-96.9	-96.1	13,523	0.0	719,522	273,059	10,102	-98.6	-96.3
PA	Clearfield	578	666	404	-30.1	-39.3	29,709	1.4	3,271,466	3,449,136	2,066,795	-36.8	-40.1
PA	Columbia	35	60	50	42.9	-16.7	24,918	0.2	42,114	179,694	147,724	250.8	-17.8
PA	Elk	46	55	9	-80.4	-83.6	14,968	0.1	490,201	353,201	8,721	-98.2	-97.5
PA	Fayette	57	52	27	-52.6	-48.1	40,040	0.1	189,534	153,524	23,605	-87.5	-84.6
PA	Greene	2,016	2,440	2,476	22.8	1.5	14,440	17.1	28,008,957	22,246,314	25,224,045	-9.9	13.4
PA	Huntingdon	0	2	0	—	-100.0	12,318	0.0	0	6,390	0	—	-100.0
PA	Indiana	399	541	412	3.3	-23.8	31,453	1.3	2,298,655	3,227,087	2,771,506	20.6	-14.1
PA	Jefferson	174	133	118	-32.2	-11.3	15,637	0.8	955,441	602,554	384,901	-59.7	-36.1
PA	Lackawanna	22	13	6	-72.7	-53.8	96,882	0.0	100,489	14,609	0	-100.0	-100.0
PA	Luzerne	287	304	339	18.1	11.5	142,346	0.2	1,198,962	211,469	496,389	-58.6	134.7
PA	Lycoming	66	35	32	-51.5	-8.6	53,016	0.1	262,743	251,818	119,887	-54.4	-52.4
PA	Mercer	5	7	5	0.0	-28.6	47,941	0.0	84,688	89,532	44,584	-47.4	-50.2
PA	Northumberlan	172	161	178	3.5	10.6	27,487	0.6	932,137	216,017	290,244	-68.9	34.4
PA	Schuylkill	800	508	553	-30.9	8.9	49,880	1.1	1,975,200	1,185,477	1,169,584	-40.8	-1.3
PA	Somerset	659	1,164	546	-17.1	-53.1	23,991	2.3	5,166,366	5,306,500	2,053,242	-60.3	-61.3
PA	Tioga	0	1	0	—	-100.0	13,045	0.0	0	0	0	—	—
PA	Venango	16	9	11	-31.3	22.2	18,921	0.1	0	0	10,985	—	—
PA	Washington	1,628	775	675	-58.5	-12.9	87,189	0.8	17,696,420	10,633,431	9,789,334	-44.7	-7.9
PA	Westmoreland	25	41	39	56.0	-4.9	133,042	0.0	111,920	114,890	204,913	83.1	78.4
TN	Anderson	22	96	8	-63.6	-91.7	39,144	0.0	41,378	294,514	0	-100.0	-100.0
TN	Campbell	102	296	21	-79.4	-92.9	9,013	0.2	651,004	952,076	68,031	-89.5	-92.9
TN	Claiborne	205	135	251	22.4	85.9	8,584	2.9	1,609,175	561,568	821,334	-49.0	46.3
TN	Cumberland	49	5	5	-89.8	0.0	17,253	0.0	265,102	0	0	-100.0	—
TN	Fentress	3	3	0	-100.0	-100.0	4,668	0.0	11,764	16,789	0	-100.0	-100.0
TN	Marion	0	2	2	—	0.0	7,157	0.0	0	0	0	—	—
TN	Scott	38	21	0	-100.0	-100.0	5,326	0.0	59,491	0	0	-100.0	—
VA	Buchanan	1,428	1,707	1,185	-17.0	-30.6	6,872	17.2	11,110,839	8,825,011	7,198,881	-35.2	-18.4
VA	Dickenson	667	781	845	26.7	8.2	3,610	23.4	3,537,504	3,347,040	3,585,016	1.3	7.1
VA	Lee	279	183	53	-81.0	-71.0	4,467	1.2	941,256	212,213	0	-100.0	-100.0
VA	Russell	214	261	46	-78.5	-82.4	7,023	0.7	915,872	726,205	551,660	-39.8	-24.0
VA	Tazewell	248	205	178	-28.2	-13.2	15,355	1.2	1,469,825	1,171,314	647,676	-55.9	-44.7
VA	Wise + Norton	2,196	1,678	758	-65.5	-54.8	15,960	4.7	15,153,086	7,440,181	2,150,835	-85.8	-71.1
WV	Barbour	168	333	277	64.9	-16.8	3,347	8.3	757,994	1,446,928	1,005,556	32.7	-30.5
WV	Boone	2,757	4,085	1,687	-38.8	-58.7	5,942	28.4	32,815,535	23,110,119	8,480,679	-74.2	-63.3
WV	Clay	362	272	18	-95.0	-93.4	1,386	1.3	5,092,609	2,095,129	0	-100.0	-100.0
WV	Fayette	391	983	627	60.4	-36.2	10,886	5.8	3,952,627	6,724,782	2,709,675	-31.4	-59.7
WV	Grant	97	28	19	-80.4	-32.1	3,408	0.6	651,898	5,017	51,431	-92.1	925.1
WV	Greenbrier	74	450	231	212.2	-48.7	13,226	1.7	563,098	919,184	916,614	62.8	-0.3
WV	Harrison	182	104	47	-74.2	-54.8	35,103	0.1	1,292,614	681,038	133,321	-89.7	-80.4
WV	Kanawha	1,100	1,468	1,498	36.2	2.0	102,811	1.5	14,253,152	9,648,376	7,657,646	-46.3	-20.6
WV	Lincoln	80	237	9	-88.8	-96.2	2,577	0.3	735,563	1,327,389	0	-100.0	-100.0
WV	Logan	804	1,909	1,678	108.7	-12.1	10,227	16.4	7,993,970	16,026,303	9,561,932	19.6	-40.3
WV	McDowell	787	1,221	867	10.2	-29.0	4,797	18.1	5,246,840	4,988,481	2,681,762	-48.9	-46.2
WV	Marion	518	1,172	1,203	132.2	2.6	19,143	6.3	6,021,172	11,387,843	13,756,775	128.5	20.8
WV	Marshall	758	1,547	1,595	110.4	3.1	10,601	15.0	10,337,601	13,944,543	16,376,633	58.4	17.4
WV	Mason	0	41	0	—	-100.0	5,621	0.0	0	157,799	0	—	-100.0
WV	Mercer	1	14	22	2100.0	57.1	19,793	0.1	0	68,836	149,721	—	117.5
WV	Mineral	14	17	2	-85.7	-88.2	7,727	0.0	45,157	74,330	0	-100.0	-100.0
WV	Mingo	1,827	1,270	515	-71.8	-59.4	5,563	9.3	22,789,252	8,628,290	3,916,121	-82.8	-54.6
WV	Monongalia	1,103	1,341	1,018	-7.7	-24.1	55,109	1.8	11,790,433	10,408,597	6,024,510	-48.9	-42.1
WV	Nicholas	339	643	177	-47.8	-72.5	7,785	2.3	4,807,406	3,566,876	655,443	-86.4	-81.6
WV	Ohio	0	100	516	—	416.0	29,100	1.8	0	180,308	6,030,582	—	3244.6
WV	Preston	251	25	2	-99.2	-92.0	7,294	0.0	1,290,996	88,443	0	-100.0	-100.0
WV	Raleigh	790	1,562	1,479	87.2	-5.3	32,291	4.6	9,639,215	7,522,708	5,633,400	-41.6	-25.1
WV	Randolph	0	19	20	—	5.3	11,448	0.2	0	0	0	—	—
WV	Tucker	19	207	220	1057.9	6.3	2,713	8.1	143,798	2,449,174	2,108,354	1366.2	-13.9
WV	Upshur	354	251	160	-54.8	-36.3	7,609	2.1	2,932,049	1,059,235	597,769	-79.6	-43.6
WV	Wayne	537	798	433	-19.4	-45.7	8,718	5.0	6,011,554	4,745,767	1,031,263	-82.8	-78.3
WV	Webster	488	498	337	-30.9	-32.3	1,998	16.9	5,595,049	4,022,561	1,596,491	-71.5	-60.3
WV	Wyoming	1,095	1,132	1,059	-3.3	-6.4	4,735	22.4	8,091,589	4,291,637	4,532,920	-44.0	5.6
Appalachian Coal-Employment Counties		**46,993**	**55,953**	**37,587**	**-20.0**	**-32.8**	**1,605,970**	**2.3**	**423,445,942**	**340,115,187**	**225,045,547**	**-46.9**	**-33.8**
U.S. Total		**71,522**	**86,195**	**65,971**	**-7.8**	**-23.5**	**139,491,699**	**0.0**	**1,073,612,000**	**1,084,368,148**	**896,940,563**	**-16.5**	**-17.3**

Source: Mine Safety and Health Administration and Energy Information Administration

Figure 3: Gains and Losses for Counties with Coal Employment in 2000



Source: U.S. Mine Safety and Health Administration (MSHA).

2.2. A Profile of the United States Coal Miner

Detailed characteristics of coal miners in the Appalachian Region are generally not available. In lieu of such data, Table 14 presents a profile of the United States coal miner assembled from a variety of sources. Most of the information is for 2015, with exceptions noted. The table reflects an experienced work force with more than three-fourths having earned a high school diploma. However, only about 3 percent of coal miners hold a bachelor's or higher college degree, which is significantly lower than both the Appalachian regional average and the national average. While this is expected in

what are, for the most part, blue-collar occupations, we would expect the growing reliance on technology in the coal industry (Thibodeau, 2016) to increase educational and training requirements from current averages. An important question is whether existing coal workers will pursue educational advancement to secure these jobs or, rather, will these emerging jobs go to new individuals.

Other aspects of the qualifications of the coal industry's work force include job and safety-related training. The numbers in Table 14 probably understate such qualifications, as indicated by the large number of examinations taken and certificates issued by the West Virginia Office of Miners' Health, Safety and Training. In 2015, this state agency issued 5,785 new certificates, for example, for apprentice electrician (172), coal truck driver (130), underground coal miner (459), surface coal miner (174), underground mine foreman (191), and qualified diesel instructor (89) (West Virginia Office of Miners' Health, Safety and Training, 2015). The largest number of new certificates (2,152) were for safety sensitive personnel. Certificates are awarded after passing an examination. The numbers reported here do not include duplicates or certificates issued as part of a reciprocity agreement. To put the number of new certificates in perspective, in 2015 West Virginia's coal industry had 16,200 (MSHA data) or 22,750 (NMA data) employees (see Tables 11 and 12 above). These certifications signal the willingness of coal workers to invest in themselves to advance their careers.

Table 14: Profile of the United States Coal Miner

Demographic Characteristics			Median Age, in years		43 years[1]
			Mean Age, in years		44 years[1]
					43.8 percent[3]
			Female, in percent		5.2 percent[1]
					3.8 percent[3]
			White, in percent		96.4 percent[3]
Qualifications	Education (in percent)		High School Diploma		> 75 percent[1]
					76.7 percent[3]
			Bachelor Degree or Beyond		3 percent[1]
					2.8 percent[3]
	Experience		Work Experience, median, in years		16 years[1]
			Work Experience in Mining, in years		16 years[3]
			Experience in Job Title, in years		7.8 years[3]
	Training	Job-related	In annual hours		10 – 25 hours[1]
		Safety[6]	New Miners, in annual hours		24 hours[1]
			Refresher, in annual hours		8 hours[1]
Earnings (in $)			Average Hourly		$32.62
					$27.80
			Average Weekly		$14,861
			Average Yearly		$836,001
					$578,202
Average Hours Worked (in hours)			Per Week		46 hours[1]
					47.3 hours[3]
Economic Impact of Coal Mining Jobs			Employment Multiplier		2.275
					2.226
			Wage Earnings Multiplier		1.645
					1.636
Unionization (in percent)			Surface Mines	Appalachia	7.78 percent[4]
				United States	19.10 percent[4]
			Underground Mines	Appalachia	30.62 percent[4]
				United States	23.63 percent[4]
			All Coal Mines	Appalachia	24.93 percent[4]
				United States	21.88 percent[4]

Sources:

[1] National Mining Association, Profile of the U.S. Coal Miner, 2015, downloaded February 2017.

[2] BLS earnings information for all occupations represented under NAICS code 212100, numbers are for 2015.

[3] McWilliams et al. (2012a), numbers are for 2007.

[4] U.S. Energy Information Administration, 2016, numbers are for 2015.

[5] Evans, 2013; numbers are for 2011 for the coalfields in Appalachian Virginia.

[6] Thompson et al., 2001; numbers are for all Appalachian coal counties for 1997.

[7] U.S. DHHS reports that in 2007 over 75 percent of all coal mines held safety meetings at least once a week (see McWilliams et al., 2012b, Table 52, p. 64).

The degree of unionization shows interesting differences between coal miners in Appalachia versus the national average. In 2015, surface mining in the United States had a degree of unionization almost 2.5 times higher than in Appalachia. By contrast, underground mining workers were more unionized by almost 30 percent in Appalachia than nationally. Employment in underground coal mines is more dominant in Appalachia (27,323 vs. 9,044, or 75.1 percent) than in the United States (39,575 vs. 24,991, or 61.3 percent), and surface mines are less likely to be unionized than underground mines across the United States (U.S. EIA, 2016).

The median age of coal miners in 2016 was 44.7 years, which is above the national average of employed persons of 42.2 years (BLS, 2017). Fotta and Bockosh (2000), in a study for the National Institute for Occupational Safety and Health, note that workers aged 45 years and older have a higher median days of work missed because of injuries. This is an important issue because coal miners, in general, are known to be at risk of health disorders due to the nature of the coal workplace. Some problems are relatively common for workers engaged in physical production activities, including tendonitis and trauma, and exposure to noise and toxins. It is well documented that exposure to dust in coal mines leads to coal worker pneumoconiosis (CWP) and chronic obstructive pulmonary disease (COPD).[6] Crystalline silica dust exposure also contributes to COPD and directly causes silicosis. The Department of Health and Human Services (2011) finds that the incidence of CWP is now on the upswing after a long period of decline. Concentrations of CWP are present in the Appalachian portions of southern West Virginia, eastern Kentucky, and western Virginia. These health conditions can be debilitating and lead to premature death. The risk tends to be higher for those working in underground mines. The scope of health-related problems for the coal work force is not well documented, for individuals or regions.

Table 15 shows typical work assignments (shifts worked and number of hours). The data are for 2007 and may have changed with the slowdown of coal production, particularly in Appalachia, since 2011. We have not been able to find region-specific work load and work assignment information. The data show that coal workers have relatively long work weeks with hours in excess of 40.

[6] These two health problems are part of a broader class of lung diseases referred to as coal mine dust lung disease or CMDLD that are concentrated in the Appalachian Region (Laney and Weissman, 2014).

Table 15: Average Number of Hours Worked by Coal Miners in 2007

Coal Mines	Production Workers	Production Support Workers	Preparation Plant/Mill Workers
Underground	43.5	41.9	42.1
Most Common Number of Shifts Worked	2/day (49.8%)	2/day (44.1%)	1/day (51.4%)
Surface	49.2	45.9	46.4
Most Common Number of Shifts Worked	2/day (60.5%)	2/day (49.9%)	1/day (51.5%)

Source: Linda Jansen McWilliams, Patricia J. Lenart, Jamie L. Lancaster, and John R. Zeiner, Jr. *National Survey of the Mining Population, Part II: Mines*. U.S. Department of Health and Human Services, June 2012 (henceforth, McWilliams et al., 2012b)

The coal mining industry (North American Industry Classification System or NAICS code 21-21000) employs workers in a wide range of occupations, including management, sales, computer specialists, engineers, truck drivers, and coal production miners narrowly defined. Table 16 presents the list of occupations by Standard Occupation Classification (SOC). Coal mining occupations fall into 15 major occupation groups,[7] which can be further subdivided into 77 individual occupations, as defined by the Bureau of Labor Statistics (BLS). Together these occupations employed 69,450 people in 2015 in the United States. The three major occupation groups—Construction and Extraction (47 percent), Transportation and Material Moving (20 percent), and Installation, Maintenance and Repair (13 percent)— account for more than 80 percent of all employment. (This has important implications for our analysis below of alternative employment opportunities in other sectors of the economy since most of our data on coal employment is confined to these broad categories.) Mean annual wage earnings in these three major occupation groups exceed $50,000. In most Appalachian counties, such earnings are well above those of most other occupations, particularly those that do not require a college education. The distribution of employees in Table 16 is for the nation and will differ by region, as will be clear in the state-by-state analysis below. One reason for deviations from the national average is the share of surface mining of all coal mining, which in Appalachia is below the national average.

[7] By increasing level of detail, the BLS distinguishes between major group, minor group, broad level, and detailed. The definitions of occupations follow the Standard Occupational Classification (SOC). The current version has been published in the *Federal Register* of January 21, 2009 (https://www.bls.gov/soc/soc2010final.pdf, downloaded February 22, 2017).

Table 16: United States Coal Mining Occupations by Major SOC Group, 2015

Standard Occupation Code (SOC)	Occupation Title by Major Occupation Group	Percent of all Employees	Hourly Wage		Mean Annual Wage
			Mean	Median	
11-0000	Management Occupations	3.52	$62.15	$54.44	$129,270
13-0000	Business & Financial Operations	2.15	$33.29	$29.68	$69,250
15-0000	Computer & Mathematical Occupations	0.15	$35.15	$35.78	$73,110
17-0000	Architecture & Engineering Occupations	3.21	$36.83	$34.62	$76,610
19-0000	Life, Physical, & Social Science Occupations	0.26	$28.88	$26.63	$60,060
27-0000	Arts, Design, Entertainment, Sports & Media	Not released	$21.60	$22.73	$44,920
29-0000	Healthcare Practitioners & Technical Occupations	0.71	$33.22	$32.05	$69,100
33-0000	Protective Service Occupations	0.56	$14.63	$13.30	$30,440
37-0000	Building & Grounds Cleaning & Maintenance	0.25	$15.78	$12.69	$32,820
41-0000	Sales & Related Occupations	0.11	$50.73	$43.67	$105,530
43-0000	Office & Administrative Support Occupations	4.28	$19.10	$17.62	$39,720
47-0000	Construction & Extraction Occupations	47.28	$26.71	$25.55	$55,550
49-0000	Installation, Maintenance & Repair Occupations	12.68	$27.53	$26.85	$57,270
51-0000	Production Occupations	4.72	$26.85	$25.87	$55,840
53-0000	Transp. & Material Moving Occupations	20.03	$24.67	$25.01	$51,320

Source: BLS 2016a, the numbers are for 2015 for the whole United States, https://www.bls.gov/oes/current/naics4_212100.htm, downloaded March 17, 2017

In Table 17 we take a closer look at the largest major occupation group in the coal mining industry, Construction and Extraction Occupations. The table reveals the variety of occupations included under SOC 47, as well as wide range of salaries. The highest paid occupation is First-line Supervisors of Construction Trades and Extraction Workers who, with $78,950 in earnings in 2015, earned more than twice the annual salary of the lowest paid employees (Construction Laborers), who earned $36,340 per annum. All other occupations listed in Table 17 earn more than $40,000, and the vast majority earn more than $50,000 annually.

