Economic Impact of Fluctuating Coal Production in Counties in Appalachian Southwest Virginia

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ABSTRACT

Introduction: The health and poverty of residents of Central Appalachia have been the focus of recent academic inquiry. Coal mining, the industry that has historically provided the economic base for the region, recently has been heavily scrutinized for its relationship to health. To date, no peer-reviewed publications have investigated the impact of declining coal production on economic variables in Southwest Virginia (VA). **Methodology**: In this study, recent data on coal production, poverty, children in poverty and unemployment were compared in three regions: (1) the entire state of VA; (2) six coal producing counties within two health districts that were similar demographically and geographically in Southwest VA; and (3) one non-coal producing county (Scott). **Results:** Coal production continually gradually declined by 36% from 1990 to 2013 in VA**.** Using general linear models (GLM) a significant difference in poverty between the coal producing counties, Scott County, and the state of VA was reported when controlling for coal production (p = 0.007) with no change in poverty rates over time. The percent of children in poverty declined over time from 1993 to 2013 (p = 0.001). Regionally, children in poverty rates were unaltered between the coal producing counties, Scott County, and the state of VA (p = 0.5). The regions trended similarly with significant changes in unemployment over time. Unemployment declined throughout most of the 1990's, the lowest rates held fairly constant until 2008, then in all regions an upward spike was observed. From 2008 to 2012 Scott County had a higher rate of unemployment than the coal producing counties and the state of VA. With unemployment there was a significant interaction between coal counties, Scott, and VA (p = 0.0001). In general, unexpected was the observation that coal production, poverty and unemployment trended downward from 1990 to 2008 suggesting a lesser-than-expected influence of the coal mining industry on the economy of the region in recent years. Further research with a more extensive approach is needed to gain a better understanding of the impact of fluctuating coal production on the economic variables of the coal mining region of Southwest VA.

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INTRODUCTION

While coal has been a focus of anecdotes and scientific research on a few health outcomes and some environmental impacts, little has been done to assess the economic impacts of coal production in Central Appalachian counties. Southwest Virginia (VA), known for health disparities and poverty, continues to experience higher rates of poverty than VA and the United States (US) (Ahern et al. 2011; Hendryx et al. 2007; Hendryx et al. 2009; Meacham et al. 2012, 2013; Salipante-Zaidel and Borak 2010). In this study we were interested in how the coal producing counties in Southwest VA performed economically based on poverty, children in poverty and unemployment compared to a non-coal producing county within the same health district and compared to the entire state.

Total US coal production, reported by the Energy Information Agency (2014) as millions of short tons, increased from 1990 (1,029) to 2011 (1,094), reflecting a 6.8 percent increase. Production peaked in 2008 (1,172), a 14.3 percent increase over 1990 annual production. This increase in coal production typically had been through growth in production from larger seam and surface mines in the Western U.S. (VCCER 2014), while production in the state of VA declined. In addition, the average price of coal increased over this same timeline by 8.1 percent. However, in 2011, the average price of coal produced by Southwestern VA coal mines was peaking at $98.63 (EIA 2014), 302.9 percent higher than the national average. This drastic difference in cost often was attributed to the quality of the coal that was mined in this region, as it contained low levels of sulfur, and thus was sought by steel manufactures to produce “coke”. Additionally, each coal mining job supported approximately three non-coal mining employment opportunities in the state of VA with jobs related to coal transportation, equipment suppliers, and surrounding businesses supported by the mining community (VCCER 2014).

During the study period, the seven predominant coal producing counties in VA located in two health districts in the Southwestern region of the state were Buchanan, Dickenson, Lee, Russell, Scott, Tazewell, and Wise (Figure 1). Wise and Buchanan Counties have consistently had the highest rates of production over time, contributing to the state’s peak production occurring in 1990. Scott County produced negligible quantities of coal from 1990 to 1995 and, thereafter, reported no production. (VCCER 2015; EIA 2014) (Figure 2).