Table 17: National Construction and Extraction Occupations, 2015

Standard Occupation Code (SOC)	Title of SOC Code 47-0000 Occupations	Percent of all 47-0000 Employees	Hourly Wage		Mean Annual Wage
			Mean	Median	
47-0000	**Construction & Extraction Occupations**	100.00%	$26.71	$25.55	$55,550
47-1011	First-Line Supervisors of Construction Trades & Extraction Workers	12.44%	$37.96	$38.79	$78,950
47-2000	**Construction Trades Workers**	38.83%	$25.44	$25.06	$52,910
47-2031	Carpenters	0.11%	$23.28	$24.69	$48,420
47-2051	Cement Masons & Concrete Finishers	0.08%	$23.60	$26.40	$49,100
47-2061	Construction Laborers	3.32%	$17.47	$15.22	$36,340
47-2073	Operating Engineers & Other Construction Equipment Operators	25.02%	$25.70	$24.61	$53,450
No code[1]	Construction Equipment Operators other than 47-2073[1]	0.11%	Similar to 47-2073		
47-2111	Electricians	10.17%	$27.54	$28.05	$57,290
47-4000	**Other Construction & Related Workers**	0.27%	$27.07	$26.73	$56,310
47-4061	Rail-Track Laying & Maintenance Equipment Operators	0.23%	$24.99	$26.16	$51,970
47-5000	**Extraction Workers**	48.43%	$24.83	$24.59	$51,650
47-5010	Derrick, Rotary Drill, & Service Unit Operators, Oil, Gas, & Mining	Not released	$19.35	$19.45	$40,240
47-5013	Service Unit Operators, Oil, Gas, & Mining	Not released	$19.35	$19.45	$40,240
47-5021	Earth Drillers, Except Oil & Gas	1.16%	$23.38	$22.42	$48,630
47-5031	Explosives Workers, Ordnance Handling Experts, & Blasters	1.10%	$29.74	$30.84	$61,860
47-5040	Mining Machine Operators	20.85%	$24.85	$24.32	$51,680
47-5041	Continuous Mining Machine Operators	12.92%	$24.44	$23.52	$50,830
47-5042	Mine Cutting & Channeling Machine Operators	6.45%	$26.00	$26.62	$54,090
47-5049	Mining Machine Operators, All Other	1.50%	$23.36	$23.06	$48,580
47-5061	Roof Bolters, Mining	14.78%	$26.53	$26.41	$55,180
47-5081	Helpers--Extraction Workers	8.86%	$21.16	$21.50	$44,010
47-5099	Extraction Workers, All Other	1.50%	$27.91	$27.25	$58,050

Source: https://www.bls.gov/oes/current/naics4_212100.htm, downloaded March 17, 2017

[1] This is the difference between SOC code 47-2070 and sub-code 47-2073.

2.3. Coal Mining Support Employment

Coal mining support activities are listed under NAICS code 21-3113. Unfortunately, the BLS does not make similarly detailed statistics available for these support activities (like office workers) as they do for coal mining (Table 16). The major occupation groups for support activities for all mining (NAICS code 21-3000) are the same as for coal mining, plus three additional ones: Legal Occupations (SOC 23-0000), Education, Training and Library Occupations (SOC 25-0000), and Food Preparation and Service Related Occupations (SOC 35-0000). Because we cannot assume that the relative shares among

occupations are similar for coal mining and non-coal mining support activities, we do not present a table similar to Table 17. For all mining activities, including oil and gas extraction, support activities employment is about 50 percent of mining employment. The numbers from the NMA in Table 12 show much smaller employment in support activities. On the other hand, the indirect and induced employment numbers reported by the NMA are implausibly high, as noted above. It seems likely that the BLS and the NMA use different definitions to distinguish between coal mining and coal mining support occupations.

3. Mobility between Industries and Occupations

Occupational and geographic mobility, alone or in combination, are ways to address job losses when a whole industry is in decline. However, geographic mobility that is forced upon individuals and households by adverse circumstances rather than choice, often comes with high social costs. Therefore, one of the main concerns in dealing with declining employment opportunities in the coal industry is the ability of laid-off workers and others who are seeking alternative opportunities to find jobs in another industry. There are at least three factors to consider. First is the availability of job opportunities in other industries, second is the match between the workers' qualifications and the qualification requirements of open jobs, and third is the number of individuals pursuing available jobs. The matrix in Figure 4 shows what one would expect: workers are most likely to transition from a job in an industry sector to another job in the same industry. Data from the U.S. Census Bureau are available only at the state level. Since West Virginia is the only state completely contained within Appalachia, and is also the largest coal producer in the Region, we use figures from this state to illustrate occupational mobility. Unfortunately, these data are currently publicly available only at a high level of industrial aggregation, so that we can only look at flows within, from, and into Mining, Quarrying, Oil and Gas Extraction (NAICS code 21). The detailed analysis of West Virginia is complemented by aggregate state-level data presented in Table 18.

In West Virginia, in the second quarter of 2005, 827 individuals moved from a job in Mining, Quarrying, Oil and Gas Extraction to another job in the same industry, while in the second quarter of 2015, only 333 workers changed jobs within this industry. The largest number of workers entering this industry from another industry in 2005 came from Construction (157 workers), followed by Transportation and Warehousing (135 workers). In 2015 these numbers were much lower, with only 68 workers from Construction and 39 workers from Transportation and Warehousing finding new jobs in the Mining, Quarrying, Oil and Gas Extraction industry. The largest source of new workers in 2015 coming from another industry was Administrative and Support and Waste Management and Remediation; 185 new workers came from this industry in 2015 compared to 111 in 2005. This could indicate a possible shift in activities within the industry in West Virginia.

The largest outflow of workers in 2005 was to Construction (91 workers), followed by Administrative and Support and Waste Management and Remediation (48 workers), and Transportation

and Warehousing (43 workers). As in the case of workers coming from other industries into Mining, Quarrying, Oil and Gas Extraction, the number of those leaving the industry also changed significantly between 2005 and 2015. In West Virginia in 2015, 161 workers left for Construction, 121 for Administrative and Support and Waste Management and Remediation, 91 for Transportation and Warehousing, 59 for Retail Trade, and 50 for Manufacturing.

These transitions highlight the changing job opportunities in Mining, Quarrying, Oil and Gas Extraction. While in 2005 the number of workers entering the industry from another industry (864 workers) was significantly larger than those leaving (349 workers), in 2015 more workers were leaving the industry (664 workers) than entering it (480 workers).

Table 18 summarizes these statistics for all states with counties in Appalachia; the data are only available at the state level. In the table, "Leaving" includes only workers who go to another industry; those who became unemployed or retired are not included. Similarly, "Entering" includes only workers who were previously employed in another industry. Mobility between industries is of particular interest in a changing economy as it indicates occupational mobility and, therefore, worker's ability to cope with and adjust to changes in job opportunities in different industries.

Table 18: Workers Entering, Leaving and Shifting within the Mining, Quarrying, Oil and Gas Extraction Industry by Appalachian State

	2005, 2nd Quarter			2015, 2nd Quarter		
State	Entering	Leaving	Shifting within Industry	Entering	Leaving	Shifting within Industry
Alabama	345	219	87	125	123	37
Georgia	142	104	20	110	90	11
Kentucky	568	205	639	187	397	199
Maryland[1]	68	38	20	30	40	1
Mississippi	384	259	47	181	302	25
North Carolina	86	63	2	90	24	4
New York	253	120	12	249	116	11
Ohio	287	177	44	367	641	108
Pennsylvania	604	352	193	722	1524	355
South Carolina	56	36	0	43	9	1
Tennessee	111	43	14	82	70	12
Viginia[1]	275	126	199	149	156	90
West Virginia	864	349	827	480	664	333

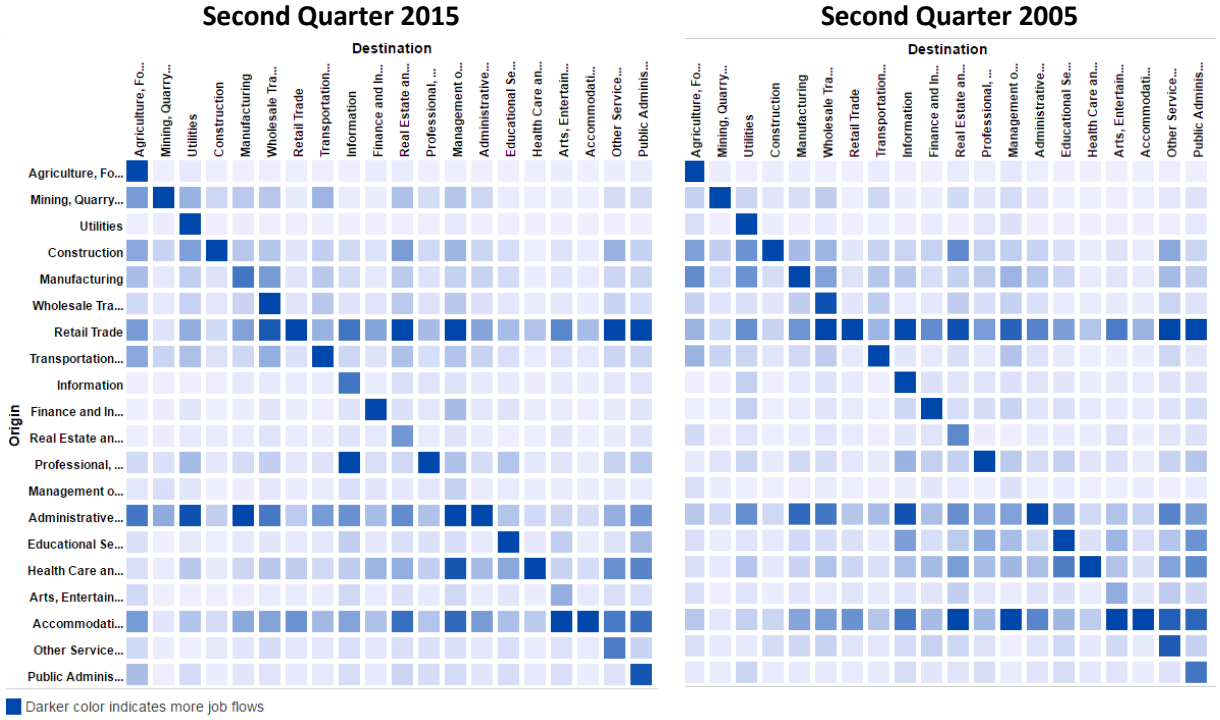
Source: U.S. Census Bureau, Longitudinal Household-Employer Dynamics. https://lehd.ces.census.gov/data/j2j_beta.html

[1] Data for Maryland and Virginia for the 2nd quarter of 2005 were not available; data are for 2nd quarter of 2006.

The matrices in Figure 4 provide a graphical account of flows between industries though the data are confined to West Virginia as noted above. They show small flows of workers from Mining, Quarrying, Oil and Gas Extraction into other industries, including Utilities, Manufacturing, Wholesale,

and Transportation, but only small flows into Construction. We would have expected a more balanced net flow since there are many employees with construction-related skills and experience. In the second quarter of 2015, we see no large flows into the NAICS 21 industry. Kentucky and Pennsylvania follow a pattern similar to that of West Virginia. Virginia resembles Kentucky and West Virginia, except for relatively large inflows from NAICS sector 55, Management of Companies and Enterprises. The other Appalachian states—Alabama, Georgia, Mississippi, New York, North Carolina, Ohio, and Tennessee—show relatively large inflows to the NAICS 21 industries, particularly from Construction and Manufacturing. South Carolina is similar to Alabama, etc., except that the job movements within NAICS 21 are smaller than the inflows from other industries, which makes it unusual. All states have relatively small outflows from Mining, Quarrying, Oil and Gas Extraction to other industries.

Figure 4: Job-to-Job Flows in West Virginia



Source: U.S. Census Bureau, Longitudinal Employer-Household Dynamics; https://lehd.ces.census.gov/data/j2j_beta.html, created using the site's "Job-to-Job Flows Explorer," downloaded March 23, 2017

Another important consideration in examining job dynamics is the spatial pattern of job openings for displaced workers. As demonstrated below, in many small coal-employment communities, there are simply few if any other occupational opportunities in other sectors of the regional economy. As a result, workers face a number of relatively undesirable options. One is to directly find a job in another sector/occupation, which may entail lower compensation. Second, workers could invest in education and training and pursue another occupational career, including entrepreneurial activity. This can be costly in terms of out-of-pocket costs and forgone income. Moreover, there is no assurance that a job or viable entrepreneurial opportunity will be forthcoming in a community with a

declining coal employment base. Third, workers could simply withdraw from the labor force. But many workers will need to work because of their age and financial commitments. Finally, workers may seek job opportunities in other places. While moving is costly and may have consequences for social connections and family ties, it may be the only viable option for workers in some communities. In general, involuntary occupational changes are associated with lower pay after the change. This is true even for workers who have received training to facilitate the transition (Barrett, 2001; Johnson, Kawachi and Lewis, 2009).

Fortunately, workers in Appalachia seek and find jobs in geographical areas that extend beyond county borders. As such, they may be relatively more inclined to pursue jobs in wide geographic areas. Workers in the Appalachian states have commuting times close to the national average of 25.9 minutes. New Yorkers, with a state average of 32.3 minutes have the longest commute, followed by Maryland with 31.2 minutes. Virginia is third with 27.9 minutes and in fourth place is West Virginia with 25.6 minutes. In the first three states with their large agglomerations, metropolitan regions may have contributed to commuting times above the national average. This is not the case in mostly rural West Virginia, however, and indicates that many rural residents already accept a significant commute to work. Kentuckians spend the least time commuting—23 minutes. There is no clear pattern indicating that urbanized states have significantly longer commuting times. For example, Ohio, with multiple metropolitan regions, has an average state-wide commuting time of only 23.2 minutes, the second lowest among the Appalachian states. Wool's observation made 36 years ago still applies: "With few exceptions, coal mining is conducted in areas which are beyond normal commuting distance from major urban centers. Of the nation's 100 largest standard Metropolitan Statistical Areas, only two (Pittsburgh and Birmingham) have significant amounts of bituminous coal mining activity. In 1970, about one-half of all coal miners resided in rural areas (population under 2,500)" (Wool, 1981: p. 3).

The geographical concentration of coal mining employment in relatively few rural areas could pose a serious policy problem. Fortunately, coal mining workers and support workers are less geographically concentrated than their jobs. We illustrate this using Boone County, West Virginia, where coal industry employment accounted for 28.4 percent of all employment in 2015. Census data on county-to-county commuting of workers, 16 years of age and older, show that 4,653 county residents commuted to a job in their home county, while 4,446 workers commuted from elsewhere in West Virginia to work in Boone County. An additional 2,956 Boone County residents commuted to work in another West Virginia county, the majority of them – 2,142 employees – to neighboring Kanawha County, the most populous in West Virginia.[8] Because Boone County is located in West Virginia's interior, commuting to and from other states was negligible. The commuting data demonstrate that commuting regions are significantly larger than counties and, as a result, policies aimed at mitigating the impacts of job losses in coal regions should account for commuting patterns.

[8] U.S. Census Bureau 2015. The information on commuting is from the American Community Survey 2009 – 2013.

4. Coal Occupations: Are Other Opportunities Available in Appalachia?

An important question is the scope of job opportunities for occupational-specific coal workers outside the coal sector itself. We have acquired occupational data for coal workers from a number of Appalachian states that, to varying degrees of detail, allow for an examination of state-specific occupational mixes associated with the state's coal employment base. For some states like Tennessee where there is a small number of coal workers, we were simply not able to acquire detailed data from the state. For other states—notably Pennsylvania and West Virginia—where the coal industry is more prominent, we have considerably more detail on occupational categories and larger numbers of coal workers across occupational classifications.

4.1. Matching Coal Worker Occupations to Similar Occupations in Other Industries

The best outcome for most displaced or potentially displaced coal workers would be to find good paying jobs in the community where they currently reside. In many cases this will simply not be possible due to the small size and lack of economic/occupational diversity that characterizes many coal-employment counties in Appalachia. For this reason, as well as data limitations for county-level economies, we focus on potential employment opportunities in two different sets of regions. The first is the set of 129 coal-employment counties in a given Appalachian state. These multicounty regions will offer greater employment opportunities than the county of employment while at the same time offering reasonably proximate and similar locations to the current place of residence for coal workers. The second region is the entire state economy that a given coal-employment county is located in. The statewide regional economy should, in many instances, be sufficiently large to yield employment opportunities for significant numbers of coal workers. However, it may also require outmigration or a long commute, as well as retraining.

For each of these broad regions, we use a NAICS-to-SOCS crosswalk applied to the manufacturing, transportation, and construction industries to determine existing levels and the mix of occupations. These three industries were chosen since they will offer occupational opportunities that are similar if not exactly equivalent to those for coal production workers. We have acquired occupational data for coal workers from the individual states that include some detail on both production and non-production occupations; there is some inconsistency in the occupational groups provided by the respective states, as well as differences in the years for which the data apply. Importantly, the number of occupational positions in the state-specific data generally do not match job counts from other sources; this problem clearly surfaced above in the context of other data on the coal industry. Given the nature of the data, we caution the reader to place emphasis on orders of magnitude rather

than specific data points. Despite the differences in the data and this cautionary note, these figures will still allow a comparison of occupational patterns in the coal industry to the same occupational patterns in other sectors of the economy. This will shed considerable light on the capacity of other sectors to absorb displaced coal workers as well as coal workers who simply seek employment opportunities outside the coal industry.

4.2. State by State Occupational Analysis

Tables 19-24 provide the occupational data for the Appalachian states that have coal employment, other than Tennessee. The first column of numerical data (*State Total*) shows the number of coal workers by occupation. The next two columns of data report coal mining occupations as a share of (i) occupations in the statewide manufacturing, transportation and construction sectors and (ii) occupations in the state's Appalachian portions in the manufacturing, transportation and construction sectors. For example, in Table 19, Alabama reports 2,150 occupations in the coal industry. This represents 0.5 percent of statewide positions in manufacturing, transportation and construction and 0.8 percent of positions in the Appalachian portions of the state for the same sectors. The final two columns of data show the number of occupations in manufacturing, transportation and construction for the state and the Appalachian portions of the state. For example, for Alabama there are 7,820 Electricians outside the coal industry in the statewide manufacturing, transportation and construction sectors; there are no Continuous Mine Machine Operators, Mining Machine Operators, Roof Bolters or Mine Shuttle Car Operators in the manufacturing, transportation and construction sectors either within the Appalachian Region of the state or across the state.

A review of the tables shows that the overall number of occupational positions engaged in coal production is generally modest compared to all occupational positions in the state in the manufacturing, construction and transportation sectors, though there are exceptions. Kentucky and West Virginia, for example, have relatively large numbers of coal-related occupations, representing 3.8 percent and 17.4 percent of the same statewide occupations in manufacturing, construction and transportation. As would be expected, the relative importance of coal occupations rises as the region of focus is narrowed to Appalachian portions of a state. For example, in Kentucky, coal-related occupations represent 25.0 percent of the number of occupations in the manufacturing, construction and transportation sectors across the Appalachian portions of the state.

Non-production coal occupations tend to be small shares of equivalent occupations in manufacturing, construction and transportation, though again there are numerous exceptions. This suggests that workers in these occupations should face reasonably bright employment prospects outside the coal industry. These alternatives are brighter still when it is recognized that there is a wide range of other sectors of the economy that will employ individuals in the same occupations.

The situation for production workers varies by state and by occupation. To draw out some of the more salient issues, we provide the following state-by-state summary assessment.

- *Alabama*. Table 19 shows the state's coal mining employment by occupation, with a total of 2,150 jobs across production and non-production classifications, representing 0.5 percent and 0.8 percent of occupations in the manufacturing, construction and transportation sectors across the state and across Appalachian portion of the state, respectively. In relative terms, the management and office-related occupations in coal counties are small shares of regional and statewide occupations in the three highlighted sectors. However, this is not the case for all occupations. Outside the coal sector, there are no Continuous Mining Machine Operator, Mining Machine Operator or Roof Bolt occupations in other sectors in either the Appalachian portion of the state or the state itself. There are 210 Excavating and Loading Machine occupations in the coal industry compared to 320 similar occupations across the state and just 203 equivalent occupations in the Appalachian portion of the state. These coal industry occupations are 65.6 percent of equivalent statewide occupations and 103.4 percent of occupations in the Appalachian portion of the state. These high figures suggest that coal workers in these occupations will face stiff competition in the pursuit of alternative jobs in other sectors of the state and regional economies.

- *Kentucky*. As shown in Table 20, a total of 6,100 occupations in Kentucky are tied to coal activity, representing 1.4 percent of state occupations in the three highlighted sectors and 9.3 percent of the same occupations in these industries in the Appalachian portion of the state. The data show no Management or office-related occupations tied to coal, but there are 170 Engineering occupations that account for 11.0 percent of the Appalachian portion and just 1.7 percent of statewide occupations in manufacturing, construction and transportation. For several occupations, including Mining and Geological Engineers, Continuous Mining Machine Operators, Mine Cutting Machine Operators, Mining Machine Operators, Roof Bolters, Extraction Workers and Loading Machine Operators, there are no equivalent positions outside the coal sector in the state. For those occupations among this group with no disclosure issues, this represents 1,320 positions. For Helpers, there are more than three times as many occupations in the coal industry than in other sectors across the state; there are only 15 equivalent occupations in the Appalachian portion of the state outside of the coal sector.

- *Ohio*. As shown in Table 21, the state reports 2,332 occupational positions in the coal industry, representing 0.2 percent of occupational positions in manufacturing, construction and transportation in the state and 1.7 percent of occupations in the same industries for the Appalachian portion of the state. Four occupations together account for 628 positions that have no equivalent occupations elsewhere in the state or regional economies. Operating Engineers and Mobile Heavy Equipment Mechanics in the coal sector are a relatively large share of the total number of equivalent occupations within the Appalachian portion of the state.