Communities in the region have been heavily dependent economically on the coal mining industry. According to a 1995 report, 37,500 employees worked in the industry, grossing $1.04 billion and producing $149 million in state and local tax revenues. In addition, it was speculated that for every million tons of production lost, 876 jobs, $25 million in personal income, and $3.3 million in state and local tax revenues would be lost (Zipper 1995). The most recent report on VA coal production saw a one year decline from 2012 to 2013 from 18,965 to 16,619 thousand short tons, a 12.4 percent drop. Despite an increase in productivity per employee, the total number of mining employees (4,521) in VA in 2013 was down 9.5 percent from 2012 (EIA 2014). This potential loss of income for families and local businesses in the presence of decreasing production rates is continually worrisome, as it is well documented that poor health and poverty rates are strongly correlated (Meacham et al. 2012). It is thus imperative to investigate any potential economic impact that fluctuating coal production may have within these counties.

Figure 1. Virginia coal producing counties have almost exclusively been those in the far Southwest: Buchanan, Dickenson, Lee, Russell, Scott (limited), Tazewell and Wise

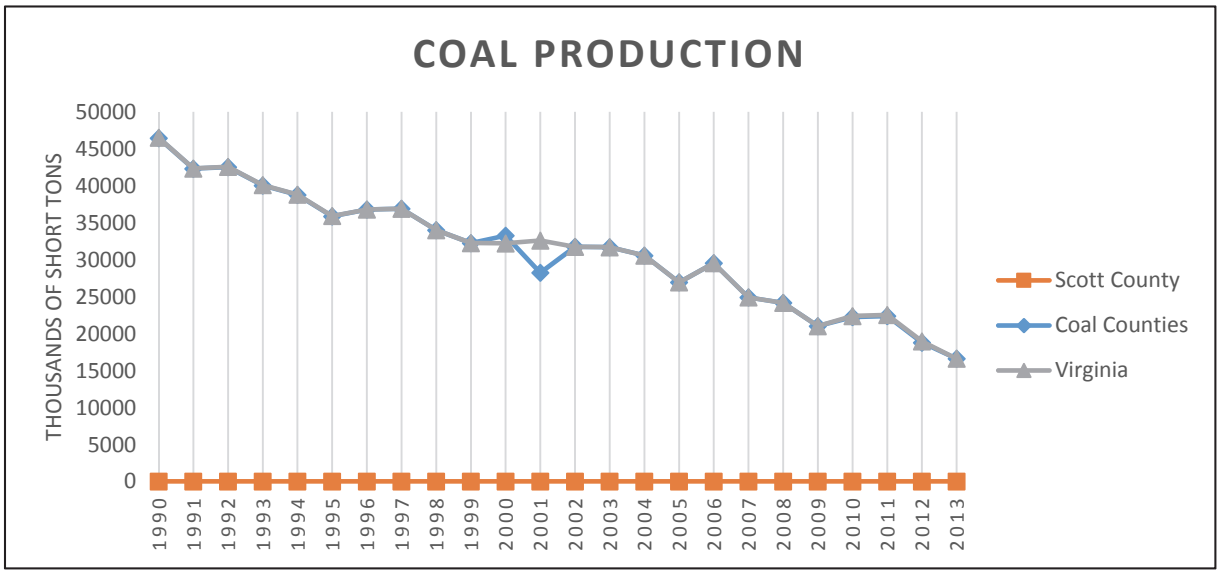

Figure 2. Coal production by county in thousand short tons from 1990 to 2013 in the state of Virginia. Six southwest Virginia counties produced almost 100 percent of the state's total coal production with the contribution from Scott County negligible (EIA 2014; VCCER 2014)

METHODS

Data were extracted for four variables indicative of economic status and for which consistent annual data were available at the state and county level. Coal production units of measure were in thousands of short tons and reported annually for years 1990 to 2013 (EIA 2014; VCCER 2014). Poverty was reported as a percent of the population for all persons with a status below the poverty threshold of a given family size; as ten year averages of aggregated data for 1990, 2000, and 2010; and as five year aggregated averages from 2005 to 2012 (ARC 2014). In 1990 a single member household poverty threshold in the U.S. was $6,652, and in 2013 $11,888. Children in poverty percentages were estimates of individuals 0 to 17 years of age and reported for 1993, 1995 and annually from 1997 to 2013 (USCB 2014).

Unemployment percentage data were recorded annually for years from 1990 to 2013 and included persons who had no employment but were available for work and persons laid off regardless of whether they were seeking employment (USBLS 2014). General linear modeling (GLM) was used to compare annual data between the six coal producing counties, Scott County (a "transitioning" or non-coal producing county due to 1996 being its final year of having measurable coal production) and the state of VA. Statistical analyses were performed using SPSS, with 0.05 the level of significance.

RESULTS

Coal Production

Coal production data were retrieved for years 1990 to 2013 for each coal county in VA and reported as a six county average in thousands of short tons per year. VA coal production peaked in 1990, and declined consistently by 2013, falling by 36 percent from 46,500 to 16,619 thousand short tons. Six Southwest VA counties produced almost 100 percent of the state's total coal production from 1990 to 2013, with Scott County's contributions minimal (Figure 2).

Poverty

Throughout the study period the annual percent of persons in poverty in VA was consistently lower than that in the U.S. and rates in Southwest VA were consistently higher than in the U.S. Analysis using GLM indicated a significant difference in poverty between the coal producing counties, Scott County, and the state of VA when controlling for the amount of coal production ($p = 0.007$) but no differences were found over time from 1990 to 2012. Although not statistically significant a noticeable improvement in poverty trends was observed from 1990 to 2000 for Scott County and the coal counties (Figure 3). For the six coal producing counties aggregated averages for percent poverty declined 16.5 percent between the first two decades, through 2010, from 23.35 to 19.5 percent. Scott County, representing a non-coal producing county in the region, experienced a 12 percent decline over the same time period, dropping from 20.9 percent to 18.4 percent. The improvement in trends of poverty, thereafter, reversed in Scott County, rising. A more gradual rise in poverty trends was observed for coal counties, the State of VA and the nation through time. These observed fluctuating trends in poverty coincided with continual downturns in coal production in VA (Figure 2).

Children in Poverty

The percent of children in poverty changed over time ($p = 0.001$), fluctuating from 1993 to 2013 (Figure 4). While actual rates of children in poverty in coal counties and Scott County appeared higher than annual state averages in VA and current rates in the U.S., statistically, poverty rates were unaltered between the coal producing counties, Scott County, and the state of VA ($p = 0.5$).

Unemployment

Again, there were observed significant changes in unemployment over time from 1990 to 2013 ($p = 0.01$). In 2008 a spike occurred, placing Scott County with a higher rate of unemployment than the coal producing counties and both group rates were consistently higher than the rate of unemployment for the state of VA (Figure 5). However, differences in unemployment rate did not reach statistical significance between coal producing counties, Scott County and the state of VA ($p = 0.09$).