- *Pennsylvania*. The state provided a high level of detail for its 4,700 coal-related occupations, as shown in Table 22. Despite the relatively large number of jobs, coal-related occupations account for small shares of statewide (0.4 percent) and regional (1.0 percent) occupations in the three highlighted sectors. Eighteen occupations in the coal sector have no counterpart occupations in the Appalachian portion of the state or the state as a whole. These occupations represent a total of 7,652 positions. Helpers, Excavating and Loading Machine Operators, Pump Operators, Operating Engineers and Mobile Heavy Equipment Mechanics account for large shares of equivalent statewide and regional occupations in manufacturing, construction and transportation. For Helpers, the number of positions in the coal sector is 533.0 percent of the positions outside the coal sector within the Appalachian portion of the state and 238.0 percent of statewide occupations, illustrating the dominance of the coal industry and highlighting the relatively limited employment opportunities outside the coal sector.

- *Virginia*. Table 23 reveals that coal-related occupations in Virginia total 6,051, representing 1.1 percent of counterpart statewide occupations and 10.3 percent of the

Appalachian portion's occupations in manufacturing, construction and transportation. Eight occupations accounting for 6,048 positions have no counterparts at the state or regional levels. The number of Operating Engineers and Mobile Heavy Equipment Mechanics in the coal sector exceeds the number of equivalent occupations in other sectors within the Appalachian portion of the state.

- *West Virginia*. The state's large coal sector has 12,780 positions that represent 12.3 percent of all positions across the state in the manufacturing, construction and transportation sectors, as shown in Table 24. Nineteen occupations have no counterparts within the state, together representing 4,510 positions. These 19 occupations alone account for 35.3 percent of all coal jobs in West Virginia. Three occupations are equally or more heavily represented in the coal industry than in the three highlighted sectors, while another four occupations have position counts that are at least 50 percent larger than the count of occupations in the other sectors. Finally, note that there are seven occupations for which data are suppressed due to concerns over disclosure (D). This generally implies small numbers of employers which in turn suggests constrained alternative employment opportunities for workers in these occupations.

The discussion above focused on direct occupation-to-occupation matching between the coal sector and the manufacturing, construction and transportation sectors at the Detailed Occupation (six digit) level. The job outlook is not nearly as dire if one rolls these occupations up to the two-digit Major Group levels for Construction and Extraction Occupations (47), Installation, Maintenance and Repair Occupations (49), Production Occupations (51) and Transportation and Material Moving Occupations (53). This is an important consideration since some of these occupations will depend on similar skills, formal training, and on-the-job training. For example, consider SOC 47 for Kentucky (see Table 20 above). There are 52,680 occupational positions at the state level and 8,007 occupational positions in the Appalachian portion of the state for these Major Groups. If we sum the disclosed data fields for Detailed Occupations within Major Group 47, there are 6,660 occupational positions. This represents 12.6 percent of statewide occupations and 83.2 percent of occupations within the Appalachian portion of the state. Similarly, consider Major Group 51 for West Virginia. Table 24 shows that there are 27,050 occupational positions in this group. West Virginia reports 560 occupational positions in this same group for the coal industry, representing just 2.1 percent of statewide occupations.

These figures indicate broader occupational opportunities for coal workers, though in specific instances the number of alternative positions even at the major SOC group level may be problematic. In general, workers would require transitional education and training, and they may need to relocate to find gainful employment. These opportunities are broader still for workers who are willing to cross major occupational group lines for alternative employment opportunities. There would certainly be impediments to occupational mobility given the uniqueness of employment and the environment in the coal industry.

Table 19: Coal Mining Employment and the Distribution of Occupations: Alabama

Coal Mining Occupations		Coal Mining Employment			Manufacturing, Construction and Transportation Employment	
Occupation Code	Name	Entire State	As percent of State Manufacturing, Construction & Transportation Employment	As percent of State's ARC Counties' Manufacturing, Construction & Transportation Employment	Entire State	Appalachian Portion
00-0000	**Total, All Occupations**	2,150	0.5	0.8	413,100	262,533
11-0000	**Management Occupations**	80	0.5	0.8	16,500	10,486
43-0000**	**Office and Administrative Support Occupations**	30	0.1	0.1	42,640	27,099
43-3031	Bookkeeping, Accounting, and Auditing Clerks	30	0.8	1.3	3,530	2,243
47-0000**	**Construction and Extraction Occupations**	680	1.3	2.0	53,870	34,235
47-2073	Operating Engineers and Other Construction Equipment Operators	100	3.5	5.5	2,870	1,824
47-2111	Electricians	180	2.3	3.6	7,820	4,970
47-5041	Continuous Mining Machine Operators	90	—	—	—	—
47-5049	Mining Machine Operators, All Other	60	—	—	—	—
47-5061	Roof Bolters, Mining	250	—	—	—	—
49-0000	**Installation, Maintenance and Repair Occupations**	D	D	D	33,010	20,979
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	D	D	D	2,760	1,754
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	50	10.0	15.7	500	318
53-0000	**Transportation and Material Moving Occupations**	540	0.8	1.3	67,520	42,910
53-3032	Heavy and Tractor-Trailer Truck Drivers	80	0.3	0.5	23,650	15,030
53-7032	Excavating and Loading Machine and Dragline Operators	210	65.6	103.3	320	203
53-7111	Mine Shuttle Car Operators	50	—	—	—	—

Source: Alabama Department of Labor 2016 Estimates/Bureau of Labor Statistics 2016 Occupational Employment Statistics; state total and ARC shares of employment calculated using 2015 QCEW data provided by IMPLAN

— indicates absence of occupation in any industry

**Indicates calculated major group; data absent from state sources

Table 20: Coal Mining Employment and the Distribution of Occupations: Kentucky

Coal Mining Occupations		Coal Mining Employment			Manufacturing, Construction and Transportation Employment	
Occupation Code	Name	Entire State	As percent of State Manufacturing, Construction & Transportation Employment	As percent of State's ARC Counties' Manufacturing, Construction & Transportation Employment	Entire State	Appalachian Portion
00-0000	**Total, All Occupations**	6,100*	1.4	9.3	431,910	65,644
17-0000**	**Architecture and Engineering Occupations**	170	1.7	11.0	10,160	1,544
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	170	—	—	—	—
47-0000**	**Construction and Extraction Occupations**	D	D	D	52,680	8,007
47-1011	First-Line Supervisors of Construction Trades and Extraction Work	830	16.6	109.4	4,990	758
47-2073	Operating Engineers and Other Construction Equipment Operators	1,090	28.5	187.7	3,820	581
47-2111	**Electricians**	680	9.9	65.2	6,860	1,043
47-5021	Earth Drillers, Except Oil and Gas	D	D	D	150	23
47-5041	Continuous Mining Machine Operators	740	—	—	—	—
47-5042	Mine Cutting and Channeling Machine Operators	D	D	D	—	—
47-5049	Mining Machine Operators, All Other	40	—	—	—	—
47-5061	Roof Bolters, Mining	370	—	—	—	—
47-5081	Helpers--Extraction Workers	310	310.0	2039.7	100	15
47-5099	Extraction Workers, All Other	D	D	D	—	—
49-0000**	**Installation, Maintenance, and Repair Occupations**	400	1.3		29,770	4,525
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	400	71.4	470.0	560	85
53-0000**	**Transportation and Material Moving Occupations**	D	D	D	97,630	14,838
53-3032	Heavy and Tractor-Trailer Truck Drivers	2,300	11.3	74.5	20,310	3,087
53-7032	Excavating and Loading Machine and Dragline Operators	D	D	D	300	46
53-7033	Loading Machine Operators, Underground Mining	D	D	D	—	—

Source: Kentucky Office of Employment & Training, Workforce Intelligence Branch, Occupational Employment Projections Program, 2016 data; state total and ARC shares of employment calculated using 2015 QCEW data provided by IMPLAN

D indicates coal industry occupation data not disclosed by state agencies

— indicates absence of occupation in any industry

*Occupation distribution provided for eastern region of the state while industry total is for whole state

**Indicates calculated major group; data absent from state sources

Table 21: Coal Mining Employment and the Distribution of Occupations: Ohio

Coal Mining Occupations		Coal Mining Employment			Manufacturing, Construction and Transportation Employment	
Occupation Code	Name	Entire State	As percent of State Manufacturing, Construction & Transportation Employment	As percent of State's ARC Counties' Manufacturing, Construction & Transportation Employment	Entire State	Appalachian Portion
00-0000	**Total, All Occupations**	2,332	0.2	1.7	1,072,990	140,164
11-0000	**Management Occupations**	36	0.1	0.5	52,450	6,851
47-0000	**Construction and Extraction Occupations**	1,225	0.9	7.0	133,390	17,425
47-1011	First-Line Supervisors of Construction Trades and Extraction	75	0.7	5.4	10,730	1,402
47-2073	Operating Engineers and Other Construction Equipment Operators	442	4.6	35.0	9,660	1,262
47-5041	Continuous Mining Machine Operators	106	—	—	—	—
47-5042	Mine Cutting and Channeling Machine Operators	275	—	—	—	—
47-5081	Helpers--Extraction Workers	139	—	—	—	—
49-0000	**Installation Maintenance and Repair Occupations**	276	0.4	3.1	69,190	9,038
49-3042	Mobile Heavy Equipment Mechanics Except Engines	108	8.4	64.6	1,280	167
51-0000	**Production Occupations**	90	0.0	0.2	388,280	50,721
53-0000	**Transportation and Material Moving Occupations**	601	0.3	2.6	173,660	22,685
53-7033	Loading Machine Operators Underground Mining	108	—	—	—	—

Source: Ohio Dept of Jobs and Family Services 2014 Estimates/Bureau of Labor Statistics 2014 Occupational Employment Statistics; state total and ARC shares of employment calculated using 2015 QCEW data provided by IMPLAN

D indicates coal industry occupation data not disclosed by state agencies

— indicates absence of occupation in any industry

Table 22: Coal Mining Employment and the Distribution of Occupations: Pennsylvania

Coal Mining Occupations		Coal Employment			Manufacturing, Construction and Transportation Employment	
Occupation Code	Name	Entire State	As percent of State Manufacturing, Construction & Transportation Employment	As percent of State's ARC Counties' Manufacturing, Construction & Transportation Employment	Entire State	Appalachian Portion
00-0000	**Total, All Occupations**	4,700	0.4	1.0	1,085,980	484,982
11-0000**	**Management Occupations**	79	0.2	0.4	42,850	19,136
11-1021	General & Operations Managers	62	0.4	0.9	15,930	7,114
11-3051	Industrial Production Managers	17	0.4	0.8	4,900	2,188
13-0000**	**Business and Financial Operations Occupations**	39	0.1	0.3	31,480	14,058
13-1023	Purchasing Agents	27	0.5	1.2	5,170	2,309
13-2011	Accountants & Auditors	12	0.2	0.4	7,620	3,403
17-0000**	**Architecture and Engineering Occupations**	38	0.1	0.2	36,600	16,345
17-2151	Mining & Geological Engineers	38	—	—	—	—
29-0000**	**Healthcare Practitioners and Technical Occupations**	14	0.9	2.1	1,530	683
29-9011	Occupational Health & Safety Specialists	14	1.6	3.5	890	397
43-0000**	**Office and Administrative Support Occupations**	228	0.2	0.4	135,280	60,414
43-3031	Bookkeeping, Accounting & Auditing Clerks	15	0.1	0.3	9,730	4,345
43-5032	Dispatchers	14	0.3	0.8	4,170	1,862
43-5081	Stock Clerks & Order Fillers	15	0.2	0.4	9,310	4,158
43-9061	Office Clerks, General	185	0.9	2.1	19,890	8,883
47-0000**	**Construction and Extraction Occupations**	2,149	1.3	3.0	161,530	72,137
47-1011	Supervisors - Construction Trades & Extraction Workers	281	1.9	—	14,560	—
47-2061	Construction Laborers	58	0.2	0.4	33,270	14,858
47-2073	Operating Engineers & Other Construction Equipment Operators	291	2.5	5.6	11,600	5,180
47-2111	Electricians	131	0.7	1.5	19,580	8,744
47-4061	Rail-Track Laying & Maintenance Equipment Operators	30	6.6	14.7	450	201
47-5013	Service Unit Operators, Oil, Gas & Mining	31	—	—	—	—
47-5041	Continuous Mining Machine Operators	325	—	—	—	—
47-5042	Mine Cutting & Channeling Machine Operators	204	—	—	—	—
47-5049	Mining Machine Operators, All Other	40	—	—	—	—
47-5061	Roof Bolters, Mining	383	—	—	—	—
47-5081	Helpers - Extraction Workers	333	238.0	533.0	140	63
47-5099	Extraction Workers, All Other	42	—	—	—	—
49-0000**	**Installation, Maintenance, and Repair Occupations**	522	0.8	1.7	66,780	29,823
49-1011	Supervisors - Mechanics, Installers & Repairers	62	1.3	2.8	4,840	2,161
49-3042	Mobile Heavy Equipment Mechanics	204	12.2	27.4	1,670	746
49-9041	Industrial Machinery Mechanics	84	1.1	2.4	7,810	3,488
49-9043	Maintenance Workers, Machinery	43	1.3	2.9	7,390	1,487
49-9071	Maintenance & Repair Workers, General	129	1.0	2.3	12,420	5,547
51-0000**	**Production Occupations**	252	0.1	0.2	304,410	135,945
51-1011	Supervisors - Production & Operating Workers	66	0.3	0.7	21,800	9,736
51-4121	Welders, Cutters, Solderers & Brazers	84	0.7	1.5	12,390	5,533
51-9021	Crushing, Grinding & Polishing Machine Setters/Oprs/Tndrs	44	5.0	11.1	890	397
51-9061	Inspectors, Testers, Sorters, Samplers & Weighers	58	0.0	0.9	14150†	6,319
53-0000**	**Transportation and Material Moving Occupations**	1,128	0.5	1.0	243,820	108,886
53-1021	Supervisors - Helpers, Laborers & Material Movers	16	0.3	0.7	5,440	2,429
53-1031	Supervisors - Transportation & Vehicle Operators	23	0.4	0.9	5,810	2,595
53-3032	Heavy & Tractor-Trailer Truck Drivers	101	0.2	0.4	59,730	26,674
53-4013	Rail Yard Engineers, Dinkey Operators & Hostlers	24	10.6	23.8	230	103
53-7011	Conveyor Operators & Tenders	120	9.7	21.6	1240†	554
53-7032	Excavating & Loading Machine & Dragline Operators	406	169.2	379.5	510	107
53-7033	Loading Machine Operators, Underground Mining	106	—	—	—	—
53-7051	Industrial Truck & Tractor Operators	22	0.1	0.2	23,680	10,575
53-7061	Cleaners of Vehicles & Equipment	19	1.6	3.5	1,190	531
53-7062	Laborers & Freight, Stock & Material Movers	51	0.1	0.2	66,960	29,903
53-7063	Machine Feeders & Offbearers	24	0.7	1.6	3,320†	1,483
53-7072	Pump Operators	30	74.0	165.8	40	18
53-7111	Mine Shuttle Car Operators	186	—	—	—	—
99-9999	**Other Misc. Occupations**	249	—	—	—	—

Source: Pennsylvania Dept of Labor and Industry 2016 Estimates/Bureau of Labor Statistics 2016 Occupational Employment Statistics; state total and ARC shares of employment calculated using 2015 QCEW data provided by IMPLAN

D indicates coal industry occupation data not disclosed by state agencies

— indicates absence of occupation in any industry

**Indicates calculated major group; data absent from state sources

†Indicates employment undisclosed for at least one of three industries; partial sum

Table 23: Coal Mining Employment and the Distribution of Occupations: Virginia

	Coal Mining Occupations				Manufacturing, Construction and Transportation Employment	
Occupation Code	Name	Entire State	As percent of State Manufacturing, Construction & Transportation Employment	As percent of State's ARC Counties' Manufacturing, Construction & Transportation Employment	Entire State	Appalachian Portion
00-0000	**Total, All Occupations**	6,051	1.1	10.3	538,020	58,589
11-0000	**Management Occupations**	235	1.1	10.3	20,940	2,280
43-0000	**Office and Administrative Support Occupations**	311	0.4	4.0	71,820	7,821
47-0000	**Construction and Extraction Occupations**	3,752	3.1	28.7	119,860	13,053
47-2000	Construction Trades Workers	1,321	—	—	—	—
47-2073	Operating Engineers and Other Construction Equipment Operators	873	13.5	123.7	6,480	706
47-5000	Extraction Workers	2,055	—	—	—	—
47-5041	Continuous Mining Machine Operators	1,203	—	—	—	—
47-5042	Mine Cutting and Channeling Machine Operators	323	—	—	—	—
47-5051	Rock Splitters, Quarry	233	—	—	—	—
49-0000	**Installation, Maintenance, and Repair Occupations**	529	1.4	12.5	38,980	4,245
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	214	17.8	163.8	1,200	131
49-9000	**Other Installation, Maintenance, and Repair Occupations**	253	—	—	—	—
49-9041	Industrial Machinery Mechanics	142	2.9	26.7	4,890	533
51-0000	**Production Occupations**	374	0.3	2.9	119,260	12,987
51-9000	**Other Production Occupations**	232	—	—	—	—
53-0000	**Transportation and Material Moving Occupations**	615	0.6	5.7	99,920	10,881
53-7000	Material Moving Workers	428	—	—	—	—

Source: Virginia Employment Commission 2014 Estimates/Bureau of Labor Statistics 2014 Occupational Employment Statistics; state total and ARC shares of employment calculated using 2015 QCEW data provided by IMPLAN

D indicates coal industry occupation data not disclosed by state agencies

— indicates absence of occupation in any industry

Table 24: Coal Mining Employment and the Distribution of Occupations: West Virginia

Coal Mining Occupations		Coal Mining Employment			Manufacturing, Construction and Transportation Employment	
Occupation Code	Name	Entire State	As percent of State Manufacturing, Construction & Transportation Employment	As percent of State's ARC Counties' Manufacturing, Construction & Transportation Employment	Entire State	Appalachian Portion
00-0000	**Total all occupations**	12,780	12.3	12.3	104,210	104,210
11-0000	**Management Occupations**	340	9.2	9.2	3,690	3,690
11-1021	General and Operations Managers	140	9.7	9.7	1,450	1,450
11-3011	Administrative Services Managers	70	87.5	87.5	80	80
11-3051	Industrial Production Managers	D	D	D	590	590
11-9021	Construction Managers	D	D	D	360	360
11-9199	Managers, All Other	30	27.3	27.3	110	110
13-0000	**Business and Financial Operations Occupations**	110	6.0	6.0	1,840	1,840
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	30	13.0	13.0	230	230
13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	10	—	—	—	—
13-1071	Human Resources Specialists	20	13.3	13.3	150	150
13-2011	Accountants and Auditors	10	3.1	3.1	320	320
17-0000	**Architecture and Engineering Occupations**	250	12.3	12.3	2,040	2,040
17-1022	Surveyors	30	—	—	—	—
17-2081	Environmental Engineers	10	—	—	—	—
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	140	—	—	—	—
19-0000	**Life, Physical, and Social Science Occupations**	D	D	D	660	660
29-0000	**Healthcare Practitioners and Technical Occupations**	80	44.4	44.4	180	180
29-9011	Occupational Health and Safety Specialists	50	50.0	50.0	100	100
29-9012	Occupational Health and Safety Technicians	30	—	—	—	—
33-0000	**Protective Service Occupations**	100	100.0	100.0	100†	100
33-9032	Security Guards	90	90.0	90.0	100	100
37-0000	**Building and Grounds Cleaning and Maintenance Occupations**	60	13.3	13.3	450	450
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	50	12.8	12.8	390	390
43-0000	**Office and Administrative Support Occupations**	480	4.2	4.2	11,490	11,490
43-1011	First-Line Supervisors of Office and Administrative Support Workers	20	3.1	3.1	640	640
43-3031	Bookkeeping, Accounting, and Auditing Clerks	40	5.5	5.5	730	730
43-3051	Payroll and Timekeeping Clerks	20	16.7	16.7	120	120
43-5032	Dispatchers, Except Police, Fire, and Ambulance	90	32.1	32.1	280	280
43-5081	Stock Clerks and Order Fillers	110	13.3	13.3	830	830
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical,	D	D	D	1,110	1,110
43-9061	Office Clerks, General	110	5.3	5.3	2,080	2,080