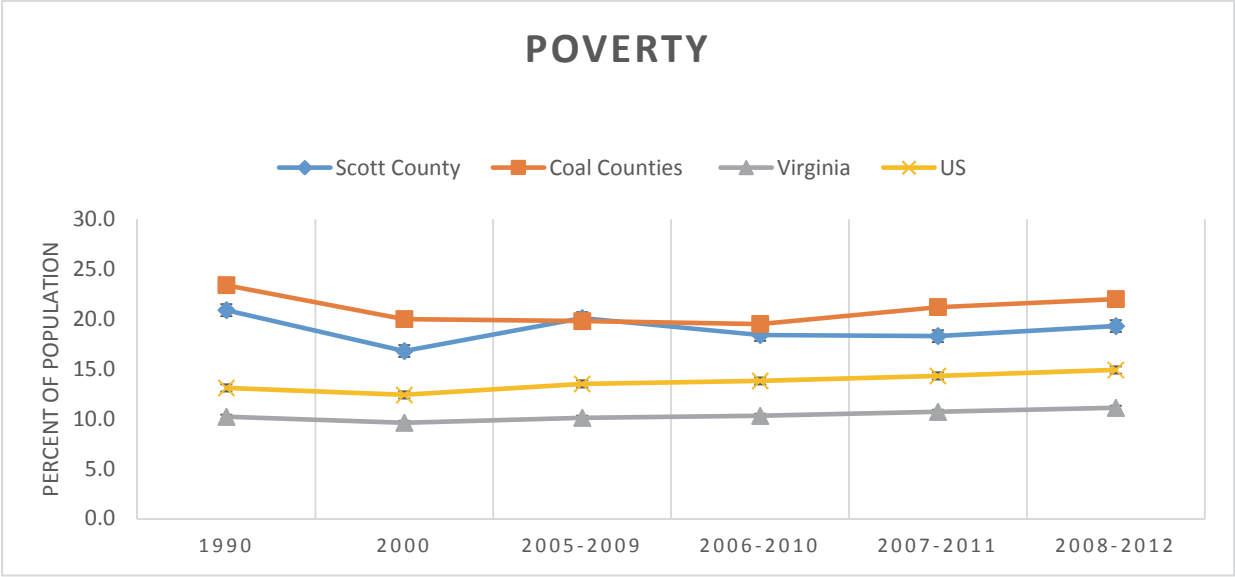

Figure 3. Percentage of Southwest VA households below poverty thresholds by county, aggregated by decade, from 1990-2000, then reported at five year averages from 2005 to 2012 (Appalachian Regional Commission, 2015)

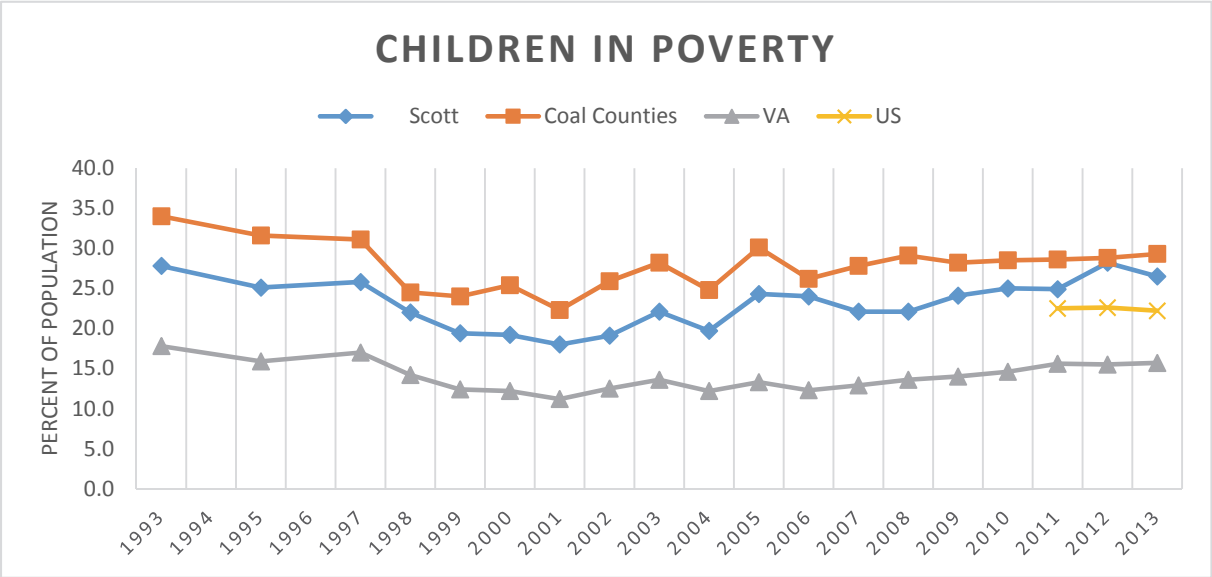

Figure 4: Children in poverty among coal producing counties, Scott County, and state of Virginia reported for years 1993, 1995, 1997 to 2013 (USCB 2014)