Table 24: Coal Mining Employment and the Distribution of Occupations: West Virginia, (continued)

Coal Mining Occupations		Coal Mining Employment			Manufacturing, Construction and Transportation Employment	
Occupation Code	Name	Entire State	As percent of State Manufacturing, Construction & Transportation Employment	As percent of State's ARC Counties' Manufacturing, Construction & Transportation Employment	Entire State	Appalachian Portion
00-0000	**Total all occupations**	12,780	12.3	12.3	104,210	104,210
47-0000	**Construction and Extraction Occupations**	6,440	28.8	28.8	22,350	22,350
47-1011	First-Line Supervisors of Construction Trades and Extraction Work	890	36.9	36.9	2,410	2,410
47-2061	Construction Laborers	180	2.9	2.9	6180†	6,180
47-2073	Operating Engineers and Other Construction Equipment Operators	1,210	48.2	48.2	2,510	2,510
47-2111	Electricians	860	41.5	41.5	2,070	2,070
47-5041	Continuous Mining Machine Operators	570	—	—	—	—
47-5042	Mine Cutting and Channeling Machine Operators	280	—	—	—	—
47-5049	Mining Machine Operators, All Other	40	—	—	—	—
47-5061	Roof Bolters, Mining	1,610	—	—	—	—
47-5081	Helpers--Extraction Workers	460	—	—	—	—
47-5099	Extraction Workers, All Other	D	D	D	—	—
49-0000	**Installation, Maintenance, and Repair Occupations**	1,520	16.6	16.6	9,180	9,180
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	240	35.3	35.3	680	680
49-2092	Electric Motor, Power Tool, and Related Repairers	60	—	—	—	—
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	60	6.1	6.1	980	980
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	480	137.1	137.1	350†	350
49-9041	Industrial Machinery Mechanics	80	7.1	7.1	1130†	1,130
49-9043	Maintenance Workers, Machinery	80	53.3	53.3	150	150
49-9071	Maintenance and Repair Workers, General	470	29.9	29.9	1,570	1,570
49-9098	Helpers--Installation, Maintenance, and Repair Workers	30	6.1	6.1	490	490
51-0000	**Production Occupations**	560	2.1	2.1	27,050	27,050
51-1011	First-Line Supervisors of Production and Operating Workers	60	2.4	2.4	2,460	2,460
51-4121	Welders, Cutters, Solderers, and Brazers	110	6.6	6.6	1,670	1,670
51-8099	Plant and System Operators, All Other	D	D	D	—	—
51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	50	—	—	—	—
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	240	15.9	15.9	1,510	1,510
53-0000	**Transportation and Material Moving Occupations**	2,790	12.4	12.4	22,480	22,480
53-1031	First-Line Supervisors of Transportation and Material-Moving Mach	190	43.2	43.2	440	440
53-3032	Heavy and Tractor-Trailer Truck Drivers	310	4.2	4.2	7,410	7,410
53-7011	Conveyor Operators and Tenders	350	—	—	—	—
53-7021	Crane and Tower Operators	30	30.0	30.0	100†	100
53-7032	Excavating and Loading Machine and Dragline Operators	700	411.8	411.8	170	170
53-7033	Loading Machine Operators, Underground Mining	330	—	—	—	—
53-7041	Hoist and Winch Operators	30	—	—	—	—
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	250	4.6	4.6	5,490	5,490
53-7072	Pump Operators, Except Wellhead Pumpers	D	D	D	—	—
53-7111	Mine Shuttle Car Operators	510	—	—	—	—

Source: West Virginia Dept of Commerce 2016 Estimates/Bureau of Labor Statistics 2016 Occupational Employment Statistics

D indicates coal industry occupation data not disclosed by state agencies

— indicates absence of occupation in any industry

†Indicates employment undisclosed for at least one of three industries; partial sum

5. Summary and Recommendations: Subtask 1

The problems confronting coal regions in Appalachia and across the country are daunting. Morris (2016) notes that for the nation as a whole, as much as $2.3 billion will be needed for pension assurance, $3 billion for mine reclamation, plus spending on training and infrastructure. She puts the price tag "…easily in the tens of billions of dollars over a decade." There is certainly disappointment in coal country at what has *not* been done; there will also likely be disappointment in ten years at what was *not* done.

One feature of the decline of coal employment is that the number of jobs lost is small relative to total employment. This means that the nation and even most individual states should be able to absorb the losses relatively quickly. However, though the share of jobs lost is not overwhelming at an aggregate level, because it is geographically concentrated, for the coal-employment regions the losses are devastating. Without assistance, the losses will result in a sustained economic crisis. The rural and often relatively remote locations of many coal mining jobs compound the problems faced by coal counties.

As documented above, many coal regions in the Appalachian Region have been devastated by long-term and near-term declines in the fortunes of the coal industry. Much of this is due to technological innovations, but public policy has played a role as well. These problems are ongoing and workers in many counties of Appalachia are struggling to find alternative employment opportunities. The needs are compelling and immediate and similar to the problems encountered in the context of other structural processes of labor market adjustment.[9] We provide the following recommendations for consideration.

- Economic base studies are needed that document the strengths and weaknesses of regional economies centered around coal-employment and coal-production communities. Complementary analyses are required of local labor markets to help enable the matching of worker skills and needs with those of employers and potential employers. These studies should seek to identify viable employment alternatives to employment in the coal sector. If it is not practical or cost-effective to promote alternative engines of economic development, then assistance should be provided to encourage workers to pursue employment opportunities outside their current place of residence. Policy should not be used to encourage people to remain in regions that will remain depressed.
- Transitional assistance to workers and families should be evaluated as a possible policy tool. One facet would focus on transitioning workers to alternative places of employment, both within workers' commuting ranges and beyond. Providing homeowners with financial assistance may increase their ability to move from origin regions with a severely depressed real estate market. The inability to sell a home for lack of buyers could prevent

[9] For example, see Autor et al. (2013) who explore the local consequences of adjustment in the face of rising imports from China.

mobility while leaving, and letting the mortgage and/or property taxes go into default would add further hardship to local governments and regional economies. For older workers, assistance for transitioning from work to retirement should also be considered.

- Little is known about the detailed characteristics of coal workers in Appalachia. There are spotty data from the Region as well as more detailed national data, but together this information paints an inadequate picture of coal workers and their many characteristics in the Appalachian Region. This information is essential to the design and implementation of people-based policies of economic development, and in particular with education and training programs. Worker and establishment surveys could provide rich data to inform the policymaking process.
- A re-development fund could be capitalized using coal severance tax revenue, general tax revenue, and potentially federal funds with the intent of providing assistance to workers and communities. These funds could be used to help support the recommendations made above through various forms of expenditures. Funds might also be used to provide financial support to entrepreneurs through a revolving loan fund, loan subsidies, or loan guarantees.

Subtask 2: The Education Pipeline

The discussion in Subtask 1 above focused primarily on current labor market conditions and occupational patterns in the coal industry compared to other sectors of the Appalachian Region. Attention in Subtask 2 turns to public funding and expenditure patterns that will affect the future labor force through the support of elementary and secondary education.

Local tax revenues are an important source of funding for K-12 education, complementing receipts from the federal government and state governments. Declines in the economic base arising from contractions in coal employment and coal production can affect virtually all state and local revenue sources either directly or indirectly through ripple effects that spill across economic sectors and communities. Sales and gross receipts taxes may fall from reduced consumer spending; the same revenue sources can be adversely affected by reduced business-to-business transactions, many of which are subject to taxation. Personal income taxes may suffer through reductions in wage and salary income as well as other forms of income like rental and pass-through income from limited liability business entities. Corporate income taxes may suffer directly and indirectly through reduced firm profitability. The property tax will face downward pressure from any reductions in business activity and residential housing activity. Because of the way in which the property tax base is determined for tax purposes through re-assessments, negative effects on the property tax may lag behind declines in coal-related activity. In general, taxes are tied to economic activity, and when this activity is reduced, so too are tax revenues.

To provide a sense of how important coal employment is to state and local revenue generation, consider the results of an economic impact assessment of West Virginia's coal industry that was conducted for this report.[10] The impact estimates were arrived at using the well-established IMPLAN modeling framework that estimates indirect and induced economic effects that arise from direct activity in the coal industry. Based on direct employment of 14,577 coal workers in West Virginia, total state and local taxes are estimated to be $335.6 million, or $23,023 per direct job. Of this total, $161.5 million in revenue accrues to the state and local property tax alone, translating to $11,082 per direct job in the coal sector. These figures highlight the potential revenue risk associated with reductions in coal industry employment.

In practice, the extent and impact of these negative revenue consequences will depend on the magnitude of coal-related contractions in the economic base, the nature of state aid programs for education, the structure of local revenue sources, and the behavioral response of the statewide and local electorate in affected communities. For some communities, changes in coal activity are modest, which means revenue consequences for public schools and other public services will also be modest. Other counties have seen significant changes, and more significant changes may be on the horizon. These communities will struggle to meet public service delivery needs. Weakened revenue raising ability at the local level may translate into higher state education aid through funding equalization programs. In places where there is local control over tax rates, it may be possible to mitigate the consequences of declining tax bases with rate increases. But raising rates in the face of declining tax bases can be politically daunting, to say the least. Some of the pressure on school finances might be reduced through the outmigration of families with children of school age. In fact, as discussed more fully below, there has been a widespread reduction in school-age enrollments in most broad coal-employment regions of Appalachia. This translates into reduced state and federal aid that is tied to student enrollment counts. In addition, school systems may find that they have excess capacity in terms of instructional staff (including shrinking class sizes) and the schooling capital stock. Winding these resources down to match declining enrollment counts will create further disruptions in the community and local government budgets. In the near term, these excess capacity costs will be an additional burden to serve delivery responsibilities. Policy options include school closings and system/function consolidations.

The analysis that follows digs deeper into elementary and secondary education finance and spending patterns for 129 coal-employment counties across Appalachia. The discussion begins with an overview of state funding programs that transfer resources to local school districts to support elementary and secondary education. The focus then turns to the performance of local government revenue collections. Local revenue performance is important since it is the locally-determined foundation for funding public schools—healthy overall revenue streams will help support fiscal health for public schools. A key finding is relatively low tax collections and low tax effort on the part of many

[10]The authors would like to thank Eric Bowen, Christiadi and John Deskins, who are affiliated with the Bureau of Business and Economic Research at West Virginia University, for providing these estimates.

coal communities that could hamper school funding and the ability to support the delivery of other locally-provided public services. We then consider education funding sourced by federal, state, and local governments. Most of the evidence on taxes and school spending that is presented in the analysis below yields few symptoms of broad-based weakening of overall fiscal health, or more specifically, support for K-12 education in coal communities in the Appalachian Region. Importantly, current spending per pupil, at least on average, is relatively high in coal communities and this spending has improved relative to the national average since 2010. However, nominal current spending per pupil fell in Kentucky, Virginia, and West Virginia between 2010 and 2014, as well as in a number of counties in Alabama, Ohio and Tennessee.

1. State K-12 Funding Programs

State funding formulas for elementary and secondary education determine the amount of state revenues that flow to local schools. These formulas typically affect the level of locally-provided funding support as well, through matching and/or local funding requirements. Of particular interest is the way that these formulas respond to changes in local *tax capacity*, or changes in the ability to generate revenue from own-source local tax bases. Declines in the CIE can be expected to put downward pressure on all local revenue sources, from traditional tax bases to fees and charges, as discussed above. Most funding formulas directly account for local tax capacity and steer more revenue toward lower-capacity school districts. Thus as the coal industry wanes and tax bases suffer, more revenue should flow to affected systems. In various ways, the formulas try to provide some degree of *equalization* that narrows spending differentials across high and low tax capacity districts. *Tax effort*, or the extent to which local tax bases are actually used to support revenue generation, is also an important element of many funding formulas. Absent effort requirements, some local communities may simply choose to provide less local funding support when state aid is forthcoming. Tax effort requirements are intended to raise overall spending above levels that would otherwise take place at the local level.

In practice, the way in which state aid formulas respond to changes in local capacity is very complicated. In the simplest case, a school district's capacity changes and the formula determines the consequences for state aid and potentially locally-required funding support. But in other contexts, there are many moving parts that need to be accounted for. For example, formulas are typically tied to some measure of enrollments. When economic conditions deteriorate, people may leave the community, meaning lower enrollments. Declining economic conditions may also lead to policy changes that raise or lower local tax effort. States may also choose to change the nature of the funding formula for any of a number of reasons and this will ripple across school systems.

A concise state-by-state synopsis of funding formulas follows:

1.1 Alabama

Alabama's foundation funding formula is unit-based. The "foundation" is intended to provide a basic level of state-supported education funding that can then be topped off by local support. The state determines each district's number of instructional units based on the prior year's average daily membership (ADM). Total revenue needed for instructional costs like salaries and benefits (based on prescribed student-teacher ratios), and ADM-dependent expenses like textbooks and materials are based on the number of grade-level weighted instructional units the district is assigned. State instructional funding responsibility to the district is then determined by reducing unit-based instructional costs by 10 mills of expected local property. Reduced tax capacity from declining coal activity would translate into higher state funding. In the event of unexpected enrollment growth, districts are allocated additional instructional units.

Block grants are provided by the state for transportation, school nurses, and other non-instructional costs, and are not weighted based on grade level. Capital costs are *power-equalized* by the state; the state matches locally-raised funds for capital improvements such that each mill of local effort provides the same amount of revenue. As with operating costs, this funding system would provide more support to local systems should tax capacity decline.

Alabama school districts do not levy taxes; counties and cities levy property and sales taxes which fund local participation in the foundation program (Verstegen 2015, 1-4). In the event of shortfalls to state revenue, proration may occur. The state has set up a proration trust fund to prevent funding gaps (AL Const. amend. 856).

1.2 Kentucky

Kentucky's formula for funding K-12 education—called the Support Education Excellence in Kentucky program, or SEEK—utilizes both *foundation* and *equalization* programs.[11] A per-pupil base is legislated in the state's biennial budget. The state calculates adjusted average daily attendance (AADA) each year, with weights for exceptional students and predicted enrollment growth built in. Districts receive SEEK funding based on AADA. A minimum local effort of 3 mills of tax on property and motor vehicle assessments is required by each district as well as a half mill of effort earmarked for capital costs (Verstegen 2015, 87-89). The state's two-tiered approach allows districts to raise

[11] Foundation aid represents a minimum grant provided by the state, typically on a per pupil or weighted per pupil basis. Equalization aid accounts for differential tax capacity across school districts and can be implemented in a number of different ways. For example, a guaranteed tax base (GTB) is a matching grant that ensures an equal per pupil tax base across school districts.

additional revenue. Reductions in tax capacity would diminish the amount of revenue generated from these minimum effort requirements; rates could be increased to sustain revenues.

Tier I equalization lets districts raise funding beyond SEEK levels and also receive additional state support. Districts may levy an equivalent tax rate (ETR) that generates up to 15 percent of total calculated SEEK funding. If the currently levied rate exceeds this ETR, the maximum additional revenue the district can be expected to generate is capped according to its relative property tax wealth. For example, the state provides 60 percent of maximum Tier I funding for a district with 40 percent of the state average property tax wealth. Tier II funding allows districts to levy a supplementary tax to raise up to 30 percent of the total of SEEK and Tier I funding; the state does not supplement this (Kentucky Department of Education 2015, 5-7).

Capital costs are funded by an additional earmarked half-mill of local effort and are subject to the same equalization arrangement as Tier I funding when used for debt; Kentucky provides $100 per AADA (Verstegen 2015, 89). The state maintains the right to adjust SEEK funding according to availability of funds (Kentucky Department of Education 2015, 9).

1.3 Maryland

Maryland elementary and secondary education funding consists of three categories: general aid, targeted aid, and other funds (e.g., for transportation and capital outlays). General aid includes: foundation funding, the *guaranteed tax base* (or GTB), and funding for Geographic Cost of Education Indexing (GCEI). Targeted aid for special education students is allocated based on weighted full time equivalent students (FTE) (Verstegen 2015, 104).

Maryland's foundation per-pupil base is the 2008 level adjusted yearly for inflation (Maryland Department of Legislative Services 2014, 70-72). The county share of the program is based on taxable property and net taxable income. The GTB program further equalizes costs for counties with wealth less than 80 percent of the statewide average (the guaranteed base), so long as the county's appropriations already surpass the required foundation county share—i.e., local tax effort is relatively high. The county's existing tax rate is applied to the difference between the guaranteed base and their own, incentivizing funding beyond local share. Per-pupil allocations under the GTB are capped at 20 percent of the foundation per pupil amount (Maryland Department of Legislative Services 2014, 85). Maryland also provides additional money to counties with above average education costs through its GCEI. The GCEI accounts for higher energy costs, cost of living (based on home prices), as well as wages needed to draw personnel to less attractive schools (Imazeki 2015, 13).

Counties distribute property and income tax revenue to fiscally-dependent districts. No minimum tax effort is required by Maryland, but counties may not decrease per-pupil funding. However, the state may require additional effort from counties with below state average education effort (local education funding relative to local wealth) (Verstegen 2015, 107). Counties may apply for waivers if unable to meet these requirements and may receive additional state funding to make up for lacking local funds (Chechovich 2016, 10).

1.4 Mississippi

Mississippi's Adequate Education Program (MAEP) per-student base cost is calculated every four years based on the average cost to educate students at schools the state deems "successful and efficient" (Verstegen 2015, 121). In intermediate years, 40 percent of the base cost is adjusted for inflation. Special categories of students are funded separately. Total district funding under MAEP is the sum of ADM-based allocations and categorical funding for special types of students.

Minimum required district effort is the equivalent of 28 mills of property tax (not to exceed 55 mills except by referendum). Reductions in tax capacity would reduce the amount of revenue generated from the minimum effort requirement because tax bases have shrunk. Local funding sources include property tax and tuition revenues (Verstegen 2015, 123). However, district share is capped at 27 percent of MAEP program costs. Wealthier districts do not receive more state funds as they spend more from local sources. (EdBuild 2017, 5).

1.5 Ohio

The Ohio General Assembly legislates the minimum per-pupil spending level biennially. A State Share Index (SSI) based on property tax capacity and relative district median income is applied to the bulk of state-calculated funding totals. Districts are responsible for the difference between calculated funding and the state's share. Districts may levy income taxes on residents in addition to traditional school property taxes. The state guarantees a total level of funding not less than the foundation total in the previous biennium but caps growth at 7.5 percent (Ohio Department of Education 2016, 17).

Targeted Assistance and Capacity Aid are equalization programs that may offset a portion of district share for places with low capacity. Under Targeted Assistance, Ohio ranks district per-pupil wealth (based on property value and income) and provides 6 mills on the difference between district and threshold wealth (i.e. the district ranked 490th out of all districts); districts are also eligible if agricultural real property makes up 10 percent of total real property values (Ohio Department of Education 2016, 7-9). Capacity Aid, a second offset, was introduced in the previous biennium and is

based solely on district relative property tax capacity (Ohio Department of Education 2016, 16). Responsibility for capital costs is apportioned based on property wealth per student (Verstegen 2015, 170).

1.6 Pennsylvania

Prior to the 2015 fiscal year, Pennsylvania was one of three states without a set education funding formula. Instead, the state guaranteed districts a 2 percent bump in funding each year regardless of enrollment shifts. Now, the Pennsylvania Senate Basic Education Funding (BEF) Commission recommends appropriations for K-12 basic aid in each fiscal year's budget; provisions for transportation, capital outlays, and special and technical education, among others, are made separately.

BEF appropriations are apportioned based on districts' adjusted, weighted ADM. District ADMs are weighted for enrollments in the following categories: poverty, acute poverty, concentrated poverty, limited English language abilities, and charter school membership; ADM is also adjusted for population density. Local effort, capacity, and median household income indices are applied to the new ADM. Districts receive state funding based on their share of the state's total adjusted weighted ADM. While no per-pupil base exists in the new funding formula, districts are guaranteed to receive a minimum of FY 2014 funding levels. School districts levy their own income and property taxes to fund costs not covered by state-distributed funds (Basic Education Commission 2015).

1.7 Tennessee

Tennessee's Basic Education Program (BEP) funding formula is ADM-based and tied to various expenditure categories. On average, the BEP pays for 75 percent of instructional costs (including benefits), 75 percent of classroom support (materials, technology, etc.), and 50 percent of non-classroom administrative and maintenance costs (including capital outlays). The formula accounts for school system ability to pay through a county Fiscal Capacity Index (FCI). School districts in counties with greater fiscal capacity shoulder a larger share of their BEP total costs. Districts receive at minimum the prior year's funding, adjusted for enrollment and salary changes. The last component of funding is the Cost Differential Factor, which provides additional funds for places with high community-wide salaries which are believed to raise schooling costs (Tennessee Department of Education 2016).

Local funding comes mainly from property and sales taxes, with no required minimum tax effort. City school districts may receive additional appropriations from city government, and special school districts may levy their own property tax with permission from the legislature (Verstegen 2015, 201).

1.8 Virginia

Virginia K-12 funding includes five categories: Standards of Quality (SOQ), categorical, supplemental, incentive, and lottery aid. For FY 2015, SOQ funding represented 91 percent of total state aid. The state's Joint Legislative Audit Review Committee (JLARC) calculates the minimum funding per pupil by county necessary to meet the state's SOQ. The state reduces total county funding for basic aid (the majority of SOQ funding) by the county's share of a .0125 percent sales tax. Apportionment is based on the county's share of state school-aged population. The remainder is split between the state and county based on the Local Composite Index (LCI), which approximates the county's ability to pay (i.e., tax capacity) (Verstegen 2015, 222-223).

The LCI measures a county's retail sales and adjusted gross income tax wealth relative to the state's. The state calculates the LCI so that i) the state pays 55 percent of LCI-adjusted funding and ii) no county receives less than 20 percent or more than 80 percent of total aid from the state (Dickey, 2009). The General Assembly has revised the SOQ to shift financial burdens away from the state, most notably during the Great Recession (Duncombe and Cassidy 2016, 1-3).

School districts are fiscally dependent; local shares of funding come from county property, sales, and special tax revenues (Verstegen 2015, 230).

1.9 West Virginia

West Virginia's Public School Support Program (PSSP) is a foundation formula based on net enrollment and school-age population density. If county net enrollment does not meet a threshold of 1,400, the state adjusts the number upward (West Virginia Department of Education 2015, 8). This, in combination with preferential funding ratios for teachers, personnel, and transportation based on student density, ensures that sparsely-populated counties receive more funding per pupil for educators and staff members, whose minimum salaries are set by the state (West Virginia Department of Education 2015, 2). This provision in principle provides some protection to rural communities that are dependent on coal production and employment. While counties may supplement salaries using local funds, salary equity law caps supplementation to ten percent of the lowest-paid employee of similar education and experience. Foundation allowances for instructional improvement, technology,

and other programs are based solely on adjusted net enrollment and are unaffected by local capacity or effort (West Virginia Department of Education 2015, 8).

West Virginia requires the same amount of tax effort from each county, levied on four classes of property (1.94 mills on Class I Property, 3.88 mills on Class II, and 7.76 mills on Classes III and IV); beyond required effort, counties may levy additional taxes on the same four classes of property capped at the state rates (West Virginia Department of Education 2015, 5).

1.10 Summary

Perhaps the most important takeaway from this discussion is the complexity of the various funding schemes across the states. At the same time, it is rather clear that the state funding formulas generally account in some way for local tax capacity and/or tax effort. This should offer some protection to local school systems that witness deterioration in local fiscal conditions. However, funding formulas typically do not hold local school districts completely harmless for losses in local tax capacity; i.e., own source revenue losses are never fully replaced by state aid. Another important point is that both the state and their constituent local governments hold fate in their own hands when it comes to funding elementary and secondary education. As discussed below, the Appalachian states and many coal-employment communities have untapped tax capacity that can be used to fund public education.

2. Local Government Taxes and Burdens

Local government revenue performance will directly affect the ability to provide public education and other locally-provided services. Total local government tax revenue, population and local tax burden data are provided in Table 25 for the 2007 and 2012 Census of Government years to frame the revenue performance and fiscal health of coal-employment communities. As with the analysis in Subtask 1 presented above, we focus on a number of key geographies, including states that are either partially or wholly in Appalachia, coal-employment communities in the Appalachian Region, the entire Appalachian Region, and the United States as a whole. For all local governments across the country, taxes per capita stood at $1,875 in 2012, compared to $1,224 for counties in the Appalachian Region and $1,297 for coal communities within Appalachia. The relative per capita burden in coal communities was just 69.2 percent (i.e. $1,298/$1,875) of the national average and 63.9 percent (i.e. $1,298/$2,032) of the average of states that are either partially or wholly in Appalachia in 2012. Relative per capita burdens were only 48.7 percent of the Appalachian statewide average in West Virginia and 32.6 percent of the average in Kentucky.

Table 25: Local Government Total Taxes for States and Other Geographies in Appalachia, 2007 and 2012

Area	2007 Local Government Total Taxes (thous $)	2007 Total Personal Income (thous $)	2007 Total Population	2012 Local Government Total Taxes (thous $)	2012 Total Personal Income (thous $)	2012 Total Population	Local Government Total Taxes: Per Capita 2007	Per Capita 2012	Personal Income 2007	Personal Income 2012
Alabama	4,642,148	152,246,048	4,672,840	5,165,992	170,881,367	4,815,960	$ 993	$1,073	3.05%	3.02%
Appalachian Alabama	3,034,183	100,709,839	2,993,512	3,337,291	113,244,852	3,082,381	$1,014	$1,083	3.01%	2.95%
Coal Counties, Alabama	1,859,184	51,931,538	1,406,520	1,979,118	57,286,886	1,440,384	$1,322	$1,374	3.58%	3.45%
Non-Appalachian Alabama	1,607,965	51,536,209	1,679,328	1,828,701	57,636,515	1,733,579	$ 958	$1,055	3.12%	3.17%
Georgia	14,836,604	332,074,930	9,349,988	15,592,462	365,480,928	9,914,668	$1,587	$1,573	4.47%	4.27%
Appalachian Georgia	4,069,260	89,150,001	2,805,474	4,243,798	99,185,573	2,997,461	$1,450	$1,416	4.56%	4.28%
Coal Counties, Georgia	–	–	–	–	–	–	–	–	–	–
Non-Appalachian Georgia	10,767,344	242,924,929	6,544,514	11,348,664	266,295,355	6,917,207	$1,645	$1,641	4.43%	4.26%
Kentucky	3,796,832	134,438,098	4,256,672	4,524,196	155,996,922	4,384,799	$ 892	$1,032	2.82%	2.90%
Appalachian Kentucky	621,095	28,960,405	1,181,504	781,826	34,029,685	1,183,185	$ 526	$ 661	2.14%	2.30%
Coal Counties, Kentucky	341,959	15,887,984	642,927	423,823	18,552,802	638,937	$ 532	$ 663	2.15%	2.28%
Non-Appalachian Kentucky	3,175,737	105,477,693	3,075,168	3,742,370	121,967,237	3,201,614	$1,033	$1,169	3.01%	3.07%
Maryland	10,925,407	267,773,656	5,653,408	13,112,085	314,159,795	5,889,651	$1,933	$2,226	4.08%	4.17%
Appalachian Maryland	332,046	8,021,213	250,770	426,256	9,516,942	253,094	$1,324	$1,684	4.14%	4.48%
Coal Counties, Maryland	125,055	3,026,635	104,597	197,827	3,638,432	103,879	$1,196	$1,904	4.13%	5.44%
Non-Appalachian Maryland	10,593,361	259,752,443	5,402,638	12,685,829	304,642,853	5,636,557	$1,961	$2,251	4.08%	4.16%
Mississippi	2,329,317	85,615,593	2,928,350	2,759,363	98,264,480	2,984,945	$ 795	$ 924	2.72%	2.81%
Appalachian Mississippi	388,811	16,119,633	625,219	455,741	19,011,389	629,569	$ 622	$ 724	2.41%	2.40%
Coal Counties, Mississippi	4,391	188,838	8,680	4,478	216,137	8,357	$ 506	$ 536	2.33%	2.07%
Non-Appalachian Mississippi	1,940,506	69,495,960	2,303,131	2,303,622	79,253,091	2,355,376	$ 843	$ 978	2.79%	2.91%
New York	70,862,196	908,162,948	19,132,335	80,187,183	1,053,660,783	19,602,769	$3,704	$4,091	7.80%	7.61%
Appalachian New York	2,079,639	32,037,730	1,069,195	2,448,303	37,844,236	1,060,605	$1,945	$2,308	6.49%	6.47%
Coal Counties, New York	–	–	–	–	–	–	–	–	–	–
Non-Appalachian New York	68,782,557	876,125,218	18,063,140	77,738,880	1,015,816,547	18,542,164	$3,808	$4,193	7.85%	7.65%
North Carolina	10,647,270	328,369,034	9,118,037	11,738,089	376,200,549	9,746,175	$1,168	$1,204	3.24%	3.12%
Appalachian North Carolina	1,698,749	52,876,034	1,658,679	1,775,727	57,714,030	1,708,358	$1,024	$1,039	3.21%	3.08%
Coal Counties, North Carolina	–	–	–	–	–	–	–	–	–	–
Non-Appalachian North Carolina	8,948,521	275,493,000	7,459,358	9,962,362	318,486,519	8,037,817	$1,200	$1,239	3.25%	3.13%
Ohio	19,937,435	408,126,658	11,500,468	20,899,220	465,139,834	11,550,839	$1,734	$1,809	4.89%	4.49%
Appalachian Ohio	2,089,193	59,728,696	2,048,579	2,168,704	68,113,122	2,027,860	$1,020	$1,069	3.50%	3.18%
Coal Counties, Ohio	1,093,677	31,468,053	1,086,902	1,171,355	36,007,028	1,071,247	$1,006	$1,093	3.48%	3.25%
Non-Appalachian Ohio	17,848,242	348,397,962	9,451,889	18,730,516	397,026,712	9,522,979	$1,888	$1,967	5.12%	4.72%
Pennsylvania	21,254,896	506,357,616	12,563,937	24,084,475	585,851,545	12,771,854	$1,692	$1,886	4.20%	4.11%
Appalachian Pennsylvania	7,792,333	203,207,105	5,784,871	8,659,225	234,977,960	5,788,440	$1,347	$1,496	3.83%	3.69%
Coal Counties, Pennsylvania	6,217,814	164,158,187	4,524,533	6,840,508	189,808,518	4,527,016	$1,374	$1,511	3.79%	3.60%
Non-Appalachian Pennsylvania	13,462,563	303,150,511	6,779,066	15,425,250	350,873,585	6,983,414	$1,986	$2,209	4.44%	4.40%
South Carolina	5,198,617	142,015,184	4,444,110	6,228,651	166,397,814	4,720,760	$1,170	$1,319	3.66%	3.74%
Appalachian South Carolina	1,128,453	36,321,644	1,127,417	1,253,478	42,576,188	1,194,278	$1,001	$1,050	3.11%	2.94%
Coal Counties, South Carolina	–	–	–	–	–	–	–	–	–	–
Non-Appalachian South Carolina	4,070,164	105,693,540	3,316,693	4,975,173	123,821,626	3,526,482	$1,227	$1,411	3.85%	4.02%
Tennessee	7,277,126	210,695,574	6,175,727	7,995,185	250,285,838	6,454,306	$1,178	$1,239	3.45%	3.19%
Appalachian Tennessee	2,597,164	83,521,149	2,722,902	2,929,903	99,296,835	2,814,573	$ 954	$1,041	3.11%	2.95%
Coal Counties, Tennessee	202,575	7,468,188	268,175	232,833	8,615,015	272,946	$ 755	$ 853	2.71%	2.70%
Non-Appalachian Tennessee	4,679,962	127,174,425	3,452,825	5,065,282	150,989,003	3,639,733	$1,355	$1,392	3.68%	3.35%
Virginia	13,704,928	345,335,541	7,751,000	15,031,885	403,880,401	8,192,048	$1,768	$1,835	3.97%	3.72%
Appalachian Virginia	679,862	21,988,858	767,099	783,639	25,087,703	766,246	$ 886	$1,023	3.09%	3.12%
Coal Counties, Virginia	158,231	4,898,376	184,433	203,500	5,623,561	182,751	$ 858	$1,114	3.23%	3.62%
Non-Appalachian Virginia	13,025,066	323,346,683	6,983,901	14,248,246	378,792,698	7,425,802	$1,865	$1,919	4.03%	3.76%
West Virginia	1,436,514	53,779,085	1,834,052	1,775,955	64,623,761	1,856,560	$ 783	$ 957	2.67%	2.75%
Appalachian West Virginia	1,436,514	53,779,085	1,834,052	1,775,955	64,623,761	1,856,560	$ 783	$ 957	2.67%	2.75%
Coal Counties, West Virginia	885,074	33,377,607	1,127,727	1,125,291	39,934,019	1,136,657	$ 785	$ 990	2.65%	2.82%
Non-Appalachian West Virginia	–	–	–	–	–	–	–	–	–	–
Appalachian States	186,849,290	3,874,989,965	99,380,924	209,094,741	4,470,824,017	102,885,334	$1,880	$2,032	4.82%	4.68%
Appalachian Counties, Total	27,947,302	786,421,392	24,869,273	31,039,846	905,222,276	25,362,610	$1,124	$1,224	3.55%	3.43%
Coal Counties, Total	10,887,960	312,405,406	9,354,494	12,178,733	359,682,398	9,382,174	$1,164	$1,298	3.49%	3.39%
Non-Appalachian Counties, Total	158,901,988	3,088,568,573	74,511,651	178,054,895	3,565,601,741	77,522,724	$2,133	$2,297	5.14%	4.99%
UNITED STATES	526,028,677	11,995,419,000	301,231,207	588,804,387	13,904,485,000	313,998,379	$1,746	$1,875	4.39%	4.23%

Source: U.S. Census Bureau, Census of Governments 2007 and 2012; Bureau of Economic Analysis; and U.S. Census Bureau, Population Division

Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA) <https://arlweb.msha.gov/OpenGovernmentData/DataSets/MinesProdYearly.zip>.

Appalachian States is the sum of all states in the Appalachian region.

One explanation for these relatively low tax burdens in coal-employment communities and the Region as a whole is low tax capacity. In general, poorer communities will have lower tax capacity than higher-income places. A good measure of capacity or ability to pay is county personal income, which is a resident-based measure of income that accrues from all sources, from wages and salaries to transfer income.[12] For individuals and households, local sales and property taxes, along with other taxes and fees, are paid from personal income. Data from Table 9 (above) indicate that per capita income in coal-employment counties ($45,268) is 94.1 percent of the national average ($48,131). This is indicative of low tax capacity. However, the data in Table 25 show that revenues in coal communities are just 69.2 percent of the national average as noted above. Thus, relatively low incomes do not fully explain low revenue collections.

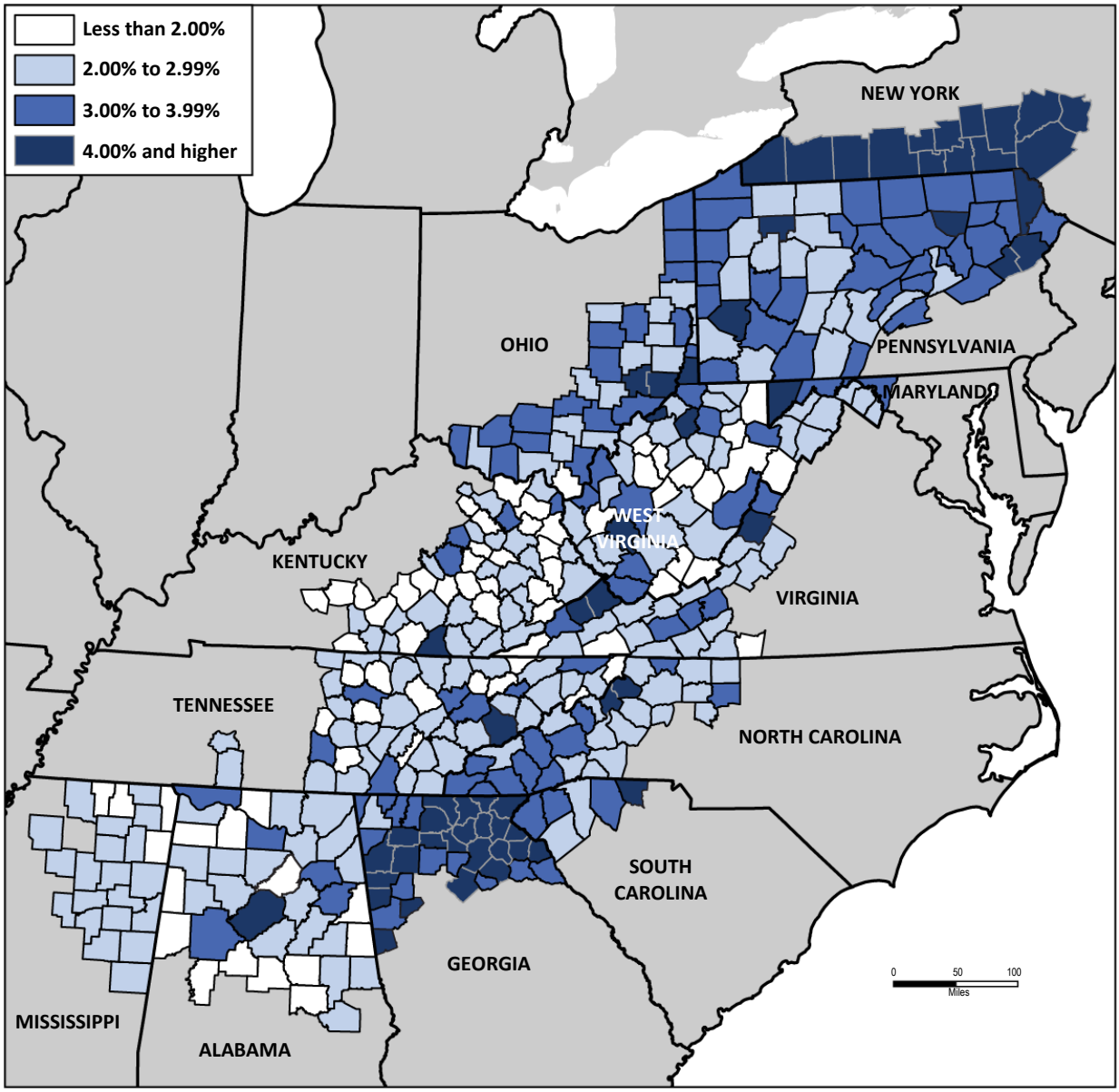
As noted above, tax effort is the extent to which own-source tax bases are utilized relative to revenue-generating capacity. In practice, tax effort may be defined as the ratio of taxes to personal income, with personal income serving as the measure of capacity. Tax effort might be viewed as a combination of fate and choice, especially in the short run. On one hand, capacity is fixed and constrained, and largely beyond the influence of policymakers, in the short run; employment levels are determined, compensation levels are set and so on. However, voters and elected officials can often affect tax effort through the choice of tax rates and/or bases. In practice, these choices may be constrained by state constitutions and legislative action. For example, states commonly require uniform and fairly assessed property tax bases. Property tax rates may be chosen by local communities, though they may also be constrained by state statute. In Alabama, local governments have considerable discretion over sales tax rates and bases. Local policy flexibility and practice varies across the states in Appalachia.

The data in the final two columns of Table 25 present tax effort figures, as measured by the ratio of taxes collected to personal income, while Figure 5 provides a snapshot of burdens for 2012 across the Appalachian Region. The data reveal the low tax effort of coal-employment counties (as well as many other counties) in Appalachia. In both 2007 and 2012, coal-employment communities had smaller tax burdens as a share of local personal income than all other broad geographies shown in Table 25, averaging 3.49 percent and 3.39 percent in each of the two years. For 2012, this is 80.1 percent of the United States average. Coal communities in Mississippi and Kentucky had the smallest tax burdens as a share of personal income of any of the geographies shown in the table. For these two states, burdens in 2012 were only 44.2 percent and 48.7 percent of the Appalachian statewide average, respectively, and 48.9 and 53.9 percent of the national average. A number of coal-employment counties have exceptionally low tax burdens that are less than 2.0 percent of personal income, including ten in Kentucky, three in Alabama, one in Virginia, and six in West Virginia. The

[12] Personal income includes wages and salaries, farm and nonfarm proprietors' income, rent, interest, dividends and transfer payments. Income is assigned to where people live. For example, if an individual resides in one county but earns wage income in an adjacent county or another state, that income is assigned based on where the worker lives, not where individual works.

combination of low capacity and low effort may compromise the ability to fund local schools and other public services.