DISCUSSION

Coal Production

Coal production has been a significant contributor to the economy of not only the coal producing counties in Southwest VA but also to the state of VA as a whole. For this reason, it was important to understand whether coal production rates and trends would have an effect on various economic

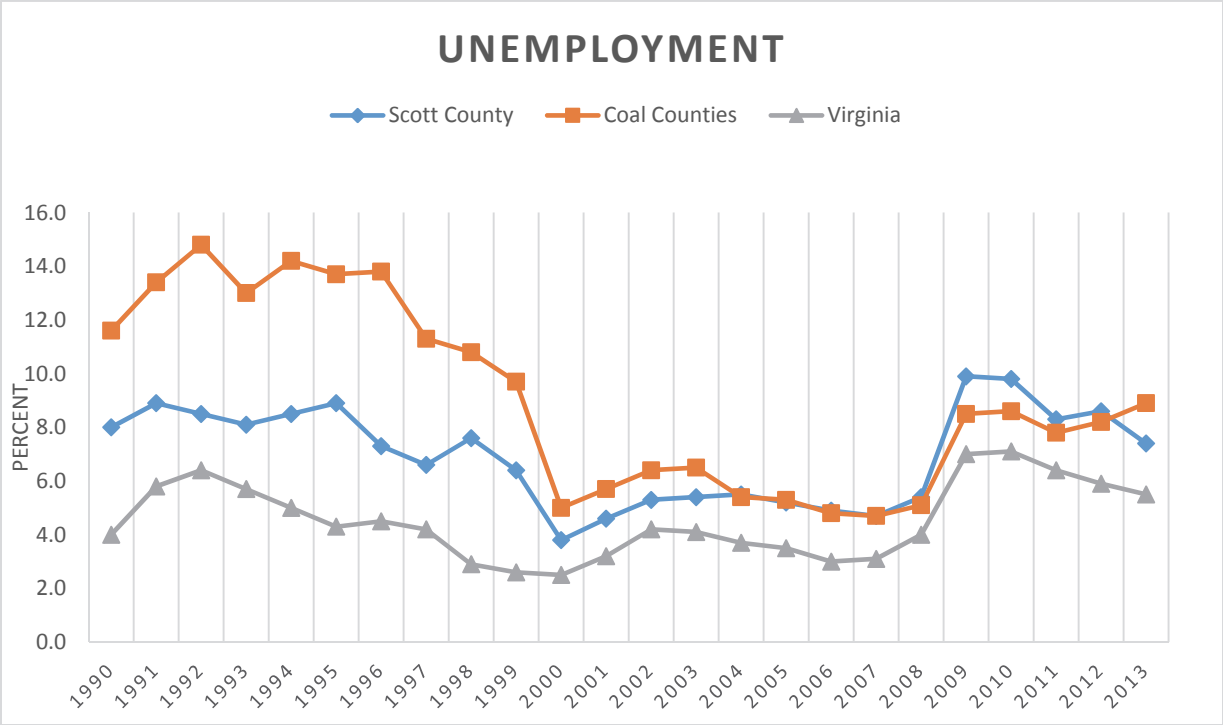

Figure 5. Unemployment among coal producing counties, Scott County, and State of Virginia, 1990-2013 (USBLS 2014)

variables throughout Southwest VA and the State. Results showed perplexing relationships between coal production and economic variables, indicating that other factors may be in play.