Figure 5: Local Tax Revenue as a Share of Total Personal Income, Appalachian Counties, 2012



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

Nominal local government tax collections per capita were up modestly between 2007 and 2012, with growth dampened by the impacts of the Great Recession. This was a period of relative stability for coal employment in the Region, preceding the sharp reductions in employment that transpired in Appalachia in subsequent years. Nominal taxes per capita were up 11.4 percent in coal-employment communities versus 8.9 percent revenue growth for all Appalachian counties and 8.1 percent revenue growth for states that are either partially or wholly in Appalachia. Surprisingly, several coal-

employment regions have seen much stronger growth in per capita local tax collections. For example, coal counties in West Virginia, Kentucky and Pennsylvania had growth of 26.1 percent, 24.6 percent and 10.0 percent. Taxes as a share of personal income were up in coal-employment communities in Kentucky, Maryland, Virginia and West Virginia, and down in Alabama, Mississippi, Ohio, Pennsylvania and Tennessee. Note that 2012 burdens as a share of personal income were down for all five broad regions summarized at the bottom of Table 25 compared to 2007, a likely legacy of the Great Recession.

Tax portfolios vary across states based on a number of factors, including constitutions and statutes, public policy choices, and historical inertia. As shown in Table 26, Appalachian counties and non-Appalachian counties rely on the property tax for about two-thirds of all local own-source tax collections. While this may seem high, it is actually below the national average of 73.5 percent. The property tax is an especially important revenue source for K-12 education not just because of its size, but also because local control can be exercised to affect collections through rate adjustments. On average, coal communities place roughly similar reliance on the property tax as other local governments. However, as one would expect, there is considerable variation around this average. For example, Alabama is least reliant on the property tax with only 43.5 percent of revenues coming from the tax in coal-employment communities; Mississippi is most reliant, with well over 90 percent of all collections coming from the property tax for all geographies considered. Local communities in West Virginia are highly reliant on the property tax, as it represents 77.4 percent of local tax collections.

Table 26: Local Government Major Taxes as a Share of Total Taxes for States and Other Geographies in Appalachia, 2012

Area	Property Tax	Total Sales & Gross Receipts Tax	Total Income Taxes	Severance Tax	Other Taxes
Alabama	43.2%	42.1%	2.0%	0.1%	12.7%
Appalachian Alabama	45.1%	39.7%	2.8%	0.1%	12.4%
Coal Counties, Alabama	43.5%	37.9%	3.9%	0.1%	14.6%
Non-Appalachian Alabama	39.8%	46.4%	0.4%	0.0%	13.3%
Georgia	66.0%	31.6%	0.0%	0.0%	2.4%
Appalachian Georgia	65.6%	32.6%	0.0%	0.0%	1.7%
Coal Counties, Georgia	–	–	–	–	–
Non-Appalachian Georgia	66.1%	31.2%	0.0%	0.0%	2.7%
Kentucky	57.5%	12.7%	27.4%	0.0%	2.4%
Appalachian Kentucky	59.8%	17.7%	18.4%	0.0%	4.1%
Coal Counties, Kentucky	61.2%	17.2%	17.7%	0.0%	3.9%
Non-Appalachian Kentucky	57.0%	11.7%	29.3%	0.0%	2.0%
Maryland	55.7%	5.8%	33.3%	0.0%	5.3%
Appalachian Maryland	69.0%	2.6%	23.5%	0.0%	4.9%
Coal Counties, Maryland	74.2%	3.9%	18.0%	0.0%	3.9%
Non-Appalachian Maryland	55.2%	5.9%	33.6%	0.0%	5.3%
Mississippi	93.1%	3.8%	0.0%	0.0%	3.1%
Appalachian Mississippi	95.4%	1.7%	0.0%	0.0%	2.9%
Coal Counties, Mississippi	97.1%	1.5%	0.0%	0.0%	1.5%
Non-Appalachian Mississippi	92.7%	4.2%	0.0%	0.0%	3.1%
New York	59.3%	19.0%	18.3%	0.0%	3.4%
Appalachian New York	73.0%	25.1%	0.0%	0.0%	1.9%
Coal Counties, New York	–	–	–	–	–
Non-Appalachian New York	58.9%	18.8%	18.9%	0.0%	3.4%
North Carolina	75.8%	21.5%	0.0%	0.0%	2.7%
Appalachian North Carolina	76.1%	21.4%	0.0%	0.0%	2.5%
Coal Counties, North Carolina	–	–	–	–	–
Non-Appalachian North Carolina	75.7%	21.5%	0.0%	0.0%	2.8%
Ohio	64.9%	9.7%	22.2%	0.0%	3.2%
Appalachian Ohio	72.1%	12.1%	11.7%	0.0%	4.1%
Coal Counties, Ohio	69.4%	12.8%	13.6%	0.0%	4.2%
Non-Appalachian Ohio	64.0%	9.5%	23.4%	0.0%	3.1%
Pennsylvania	70.7%	5.1%	18.8%	0.0%	5.4%
Appalachian Pennsylvania	75.4%	3.9%	15.4%	0.0%	5.2%
Coal Counties, Pennsylvania	73.3%	4.9%	16.2%	0.0%	5.6%
Non-Appalachian Pennsylvania	68.1%	5.7%	20.7%	0.0%	5.6%
South Carolina	78.2%	10.5%	0.0%	0.0%	11.3%
Appalachian South Carolina	85.7%	4.3%	0.0%	0.0%	10.0%
Coal Counties, South Carolina	–	–	–	–	–
Non-Appalachian South Carolina	76.4%	12.0%	0.0%	0.0%	11.6%
Tennessee	64.2%	30.7%	0.0%	0.1%	5.0%
Appalachian Tennessee	63.0%	33.1%	0.0%	0.1%	3.8%
Coal Counties, Tennessee	58.6%	36.8%	0.0%	0.9%	3.8%
Non-Appalachian Tennessee	64.9%	29.3%	0.0%	0.1%	5.7%
Virginia	75.2%	16.3%	0.0%	0.3%	8.1%
Appalachian Virginia	66.6%	21.2%	0.0%	6.5%	5.7%
Coal Counties, Virginia	54.9%	15.9%	0.0%	25.1%	4.1%
Non-Appalachian Virginia	75.7%	16.1%	0.0%	0.0%	8.3%
West Virginia	80.5%	7.0%	0.0%	0.0%	12.5%
Appalachian West Virginia	80.5%	7.0%	0.0%	0.0%	12.5%
Coal Counties, West Virginia	77.4%	9.0%	0.0%	0.0%	13.6%
Non-Appalachian West Virginia	–	–	–	–	–
Appalachian States	64.5%	16.9%	14.1%	0.0%	4.5%
Appalachian Counties, Total	69.6%	18.6%	6.2%	0.2%	5.4%
Coal Counties, Total	67.5%	12.6%	12.0%	0.5%	7.5%
Non-Appalachian Counties, Total	63.6%	16.6%	15.5%	0.0%	4.4%
UNITED STATES	73.5%	16.6%	5.7%	0.0%	4.1%

Source: U.S. Census Bureau, Census of Governments 2012
Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/OpenGovernmentData/DataSets/ MinesProdYearly.zip>.
Appalachian States is the sum of all states in the Appalachian region.

Sales and gross receipts taxes accounted for just 12.6 percent of local revenue in coal-employment counties compared to 18.6 percent for all Appalachian counties and 16.6 percent for all local governments across the country. Local governments in Alabama, Georgia, and Tennessee place heavy reliance on the local sales tax, where it represents about one-third of local collections. Sales and gross receipts taxes are a small share of the local revenue portfolio in Maryland, Mississippi, Pennsylvania and West Virginia.

Local personal income tax revenue accrues to coal counties in Alabama, Kentucky, Maryland, Ohio and Pennsylvania. Local corporation income tax revenues accrue to coal counties in Kentucky and Ohio as well as a small number of non-coal counties in New York and Pennsylvania. In Kentucky, local governments cannot tax income, but can adopt occupational license taxes that are defined as corporation income taxes for reporting purposes to the U.S. Census Bureau. Ohio replaced its corporation income tax with a gross receipts tax in 2005, but local communities can impose a municipal corporation income tax as well as choose the rate; more than 600 municipalities across the state have adopted this tax instrument. Together, personal and corporation income taxes were 12.0 percent of local revenue in coal-employment counties in 2012, almost twice the share for all Appalachian counties.

The *other* tax category accounts for license taxes, death and gift taxes, documentary and stock transfer taxes, and other small revenue sources. These small pieces add up to represent a significant 7.5 percent share of tax collections for coal counties, which is higher than all of the other broad geographies shown in the table. Coal counties in Alabama and West Virginia generate 14.6 percent and 13.6 percent of their revenue from these smaller tax instruments. While the individual contribution of each tax is small, together the revenues can be substantial. Moreover, states generally enable local discretion in setting the rates of some of these tax instruments, which gives local governments additional revenue autonomy to help fund government services.

Local severance tax revenue was just 0.5 percent of local own-source taxes for coal communities in 2012, with most communities showing little to no severance tax revenue. Census data in Table 26 reflects revenues *administered* at the county level; Alabama, Kentucky, Tennessee, and West Virginia collect and distribute severance revenue to counties, while Virginia and Maryland give counties the authority to collect tax.[13] Ohio's coal severance revenue is distributed to reclamation and geological mapping funds, but is not remitted to counties of severance directly (Ohio Department of Taxation). State coal severance tax rates are presented in Table 27 while state severance tax collections for 2005 to 2015 are shown in Table 28.

[13] The following excludes revenue from mining permit fees, per acre permit fees, and reclamation fees.

Table 27: State Severance Taxes, 2016

State	Title and application of tax	Rate
Alabama	Coal Severance Tax	$.135/ton
	Coal and Lignite Severance Tax	$.20/ton in select counties
Kentucky	Coal Severance Tax	4.5% of gross value, less transportation expenses; $0.50/ton minimum for extraction and processing
Maryland[a]	Mine Reclamation Surcharge	$.15/ton of coal removed by open-pit, strip or deep mine methods
	Bond Supplement Reserve Surcharge	$.02/ton of coal removed by open pit or strip methods
Ohio	Resource Severance Tax	$.10/ton
	Surface Mining Tax	an additional 1.2 cents per ton on surface mining operations
	Reclamation Tax	an additional 12, 14, or 16 cents per ton on operations without a full cost bond, depending of Reclamation Forfeiture Fund Balance
Tennessee	Coal Severance Tax [b]	$1.00/ton (effective 7/17/13)
Virginia[c]	Coal Surface Mining Reclamation Tax	$.04/ton surface-mined clean coal; $.03/ton deep-mined clean coal; $.015/ton on prepared coal if Surface Mining Reclamation Fund balance less than $20 mil (beginning in FY 2018, if balance is less than $1.75 mil)
West Virginia	Natural Resource Severance Taxes	Greater of 5% or $.75/ton for seams >45" (4.65% for state purposes, .35% distributed to local governments) Seams between 37" and 45": greater of 2% or $.75/ton (1.65% for state purposes, .35% distributed to local governments) Seams less than 37": greater of 1% or $.75/ton (0.65% for state purposes, .35% distributed to local governments) Coal from gob, refuse piles, or other sources of waste coal: 2.5% Workers' compensation debt reduction fund tax: $.56/ton

Sources: The Council of State Governments, 2016, state codes

[a]Maryland authorizes collection of $.30/ton by county of severance.

[b]Except any mineral fuel used in the production of energy, including coal and lignite.

[c]Virginia authorizes License and Road Improvement Gross Receipts tax collection by counties of severance.

Table 28: State-Levied Coal Severance Tax Revenue, State Fiscal Years 2005-2015 ($)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Alabama	$6,463,266	$6,217,984	$6,620,139	$6,200,358	$6,444,763	$6,415,677	$3,452,559	$9,141,626	$5,582,315	$4,981,975	$3,123,841
Kentucky	224,490,111	221,952,516	232,977,827	292,591,094	271,943,100	295,836,611	298,263,637	230,540,150	197,525,899	180,283,352	120,607,931
Maryland[a]	28,310	729,183	311,171	1,055,460	468,107	1,055,460	453,290	524,342	362,765	406,757	7,105
Mississippi	–	–	–	–	–	–	–	–	–	–	–
Ohio	2,052,560	2,216,710	2,016,846	4,463852[c]	6,272,478	6,269,174	6,792,419	5,626,852	7,427,496	4,461,153	4,910,033
Pennsylvania	–	–	–	–	–	–	–	–	–	–	–
Tennessee	60,139	47,394	37,705	42,905	42,539	117,509	52,918	65,120	117,132	46,241	60,517
Virginia[ab]	327,047	318,880	323,689	326,890	373,190	292,086	518,652	283,251	209,332	119,138	116,332
West Virginia	242,684,024	319,530,614	384,275,642	419,380,680	456,272,342	480,814,413	526,817,310	531,108,015	451,646,047	407,147,587	375,588,311

Sources: State revenue and operating budget reports

[a] The bulk of severance taxes in Virginia and Maryland are collected at the local level.

[b] Revenues include permit fees in addition to per ton tax.

[c] Ohio began levying Reclamation Fund Tax.

For coal counties in Virginia, severance taxes account for 25.1 percent of local tax collections. The state itself levies only a small Coal Surface Mining Reclamation Tax; it instead authorizes counties of severance to levy two separate gross receipts taxes. The severance license and coal road improvement taxes are between 0.75 and 1.0 percent of gross receipts depending on mine size. Severance license revenue remains with the county of severance, while 20 percent of all coal road improvement tax revenues are distributed to Wise County (VA Code 58.1-3742-3743). Local severance revenue for Maryland coal counties comes from a 30 cent per ton tax on coal levied by Garrett and other Maryland coal counties[14] (MD Local Government Code 20-301-306). Additionally, 6 cents of the state's 15 cent Mine Reclamation Surcharge Tax are also distributed back to counties of severance.

[14] Revenues are small enough to be negligible in Table 27.

State revenues from the Mine Reclamation Surcharge Tax are listed in Table 28 (MD Environment Code § 15-509).

Alabama levies two separate severance taxes on coal. All of a 20 cent per ton tax is distributed back to the counties of severance. Sixty percent of the revenue from an additional 13.5 cent per ton tax is returned to counties of severance; the remainder is earmarked for various economic development funds with leftover proceeds funneled to the state's general fund (Alabama Department of Revenue).

Kentucky distributes one half of state-collected severance revenue into two separate funds: the Local Government Economic Assistance Fund (LGEAF) and the Local Government Economic Development Fund (LGEAD). The LGEAF primarily funds public works projects and the coal haul road system (KRS 42.450), while the LGEAD was created to distribute severance revenues back to county general funds based on share of coal production, employment, and potential to benefit from industrial development projects (KRS 42.4585, 42.4592, 42.470).

For the small number of coal counties in Tennessee, severance taxes are just 0.9 percent of collections, likely from county-set non-coal mineral taxes (§ 67-7-110), the proceeds of which may go to county general funds. Tennessee collects then remits all state coal severance revenue (except a small portion for administration) to the counties of severance, but mandates that half goes to county education and the other half to road and stream maintenance (§ TN Code 67-7-201).

West Virginia shows no locally-levied severance tax collections in 2012. However, severance revenues are distributed to all counties in West Virginia, including counties without severance activity. For example, of the regular 5 percent rate, one-quarter of the proceeds from 0.35 percent of the tax rate is distributed to all counties based on population share. The other three-quarters goes to counties of severance, as does the rest of the 5 percent rate proceeds. Severance revenue to counties must be used for economic development or infrastructure projects (WVC §11-13A-6 &6-A).

3. Elementary and Secondary Education Funding and Spending

Federal, state and local governments all contribute to funding elementary and secondary education. The federal government provides modest financing, representing 8.4 percent of schooling revenues across all states in 2014, as reported in Table 29. Appalachian counties had 9.0 percent of revenue sourced by the federal government compared to 8.8 percent for coal-employment counties within the Region. Coal counties in all states other than Pennsylvania have higher-than-average shares of revenue from the federal government.[15] The relative role of the states has grown over time in order

[15] Coal-employment counties in Pennsylvania accounted for 62.8 percent of all federal revenue going to public schools in coal communities across the Appalachian Region in 2014.

to address local disparities in tax capacity that contribute to wide disparities in per pupil spending. In 2014, for the nation as a whole, 45.9 percent of elementary and secondary revenue came from state government coffers. For the Appalachian Region the comparable figure is 50.5 percent and for coal communities the figure is 47.6 percent. Coal communities in Kentucky are most reliant on state revenues (64.4 percent of revenues), followed by Virginia, Maryland, and West Virginia; Mississippi and Pennsylvania have the smallest shares of state revenue supporting K-12 education.

For all states, local government revenues account for 45.6 percent of K-12 revenue resources. For the Appalachian Region, the average is 40.5 percent, and for Appalachian coal communities the average is 43.6 percent. Below the coal community average, which is heavily affected by Pennsylvania, are Alabama (39.3 percent), Kentucky (19.8 percent), Maryland (31.7 percent), Ohio (40.4 percent), Tennessee (35.2 percent), Virginia (29.6 percent) and West Virginia (32.4 percent).

State funding support for K-12 education is substantial across all states in the Appalachian Region as shown in Table 30. In 2014, total state funding per pupil was $6,639 in coal-employment communities, higher than spending in other Appalachian counties, states in the Appalachian Region, and the United States. The highest level of state support is in West Virginia; the lowest levels are in Tennessee and Mississippi.

Table 29: Total Elementary-Secondary Revenue, Distribution by Source for States and Other Geographies in Appalachia, 2014

	Total Revenue (thous $)			Distribution (%)		
Area	Federal	State	Local	Federal	State	Local
Alabama	794,090	4,031,547	2,531,630	10.8	54.8	34.4
Appalachian Alabama	465,933	2,602,023	1,726,741	9.7	54.3	36.0
Coal Counties, Alabama	216,130	1,180,593	904,807	9.4	51.3	39.3
Non-Appalachian Alabama	328,157	1,429,524	804,889	12.8	55.8	31.4
Georgia	1,804,212	7,837,335	8,180,073	10.1	44.0	45.9
Appalachian Georgia	470,699	2,672,951	2,434,120	8.4	47.9	43.6
Coal Counties, Georgia	–	–	–	–	–	–
Non-Appalachian Georgia	1,333,513	5,164,384	5,745,953	10.9	42.2	46.9
Kentucky	825,742	3,966,872	2,437,243	11.4	54.9	33.7
Appalachian Kentucky	300,493	1,317,503	418,094	14.8	64.7	20.5
Coal Counties, Kentucky	181,281	740,091	227,147	15.8	64.4	19.8
Non-Appalachian Kentucky	525,249	2,649,369	2,019,149	10.1	51.0	38.9
Maryland	816,033	6,186,736	6,979,775	5.8	44.2	49.9
Appalachian Maryland	39,400	294,846	173,677	7.8	58.0	34.2
Coal Counties, Maryland	18,398	109,846	59,451	9.8	58.5	31.7
Non-Appalachian Maryland	776,633	5,891,890	6,806,098	5.8	43.7	50.5
Mississippi	664,697	2,243,098	1,572,310	14.8	50.1	35.1
Appalachian Mississippi	139,998	495,480	283,379	15.2	53.9	30.8
Coal Counties, Mississippi	2,013	7,114	7,601	12.0	42.5	45.4
Non-Appalachian Mississippi	524,699	1,747,618	1,288,931	14.7	49.1	36.2
New York	3,346,420	24,816,869	33,154,746	5.5	40.5	54.1
Appalachian New York	167,340	1,872,458	1,081,495	5.4	60.0	34.6
Coal Counties, New York	–	–	–	–	–	–
Non-Appalachian New York	3,179,080	22,944,411	32,073,251	5.5	39.4	55.1
North Carolina	1,529,624	7,849,343	4,083,787	11.4	58.3	30.3
Appalachian North Carolina	257,844	1,314,015	606,423	11.8	60.3	27.8
Coal Counties, North Carolina	–	–	–	–	–	–
Non-Appalachian North Carolina	1,271,780	6,535,328	3,477,364	11.3	57.9	30.8
Ohio	1,692,769	9,492,461	12,176,077	7.2	40.6	52.1
Appalachian Ohio	350,924	1,936,848	1,532,743	9.2	50.7	40.1
Coal Counties, Ohio	195,983	1,011,030	817,917	9.7	49.9	40.4
Non-Appalachian Ohio	1,341,845	7,555,613	10,643,334	6.9	38.7	54.5
Pennsylvania	1,812,609	10,272,392	16,983,068	6.2	35.3	58.4
Appalachian Pennsylvania	830,796	5,170,971	6,370,766	6.7	41.8	51.5
Coal Counties, Pennsylvania	659,516	3,944,262	4,935,898	6.9	41.3	51.7
Non-Appalachian Pennsylvania	981,813	5,101,421	10,612,302	5.9	30.6	63.6
South Carolina	812,536	3,902,923	3,702,239	9.7	46.4	44.0
Appalachian South Carolina	175,049	1,009,930	838,756	8.6	49.9	41.4
Coal Counties, South Carolina	–	–	–	–	–	–
Non-Appalachian South Carolina	637,487	2,892,993	2,863,483	10.0	45.2	44.8
Tennessee	1,095,377	4,315,952	3,826,453	11.9	46.7	41.4
Appalachian Tennessee	447,806	1,758,616	1,524,796	12.0	47.1	40.9
Coal Counties, Tennessee	50,744	202,717	137,763	13.0	51.8	35.2
Non-Appalachian Tennessee	647,571	2,557,336	2,301,657	11.8	46.4	41.8
Virginia	1,009,659	5,994,897	8,343,306	6.6	39.1	54.4
Appalachian Virginia	101,869	604,780	413,608	9.1	54.0	36.9
Coal Counties, Virginia	29,945	161,750	80,667	11.0	59.4	29.6
Non-Appalachian Virginia	907,790	5,390,117	7,929,698	6.4	37.9	55.7
West Virginia	351,957	2,033,948	1,128,984	10.0	57.9	32.1
Appalachian West Virginia	351,957	2,033,948	1,128,984	10.0	57.9	32.1
Coal Counties, West Virginia	228,607	1,215,286	692,206	10.7	56.9	32.4
Non-Appalachian West Virginia	–	–	–	–	–	–
Appalachian States	16,555,725	92,944,373	105,099,691	7.7	43.3	49.0
Appalachian Counties, Total	4,100,108	23,084,369	18,533,582	9.0	50.5	40.5
Coal Counties, Total	1,582,617	8,572,689	7,863,457	8.8	47.6	43.6
Non-Appalachian Counties, Total	12,455,617	69,860,004	86,566,109	7.4	41.4	51.3
UNITED STATES	52,882,083	288,584,445	286,750,061	8.4	45.9	45.6

Source: U.S. Census Bureau, Annual Survey of School System Finances
Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/ OpenGovernmentData/DataSets/MinesProdYearly.zip>.
Appalachian states is the sum of all states in the Appalachian region.