Poverty

Poverty within the coal producing counties was our primary focus, as it has become well established in the literature that poverty is related to a poorer health status. Our findings were generally consistent with the findings over the past 50 years (Meacham et al. 2012; Meacham et al. 2013). As expected, differences in poverty rates existed, with the coal mining county rates significantly higher when compared to rates in Scott County, VA and the U.S. Unexpected was the decline in poverty from 1990 to 2010 that appeared in the coal producing counties. While a trend in the "right" direction would be viewed positively, this occurred despite a decline in coal production, the primary economic basis in the regions. Non-coal producing Scott County also experienced a decline in poverty trends initially from 1990 to 2000, yet a noted increase in poverty was reported thereafter which would typically be expected with a decline in economic status in a community. This may indicate a number of different scenarios for the coal counties during the period from 1990-2010: (1) individuals who were impoverished were leaving the coal producing counties; (2) alternative employment was available for former coal employees; and/or (3) individuals formerly impoverished found a means of acquiring income. Our analysis controlled for coal production, suggesting other environmental factors may be influencing poverty. Needed are future studies to address additional modifiable variables other than coal mining activities to guide the design of intervention programs which will reduce the persistently high poverty rates in Appalachian communities like those in Southwest VA.

Children in Poverty

Children in poverty rates also trended as anticipated according to literature reviews (Meacham et al. 2012; Meacham et al. 2013) with consistently higher rates in coal counties than in Scott County and the state of VA. However, the increases observed over time after 2000 were perplexing and concerning, as unemployment and poverty rates were both trending downward in their respective regions. It is imperative, therefore, to evaluate high school graduation rates and school lunch recipient rates, in addition to other economic variables which account for economic stability in younger populations.

Unemployment

Unemployment trended downward throughout the ten year period from 1990 to 2000 and remained fairly stable throughout all three regions of interest until 2008. However, beginning in 2008 these rates rebounded to the higher values found in the 1990's. Again, as coal production decreased, so too did unemployment rates, another perplexing, counter-intuitive observation. The scenario (2, above) that suggests alternative forms of employment may be the most plausible explanation for the observed improvements in unemployment in all regions during this time, as coal production yields were continually and steadily declining. However, the sharp rise in unemployment in all regions beginning in 2008 coincides with the national recession and the rate of recovery that occurred through 2013. An exception was noted in the coal counties where an observed upswing in unemployment was reported beginning in 2011.

With declining coal production rates, it could reasonably be anticipated that economic variables would also decline, especially in a region known for producing vast amounts of high value, high quality coal. However, a declining coal production trend was accompanied by fluctuating rates of several economic indicators. Initially, decreasing unemployment and poverty rates were counter-intuitive to expected relationships. While difficult to define a rationale for these findings, a basic trends analysis suggests that this region may not be as dependent on the coal industry as initially believed, but rather transitioned to other methods of employment and other measures of economic stability. Another explanation may be that there was a 'lag time' such that the effects of declining coal production were realized several years later and the local economies were initially able to absorbed the effects of declining coal production on local communities. The effects of the national economic recession that occurred during the study period further complicated identifying local cause-effect relationships.

LIMITATIONS

The data reported reflected the most reliable, continuous data available over the study time period. This was not always possible to obtain, thus available aggregated data by decade or five year periods was included. Likewise, consistent data on additional variables such as educational attainment were not consistently available, thus, not included. A study of this nature, which is searching for macro-level, i.e., big-picture information, may miss influential variables specific to defined regions. This is especially problematic when grouping six counties as a single entity, despite their similarities by race, gender, and socioeconomics. Another limitation is comparing six coal producing counties to one non-coal producing county, Scott. This may be addressed in future studies by approaching analyses on a county by county basis and including region-specific variables.

CONCLUSIONS

It will be important to understand this region's dependence on the coal industry. Future studies concerning coal production and various economic variables should include (1) population trends,

(2) high school graduation rates, (3) rates of at-risk youth, (4) crime rates, and (5) school lunch recipient rates, all of which would help elucidate whether there are factors previously unexplored that affect unemployment and poverty. In addition, a county by county evaluation including these factors plus an examination of the region's transient workers, their employment and future wanderings, should yield insight into the perplexing trends regarding coal production, poverty, and unemployment. Furthermore, economic activities occurring at the state and national level will invariably impact local economies.

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