Total per pupil state K-12 funding in coal communities was up 43.9 percent between 2000 and 2010 and 11.2 percent in the more recent 2010-2014 window. These growth rates compare favorably to the rates for most other geographies shown in the bottom panel of Table 30. Coal communities in Alabama, Mississippi, and Ohio experienced more rapid growth in per pupil state funding than these entire states between 2010 and 2014. Maryland coal communities were the only places to see reductions in total per pupil state funding during the same time period. These state funding data do not show any broad-based signs of weakening support for K-12 education in coal-employment counties of Appalachia.

Table 30: Total Elementary-Secondary State Revenue per Pupil for States and Other Geographies in Appalachia, 2000, 2010 and 2014

	Total State Revenue Per Pupil ($)			Growth (%)	
Area	**2000**	**2010**	**2014**	**2000 to 2010**	**2010 to 2014**
Alabama	4,114	5,074	5,447	23.4	7.4
Appalachian Alabama	4,104	5,111	5,505	24.5	7.7
Coal Counties, Alabama	4,085	4,925	5,425	20.6	10.1
Non-Appalachian Alabama	4,131	5,009	5,345	21.3	6.7
Georgia	3,800	4,058	4,612	6.8	13.7
Appalachian Georgia	3,805	4,104	4,759	7.9	16.0
Coal Counties, Georgia	–	–	–	–	–
Non-Appalachian Georgia	3,798	4,036	4,540	6.3	12.5
Kentucky	4,042	5,386	5,775	33.3	7.2
Appalachian Kentucky	4,617	6,221	6,656	34.8	7.0
Coal Counties, Kentucky	4,715	6,302	6,708	33.7	6.4
Non-Appalachian Kentucky	3,780	5,037	5,418	33.2	7.6
Maryland	3,312	6,537	7,146	97.3	9.3
Appalachian Maryland	3,757	8,083	8,364	115.2	3.5
Coal Counties, Maryland	4,132	8,999	8,610	117.8	-4.3
Non-Appalachian Maryland	3,293	6,469	7,094	96.5	9.7
Mississippi	3,012	4,290	4,555	42.4	6.2
Appalachian Mississippi	3,190	4,559	4,853	42.9	6.5
Coal Counties, Mississippi	3,482	4,268	4,992	22.6	17.0
Non-Appalachian Mississippi	2,963	4,219	4,477	42.4	6.1
New York	4,811	8,568	9,477	78.1	10.6
Appalachian New York	6,478	11,417	12,711	76.2	11.3
Coal Counties, New York	–	–	–	–	–
Non-Appalachian New York	4,697	8,391	9,285	78.7	10.6
North Carolina	4,675	5,159	5,446	10.3	5.6
Appalachian North Carolina	4,841	5,440	5,764	12.4	6.0
Coal Counties, North Carolina	–	–	–	–	–
Non-Appalachian North Carolina	4,640	5,104	5,386	10.0	5.5
Ohio	3,526	5,982	5,927	69.7	-0.9
Appalachian Ohio	4,470	6,703	6,867	50.0	2.4
Coal Counties, Ohio	4,305	6,634	6,917	54.1	4.3
Non-Appalachian Ohio	3,311	5,825	5,726	76.0	-1.7
Pennsylvania	3,458	5,604	6,399	62.1	14.2
Appalachian Pennsylvania	3,904	6,156	7,064	57.7	14.8
Coal Counties, Pennsylvania	3,901	6,123	6,992	57.0	14.2
Non-Appalachian Pennsylvania	3,046	5,138	5,842	68.7	13.7
South Carolina	3,630	4,720	5,351	30.0	13.4
Appalachian South Carolina	3,491	4,636	5,329	32.8	15.0
Coal Counties, South Carolina	–	–	–	–	–
Non-Appalachian South Carolina	3,675	4,749	5,359	29.2	12.8
Tennessee	2,678	3,947	4,348	47.4	10.2
Appalachian Tennessee	2,710	3,946	4,275	45.6	8.3
Coal Counties, Tennessee	3,126	4,616	4,874	47.6	5.6
Non-Appalachian Tennessee	2,655	3,948	4,400	48.7	11.4
Virginia	3,321	4,411	4,708	32.8	6.8
Appalachian Virginia	4,303	5,642	5,801	31.1	2.8
Coal Counties, Virginia	4,872	6,082	6,102	24.8	0.3
Non-Appalachian Virginia	3,214	4,293	4,611	33.6	7.4
West Virginia	4,692	5,953	7,257	26.9	21.9
Appalachian West Virginia	4,692	5,953	7,257	26.9	21.9
Coal Counties, West Virginia	4,732	6,094	7,121	28.8	16.9
Non-Appalachian West Virginia	–	–	–	–	–
Appalachian States	3,871	5,696	6,185	47.1	8.6
Appalachian Counties, Total	4,099	5,588	6,165	36.3	10.3
Coal Counties, Total	4,149	5,971	6,639	43.9	11.2
Non-Appalachian Counties, Total	3,794	5,732	6,192	51.1	8.0
UNITED STATES	4,010	5,340	5,969	33.2	11.8

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

Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/ OpenGovernmentData/ DataSets/MinesProdYearly.zip>.
Appalachian States is the sum of all states in the Appalachian region.

Locally-generated per pupil revenue data for elementary and secondary education are presented in Table 31. (These are aggregate data for all local public school systems in a county.) Total local revenues in coal-employment communities were slightly higher than the national average in 2000, below the national average in 2010, and then slightly above the national average again in 2014. Local per pupil revenue growth in coal communities was below the national average for 2000-2010, but was up by 14.1 percent compared to 5.6 percent for the nation between 2010 and 2014. These same communities experienced stronger revenue growth in Alabama, Mississippi, Ohio, Tennessee and Virginia than each state as a whole. As with the state funding data presented above, these local revenue patterns do not indicate declining support for K-12 education in coal communities in Appalachia. At the same time, local contributions to school spending are very low in some communities. For example, one Alabama county, 14 counties in Kentucky, three counties in Tennessee, and three counties in West Virginia commit less than $2,000 per pupil in support of elementary and secondary education.

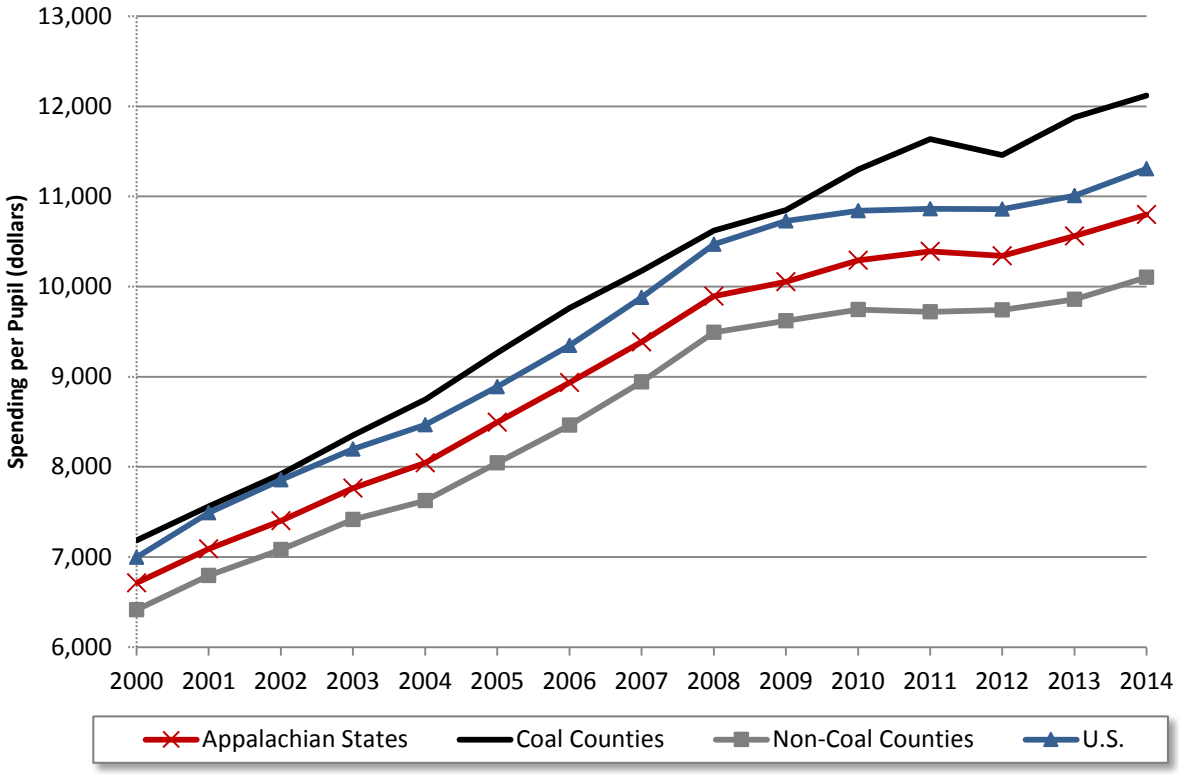
Table 31: Total Elementary-Secondary Local Revenue per Pupil for States and Other Geographies in Appalachia, 2000, 2010 and 2014

Area	Total Local Revenue Per Pupil ($)			Growth (%)	
	2000	2010	2014	2000 to 2010	2010 to 2014
Alabama	1,994	3,134	3,421	57.1	9.2
Appalachian Alabama	2,274	3,320	3,653	46.0	10.1
Coal Counties, Alabama	2,675	3,778	4,157	41.2	10.0
Non-Appalachian Alabama	1,511	2,801	3,010	85.4	7.4
Georgia	3,570	5,120	4,814	43.4	-6.0
Appalachian Georgia	3,461	4,780	4,333	38.1	-9.3
Coal Counties, Georgia	–	–	–	–	–
Non-Appalachian Georgia	3,612	5,283	5,052	46.3	-4.4
Kentucky	1,996	3,177	3,548	59.1	11.7
Appalachian Kentucky	1,216	1,871	2,112	53.9	12.9
Coal Counties, Kentucky	1,195	1,860	2,059	55.6	10.7
Non-Appalachian Kentucky	2,351	3,724	4,129	58.4	10.9
Maryland	4,968	7,991	8,062	60.9	0.9
Appalachian Maryland	3,292	4,801	4,927	45.8	2.6
Coal Counties, Maryland	3,157	4,716	4,660	49.4	-1.2
Non-Appalachian Maryland	5,042	8,130	8,195	61.3	0.8
Mississippi	1,743	2,871	3,193	64.7	11.2
Appalachian Mississippi	1,586	2,493	2,776	57.2	11.3
Coal Counties, Mississippi	1,452	3,664	5,334	152.4	45.6
Non-Appalachian Mississippi	1,786	2,970	3,302	66.3	11.2
New York	5,662	10,621	12,662	87.6	19.2
Appalachian New York	3,573	6,009	7,342	68.2	22.2
Coal Counties, New York	–	–	–	–	–
Non-Appalachian New York	5,805	10,907	12,979	87.9	19.0
North Carolina	2,017	5,014	2,833	148.6	-43.5
Appalachian North Carolina	2,051	3,556	2,660	73.4	-25.2
Coal Counties, North Carolina	–	–	–	–	–
Non-Appalachian North Carolina	2,010	5,298	2,866	163.6	-45.9
Ohio	4,422	6,558	7,603	48.3	15.9
Appalachian Ohio	3,105	4,612	5,435	48.5	17.8
Coal Counties, Ohio	3,109	4,583	5,595	47.4	22.1
Non-Appalachian Ohio	4,721	6,979	8,066	47.8	15.6
Pennsylvania	5,557	9,196	10,579	65.5	15.0
Appalachian Pennsylvania	4,874	7,584	8,703	55.6	14.8
Coal Counties, Pennsylvania	5,019	7,689	8,750	53.2	13.8
Non-Appalachian Pennsylvania	6,187	10,557	12,152	70.6	15.1
South Carolina	2,855	4,639	5,076	62.5	9.4
Appalachian South Carolina	3,083	4,133	4,426	34.1	7.1
Coal Counties, South Carolina	–	–	–	–	–
Non-Appalachian South Carolina	2,781	4,815	5,304	73.2	10.1
Tennessee	2,697	3,579	3,855	32.7	7.7
Appalachian Tennessee	2,630	3,452	3,707	31.3	7.4
Coal Counties, Tennessee	2,096	2,865	3,312	36.7	15.6
Non-Appalachian Tennessee	2,747	3,670	3,960	33.6	7.9
Virginia	4,112	6,359	6,553	54.7	3.0
Appalachian Virginia	2,384	3,590	3,967	50.6	10.5
Coal Counties, Virginia	1,746	2,530	3,043	44.9	20.3
Non-Appalachian Virginia	4,301	6,623	6,784	54.0	2.4
West Virginia	2,295	3,496	4,028	52.4	15.2
Appalachian West Virginia	2,295	3,496	4,028	52.4	15.2
Coal Counties, West Virginia	2,279	3,390	4,056	48.7	19.7
Non-Appalachian West Virginia	–	–	–	–	–
Appalachian States	3,987	6,554	6,994	64.4	6.7
Appalachian Counties, Total	3,126	4,608	4,950	47.4	7.4
Coal Counties, Total	3,598	5,339	6,090	48.4	14.1
Non-Appalachian Counties, Total	4,277	7,206	7,673	68.5	6.5
UNITED STATES	3,591	5,618	5,931	56.5	5.6

Source: U.S. Census Bureau, Annual Survey of School System Finances
Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/ OpenGovernmentData/ DataSets/MinesProdYearly.zip>.
Appalachian States is the sum of all states in the Appalachian region.

The federal, state and local revenue data discussed above include revenue that is used for all schooling functions. *Current* spending per pupil reveals how much of this revenue is actually being used for instructional purposes. As illustrated in Figure 6, current spending per pupil has generally been trending upward over time, with a sluggish pattern emerging in the years following the Great Recession. Coal-employment communities have consistently spent more per pupil than the other geographies displayed in the figure. Moreover, these same places have seen more rapid recent growth than their non-coal counterparts in recent years.

Figure 6: Total Current Spending per Pupil by Geography



Source: U.S. Census Bureau, Annual Survey of School System Finances
Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/ OpenGovernmentData/ DataSets/MinesProdYearly.zip>.
Non-Coal Counties are those ARC counties without coal mining employment in 2010.
Appalachian States is the sum of all states in the Appalachian region.

Table 32 provides summary data on nominal current spending per pupil for the Appalachian states and related geographies for 2000, 2010, and 2014. With just two exceptions, all counties in West Virginia spend more than $10,000 per pupil in instructional expenditures. Spending per pupil is less than $9,000 in four counties in Alabama, three counties in Kentucky, all six coal-employment counties in Tennessee, and one county in Virginia. Current spending per pupil in elementary and secondary education averaged $11,307 across all states in 2014. In comparison, spending in Appalachian counties averaged $10,798, or 95.5 percent of the national average. Coal-employment counties, on the other hand, spent $12,119 per pupil in 2014, well above the national average. Patterns for coal communities are largely the same as the schooling revenue patterns discussed above. Coal communities have seen per pupil spending growth that exceeded the nation in the 2000 to 2010 and 2010 to 2014 windows. In the more recent 2010 to 2014-time period, per pupil spending in coal communities was up 7.2 percent, significantly above the national average of 4.3 percent.

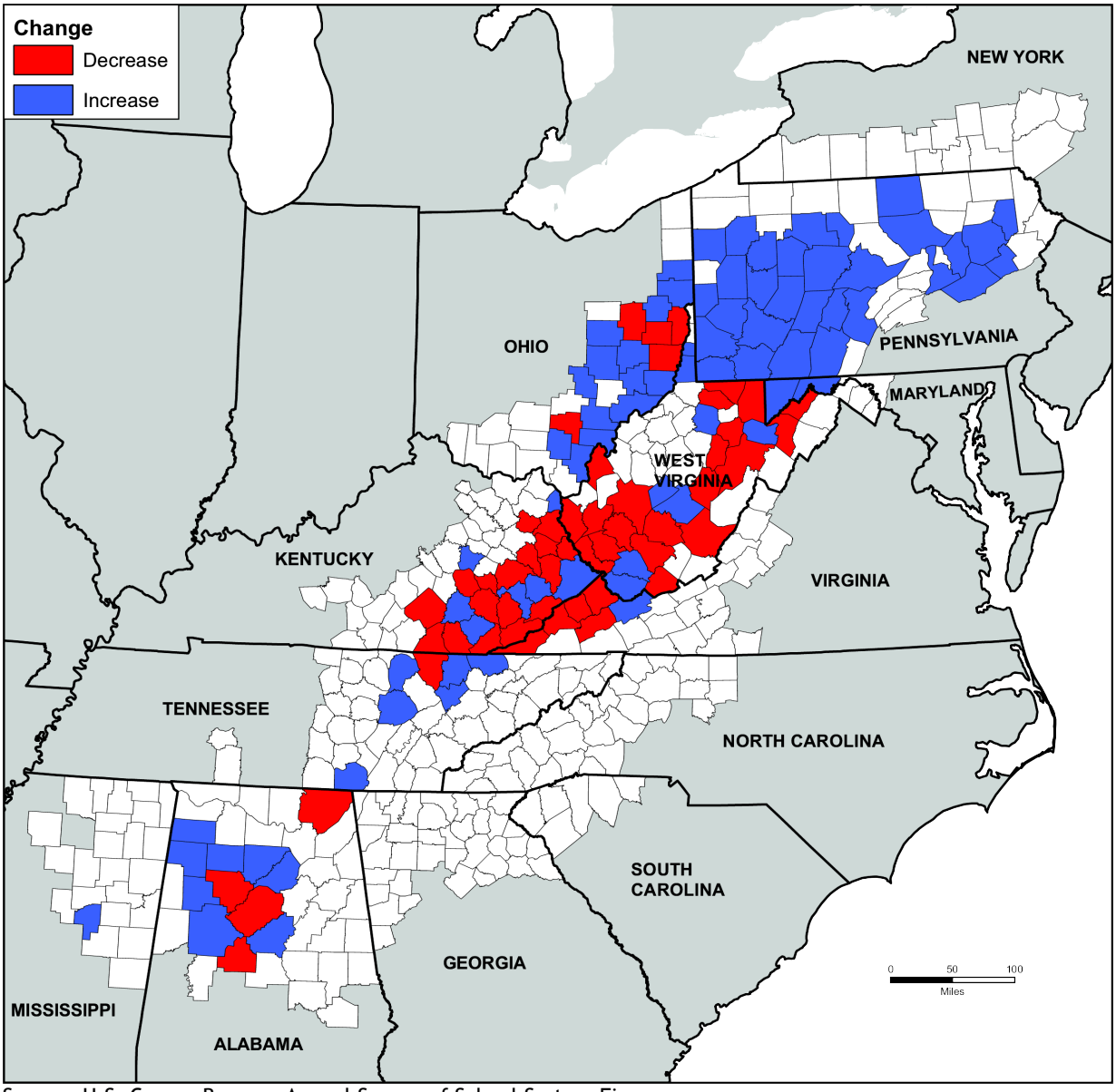
As is often the case, averages can mask significant differences that lay beneath the surface of the data. While coal communities did well on average between 2010 and 2014 (in large part because of exceptional growth in spending in Pennsylvania), current per pupil spending declined in Kentucky, Virginia and West Virginia. (See figure 7 for coal communities that experienced increases and decreases in per pupil funding between 2010 and 2014.) In Kentucky, spending per pupil was up statewide at a 4.0 percent rate, but spending in coal communities was down 0.9 percent. In Virginia, statewide spending grew 3.5 percent, but per pupil spending fell 2.6 percent in coal-employment counties of the state. Coal communities in West Virginia saw spending contract 2.2 percent versus a statewide 2.0 percent setback. A number of coal communities in Alabama, Ohio, and Tennessee also saw reductions in current per pupil spending. These reductions in current per pupil spending are inconsistent with the growth in *total* state and local revenue per pupil revenue data presented in Tables 30 and 31.

Table 32: Current Spending per Pupil for States and Other Geographies in Appalachia, 2000, 2010 and 2014

Area	Current Spending Per Pupil ($)			Growth (%)	
	2000	2010	2014	2000 to 2010	2010 to 2014
Alabama	5,843	9,033	9,192	54.6	1.8
Appalachian Alabama	5,942	9,133	9,316	53.7	2.0
Coal Counties, Alabama	6,086	9,391	9,586	54.3	2.1
Non-Appalachian Alabama	5,674	8,853	8,972	56.0	1.3
Georgia	6,451	9,469	9,299	46.8	-1.8
Appalachian Georgia	6,290	9,091	9,011	44.5	-0.9
Coal Counties, Georgia	–	–	–	–	–
Non-Appalachian Georgia	6,512	9,650	9,441	48.2	-2.2
Kentucky	6,017	9,045	9,403	50.3	4.0
Appalachian Kentucky	6,027	9,122	9,076	51.4	-0.5
Coal Counties, Kentucky	6,122	9,307	9,227	52.0	-0.9
Non-Appalachian Kentucky	6,013	9,013	9,536	49.9	5.8
Maryland	7,517	13,765	14,030	83.1	1.9
Appalachian Maryland	7,145	13,018	13,350	82.2	2.6
Coal Counties, Maryland	7,641	14,141	14,368	85.1	1.6
Non-Appalachian Maryland	7,534	13,798	14,059	83.1	1.9
Mississippi	5,043	8,156	8,301	61.7	1.8
Appalachian Mississippi	5,012	8,229	8,331	64.2	1.2
Coal Counties, Mississippi	4,967	9,595	10,005	93.2	4.3
Non-Appalachian Mississippi	5,051	8,137	8,293	61.1	1.9
New York	10,237	19,357	21,789	89.1	12.6
Appalachian New York	9,353	16,479	18,314	76.2	11.1
Coal Counties, New York	–	–	–	–	–
Non-Appalachian New York	10,297	19,536	21,997	89.7	12.6
North Carolina	6,096	8,458	8,558	38.8	1.2
Appalachian North Carolina	6,248	8,733	8,863	39.8	1.5
Coal Counties, North Carolina	–	–	–	–	–
Non-Appalachian North Carolina	6,063	8,404	8,501	38.6	1.2
Ohio	7,194	11,600	12,094	61.2	4.3
Appalachian Ohio	6,537	10,690	11,253	63.5	5.3
Coal Counties, Ohio	6,575	10,636	11,534	61.8	8.4
Non-Appalachian Ohio	7,344	11,797	12,274	60.6	4.0
Pennsylvania	8,071	13,311	15,203	64.9	14.2
Appalachian Pennsylvania	7,891	12,665	14,341	60.5	13.2
Coal Counties, Pennsylvania	8,007	12,690	14,347	58.5	13.1
Non-Appalachian Pennsylvania	8,238	13,857	15,926	68.2	14.9
South Carolina	6,185	9,269	9,890	49.9	6.7
Appalachian South Carolina	5,985	8,460	9,116	41.4	7.8
Coal Counties, South Carolina	–	–	–	–	–
Non-Appalachian South Carolina	6,249	9,552	10,162	52.9	6.4
Tennessee	5,450	8,151	8,703	49.6	6.8
Appalachian Tennessee	5,411	7,912	8,544	46.2	8.0
Coal Counties, Tennessee	5,356	8,196	8,634	53.0	5.3
Non-Appalachian Tennessee	5,479	8,322	8,815	51.9	5.9
Virginia	6,896	10,661	11,034	54.6	3.5
Appalachian Virginia	6,471	9,618	9,801	48.6	1.9
Coal Counties, Virginia	6,496	9,761	9,506	50.3	-2.6
Non-Appalachian Virginia	6,942	10,760	11,144	55.0	3.6
West Virginia	7,220	11,630	11,397	61.1	-2.0
Appalachian West Virginia	7,220	11,630	11,397	61.1	-2.0
Coal Counties, West Virginia	7,314	11,718	11,458	60.2	-2.2
Non-Appalachian West Virginia	–	–	–	–	–
Appalachian States	7,375	11,998	12,748	62.7	6.2
Appalachian Counties, Total	6,713	10,292	10,798	53.3	4.9
Coal Counties, Total	7,185	11,300	12,119	57.3	7.2
Non-Appalachian Counties, Total	7,598	12,570	13,395	65.4	6.6
UNITED STATES	6,998	10,842	11,307	54.9	4.3

Source: U.S. Census Bureau, Annual Survey of School System Finances
Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/ OpenGovernmentData/DataSets/MinesProdYearly.zip>.
Appalachian States is the sum of all states in the Appalachian region.

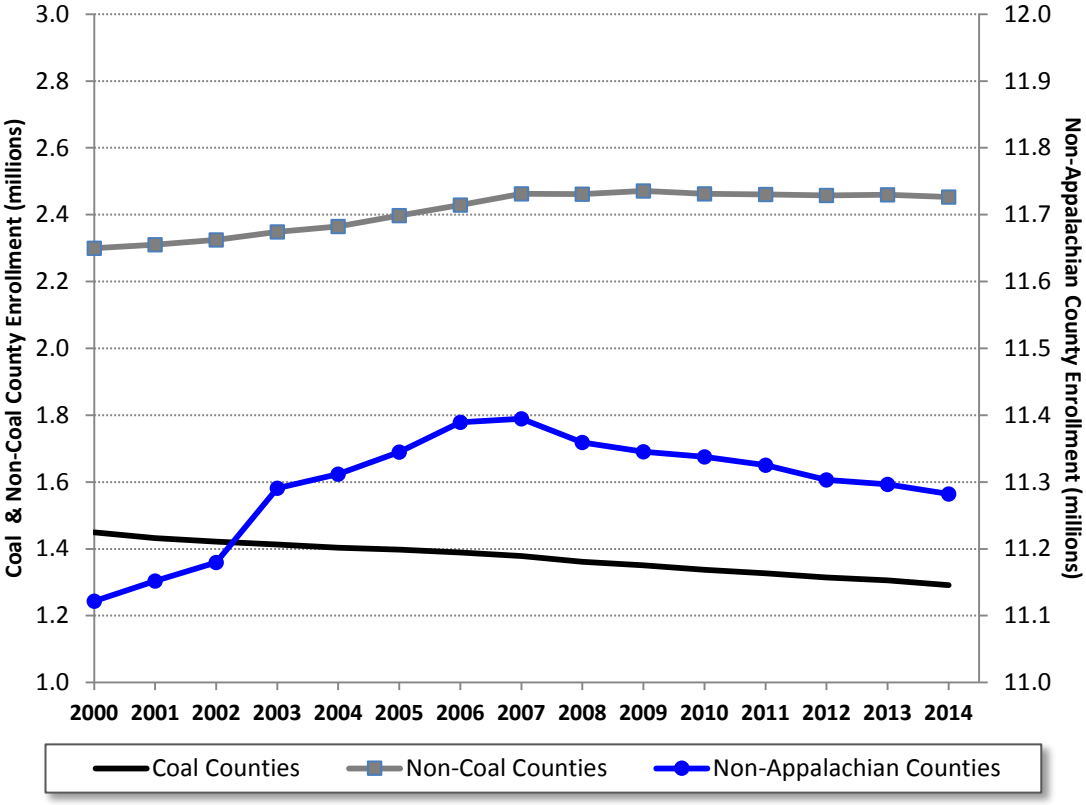
Figure 7: Change in Total Current Spending Per Pupil, 2010 to 2014



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

The population data that were presented above in Table 5 showed the United States population growing 14.2 percent between 2000 and 2014 compared to a 0.4 percent loss for coal communities within Appalachia. The K-12 enrollment data in Figure 8 illustrates the consequences of this outmigration for the school-aged population in the Region. Schools in coal-employment counties saw enrollment counts fall by 158,192 between 2000 and 2014, representing a decline of 10.9 percent. Non-coal communities in the Appalachian Region, on the other hand, had enrollment growth of 2.3 percent over the same time period.

*Figure 8: Elementary **and** Secondary School Enrollment by Geography*



Source: U.S. Census Bureau, Annual Survey of School System Finances
Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/ OpenGovernmentData/ DataSets/MinesProdYearly.zip>.
Non-Coal Counties are those ARC counties without coal mining employment in 2010.
REGION is the sum of all states in the Appalachian region.

It is remarkable that enrollments have declined between 2000 and 2014 for the aggregate of coal-employment communities in all states other than Alabama, where enrollments were up only 0.2 percent, or just 471 children. (See Table 33.) The largest declines were in Mississippi (-24.9 percent), Maryland (-18.5 percent), Ohio (-17.9 percent), Pennsylvania (-14.9 percent) and Virginia (-13.7 percent). West Virginia's K-12 enrollments fell 6.7 percent, while Kentucky's were down 6.2 percent, and Tennessee had the smallest contraction of 1.8 percent. These enrollment reductions help ease operational funding pressures associated with declining economic fortunes. At the same time, it may leave excess capacity in instructional capacity, as well as excess capacity in school administration and the physical capital stock of school buildings and support structures.

Table 33: Total Elementary and Secondary School Enrollment for States and Other Geographies in Appalachia, 2000, 2010 and 2014

Area	Enrollment			Growth (%)	
	2000	2010	2014	2000 to 2010	2010 to 2014
Alabama	730,184	748,889	740,081	2.56	-1.18
Appalachian Alabama	462,286	480,373	472,633	3.91	-1.61
Coal Counties, Alabama	217,167	224,191	217,638	3.23	-2.92
Non-Appalachian Alabama	267,898	268,516	267,448	0.23	-0.40
Georgia	1,422,941	1,660,643	1,699,185	16.70	2.32
Appalachian Georgia	389,666	539,058	561,720	38.34	4.20
Coal Counties, Georgia	–	–	–	–	–
Non-Appalachian Georgia	1,033,275	1,121,585	1,137,465	8.55	1.42
Kentucky	646,467	679,901	686,938	5.17	1.04
Appalachian Kentucky	202,141	200,790	197,945	-0.67	-1.42
Coal Counties, Kentucky	117,582	112,057	110,332	-4.70	-1.54
Non-Appalachian Kentucky	444,326	479,111	488,993	7.83	2.06
Maryland	846,582	848,252	865,768	0.20	2.06
Appalachian Maryland	35,604	35,365	35,253	-0.67	-0.32
Coal Counties, Maryland	15,651	13,463	12,758	-13.98	-5.24
Non-Appalachian Maryland	810,978	812,887	830,515	0.24	2.17
Mississippi	499,362	491,651	492,421	-1.54	0.16
Appalachian Mississippi	107,634	102,205	102,089	-5.04	-0.11
Coal Counties, Mississippi	1,897	1,602	1,425	-15.55	-11.05
Non-Appalachian Mississippi	391,728	389,446	390,332	-0.58	0.23
New York	2,861,478	2,697,357	2,618,542	-5.74	-2.92
Appalachian New York	183,285	157,687	147,306	-13.97	-6.58
Coal Counties, New York	–	–	–	–	–
Non-Appalachian New York	2,678,193	2,539,670	2,471,236	-5.17	-2.69
North Carolina	1,261,586	1,444,409	1,441,391	14.49	-0.21
Appalachian North Carolina	222,341	235,814	227,952	6.06	-3.33
Coal Counties, North Carolina	–	–	–	–	–
Non-Appalachian North Carolina	1,039,245	1,208,595	1,213,439	16.30	0.40
Ohio	1,822,566	1,669,748	1,601,566	-8.38	-4.08
Appalachian Ohio	338,080	297,133	282,036	-12.11	-5.08
Coal Counties, Ohio	178,111	154,419	146,176	-13.30	-5.34
Non-Appalachian Ohio	1,484,486	1,372,615	1,319,530	-7.54	-3.87
Pennsylvania	1,782,444	1,682,887	1,605,292	-5.59	-4.61
Appalachian Pennsylvania	856,361	770,436	731,987	-10.03	-4.99
Coal Counties, Pennsylvania	662,977	589,466	564,114	-11.09	-4.30
Non-Appalachian Pennsylvania	926,083	912,451	873,305	-1.47	-4.29
South Carolina	666,780	715,590	729,386	7.32	1.93
Appalachian South Carolina	162,636	185,231	189,514	13.89	2.31
Coal Counties, South Carolina	–	–	–	–	–
Non-Appalachian South Carolina	504,144	530,359	539,872	5.20	1.79
Tennessee	907,222	971,414	992,583	7.08	2.18
Appalachian Tennessee	386,630	405,481	411,329	4.88	1.44
Coal Counties, Tennessee	42,351	41,725	41,593	-1.48	-0.32
Non-Appalachian Tennessee	520,592	565,933	581,254	8.71	2.71
Virginia	1,132,673	1,244,673	1,273,211	9.89	2.29
Appalachian Virginia	111,858	108,123	104,258	-3.34	-3.57
Coal Counties, Virginia	30,726	28,351	26,507	-7.73	-6.50
Non-Appalachian Virginia	1,020,815	1,136,550	1,168,953	11.34	2.85
West Virginia	290,982	281,828	280,265	-3.15	-0.55
Appalachian West Virginia	290,982	281,828	280,265	-3.15	-0.55
Coal Counties, West Virginia	182,937	171,748	170,664	-6.12	-0.63
Non-Appalachian West Virginia	–	–	–	–	–
Appalachian States	14,871,267	15,137,242	15,026,629	1.79	-0.73
Appalachian Counties, Total	3,749,504	3,799,524	3,744,287	1.33	-1.45
Coal Counties, Total	1,449,399	1,337,022	1,291,207	-7.75	-3.43
Non-Appalachian Counties, Total	11,121,763	11,337,718	11,282,342	1.94	-0.49
UNITED STATES	46,432,782	48,266,209	48,349,251	3.95	0.17

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

Notes: Coal counties are those counties with coal mining employment in 2010 as reported in the annual employment and production data file from the U.S. Mine Safety and Health Administration (MSHA), <https://arlweb.msha.gov/ OpenGovernmentData/DataSets/MinesProdYearly.zip>.

Enrollments represent fall memberships collected by the National Center for Education Statistics on the Common Core of Data agency universe file—"Local Education Agency (School District) Universe Survey, Provisional Version 1a." Enrollments for state educational facilities, federal school systems, and charter schools whose charters are held by a nongovernmental entity have been excluded. Enrollments were subject to adjustment if they were inconsistent with the finances reported.

Appalachian States is the sum of all states in the Appalachian region.

4. Summary and Recommendations: Subtask 2

Declining coal-related economic activity gives rise to the threat of significant reductions in public funding for elementary and secondary education, especially where there are concentrations of coal employment and school-age children. An economic impact study for West Virginia noted above highlights the risk, showing that each job directly tied to the coal industry is associated with $23,023 in state and local taxes. However, the analysis presented here does not find broad-based weakening of overall fiscal health or total state and local funding support for K-12 education in coal-employment communities of Appalachia since 2000. State and local finances have remained relatively healthy and total revenues to support schooling have shown decent growth. One important indicator, current per pupil spending, has been consistently higher in coal-employment communities, with spending disparities actually rising relative to other key geographies since 2009.

Despite these broad findings, there are pockets of coal-employment regions of Appalachia that remain at risk. First, current per pupil spending in Kentucky, Virginia, and West Virginia and several coal-employment communities in Alabama, Ohio, and Tennessee has declined in nominal terms since 2010. While total state and local revenues have seen healthy growth in these same places, the funding has not made it to the classroom. Second, many local communities, especially in Kentucky, Mississippi, West Virginia, and Virginia, exhibit low tax effort. While some of this low effort may reflect state-level constraints on the local ability to generate revenue, it largely reflects the community's choice to tax itself relatively lightly. This limits the ability to fund schools as well as other locally-provided public services.

- Declining school enrollments have been pronounced in some coal-employment regions. In Ohio, for example, enrollments fell by 31,935 between 2000 and 2014 in counties where coal employment was present in 2010. Because of the small size of many coal regions of Appalachia, even modest enrollment reductions may give rise to excess capacity in school administration and instructional capacity (including the building capital stock). Opportunities for consolidation and cost savings may exist in some communities. Further analysis would be required to identify candidate school systems and specific functions that might be consolidated.
- Many coal-employment regions of Appalachia are characterized by low tax effort. That is, given their capacity to generate revenues from own-source tax bases, they have taxed themselves relatively lightly. While this has the desirable effect of limiting government's role in the economy, it also constrains the ability to fund elementary and secondary education which is critical to economic development and individual wellbeing. Low tax effort is especially pronounced in local coal-employment communities in Kentucky, Mississippi, Tennessee, and West Virginia. A large part of this reflects the choice of community residents. In Tennessee, for example, local governments have considerable revenue-raising potential through the local option sales tax, the local property tax, and other taxes and fees. More generally, virtually all local governments have the capacity to raise revenues from instruments like the property tax, as well as smaller fees and charges that can collectively be significant. On the other hand, what appears to be low effort may in some instances be partially attributable to limited revenue-raising autonomy granted by the state—in other words, state-constrained local capacity. Additional inquiry into local government revenue-raising capacity and effort is warranted to determine potential options for expanded local choice over tax rates to better enable the funding of local public schooling.

- The importance of education as a foundation for economic development cannot be overstated. Educational attainment in coal-employment regions of Appalachia, as well as Appalachia more generally, lags the nation. While progress has been made in improving attainment rates, the gap between the Appalachian Region and the nation has widened rather than narrowed over time, as discussed above. Consideration should be given to capitalization of a legacy investment fund or creation of new dedicated funding streams that can be used to enhance investments in elementary and secondary education in coal-employment communities of the Appalachian Region. Proceeds would supplement rather than supplant traditional funding sources. Funding sources could include coal severance tax revenues, general revenues from states and local communities, federal revenues and funds from the private sector. Fund utilization could be managed by a board representing the general public, the private sector and school officials. Resources would be used to develop and deliver unique instructional and related programs that complement traditional schooling services. This might include STEM classes, school-to-work internships, and advanced placement coursework to better prepares students for college. Pooling of resources across school districts may lead to efficiencies and exploit economies of scale in program delivery. Such partnerships should be strongly encouraged.
- The failure to invest state and local dollars in traditional K-12 education may have dire consequences for students and communities. The Appalachian Region has long struggled to promote school achievement and educational attainment and this has certainly affected the Region's path of economic development. As discussed above, nominal current spending per pupil has fallen in Kentucky, Virginia, and West Virginia, as well as in a number of counties in Alabama, Ohio, and Tennessee, since 2010. This sends a signal that schooling is not valued, a signal that can hamper efforts to recruit new businesses and promote economic development. Lower spending can also lead to substantive effects on student outcomes that may affect their life experience and performance in the labor market. States and localities must set their own budget priorities. But it is hard to argue that elementary and secondary education should not be a top funding priority given its well-documented impact on people and places. States in the Appalachian Region should consider additional state-level funding support and/or require greater local funding (effort) for K-12 education as part of their state aid programs.

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