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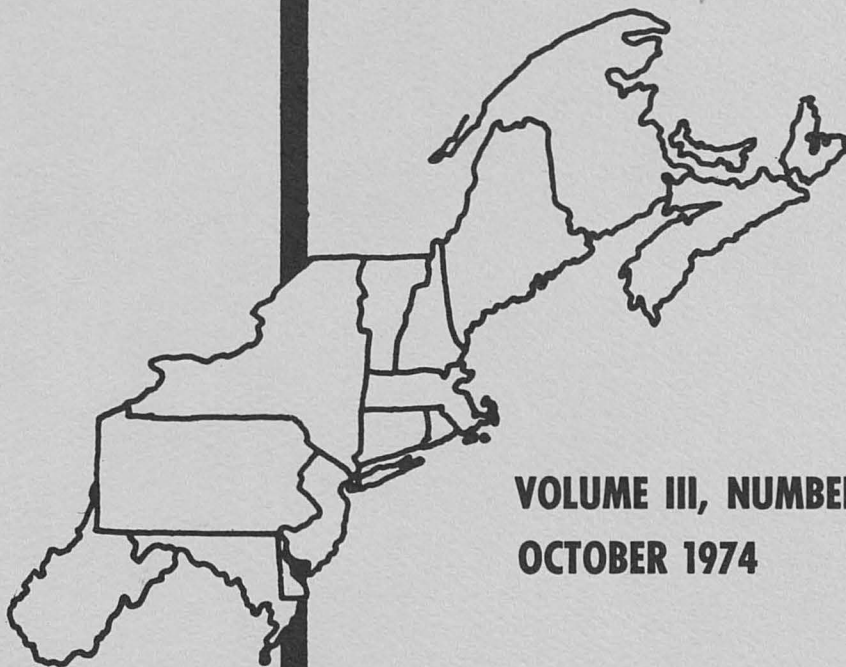
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ECONOMIC IMPLICATIONS OF SURFACE MINE
REGULATION IN THE RURAL COAL PRODUCING
COUNTIES OF WEST VIRGINIA

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Introduction

Traditionally coal has held the distinction of being West Virginia's bedrock industry. With the exception of 1971, West Virginia has lead the nation in coal production consistently since 1931. In recent years, many changes have occurred in the coal industry, one of these changes being the relative importance of strip mined coal. In 1960, 6.8 percent of West Virginia's coal was produced by surface mining [1]. By 1971 surface mined coal accounted for 21.9 percent of total production, an increase of 15.1 percentage points. During the same time period the percent of total mining industry employment engaged in surface mining increased from 4.5 to 14.1 percent, an increase of only 9.6 percentage points [1], indicating the higher relative efficiency of labor in surface mining as compared to underground mining.

The accelerated despoiling of natural resources caused by the increased production of strip mined coal has caused much controversy between environmentalists and mine operators. Environmentalists maintain that once mining occurs there is no effective way to reclaim most of the land and in conjunction with off-site damage, surface mining will disturb the land on which it is mined, as well as the surrounding area. On the other hand coal operators claim that surface mined land can be reclaimed effectively and in many cases made more productive than before mining took place.

From the standpoint of the economy, surface mine operators claim that laws restricting surface mining would cause serious unemployment problems as well as a shortage of much needed coal. Environmentalists suggest that production and employment lost due to surface mine restrictions could easily be recovered by expanding underground mining.

In the midst of all the controversy, legislators have the job of attempting to pass laws that will be fair to all concerned. When considering such laws the economic impact on rural coal producing counties cannot be overlooked. In many of the rural counties, coal is the prime mover of all economic activity and there are few, if any, alternative opportunities for employment. The purpose of this paper is

to attempt to ascertain what potential effect passage of a proposed 20-degree^{1/}-slope law would have on the predominately rural coal producing counties in West Virginia.

Methodology

The State was divided into the traditional northern and southern coal fields and land slope and coal seam data were correlated with production, employment, and income data to determine what affect the 20-degree-slope law could have on each coal field's economy. In estimating this affect a linear relationship between land-slope restrictions and production, employment, and income was assumed. If the 20-degree-slope restriction is imposed and 25 percent of the land area would be deemed not minable then 25 percent of strip mine production, employment, and income would be eliminated.

Two hypotheses as to what could happen to the economy, upon passage of the 20-degree-slope law, were explored. First it was postulated that all production, employment, and income lost will be permanently lost and people will move to other areas or be unemployed. In the second case it was postulated that production lost will be absorbed by additional employment in the surrounding deep mines.

In both cases employment and income multipliers were used to estimate the potential effect of the 20-degree-slope law on the economy of the rural coal producing counties of the state.

Importance of the Mining Industry

In order to ascertain what effect the proposed slope law could have on an area we must first determine the importance of the mining industry in that area. One question that must be answered is; how much of the total employment is directly engaged in the mining of coal?

On an average annual employment basis,^{2/} the mining industry employed 13,819 employees, or 7.3 percent of the total number of employees

^{1/} Twenty degrees is equal to approximately 33.3 percent slope. Due to the availability of slope data, analyses herein will be based on a 30.0 percent slope.

^{2/} Data found in this section are for average annual employment and are used as a means of comparison between total employment and mining industry employment. Employment data reported in the following sections are actual (not average) employment numbers.

in the northern coal field in 1970. [2] The county range in the northern field was from 0.7 to 21.1 percent. In the southern field average annual mining industry employment was 32,708 employees with a range, by county, from 0.7 to 44.1 percent and an average of 12.2 percent. The range between counties indicates to a large extent the degree of importance that the mining industry has directly upon the economy of each county.

Characteristics of the Mining Industry

Aggregate and average production and employment data vary considerably between counties and must be examined in order to make meaningful analyses pertaining to such. As an example, during the year 1971, in the southern field, 4,670 employees worked an average of 121.6 days in surface mines and produced an average of 29.0 tons per man day. [3] However, within the southern field, in Summers County, nine employees worked an average of 20 days and produced only 3.9 tons per man day. At the same time, in Raleigh County, 682 employees worked an average of 153.9 days and produced an average of 21.8 tons per man day.

Underground mining in the southern field showed some variation in employment and average production per man day, between counties, but not so much as in surface mining. The range in average days worked per man was from 128.3 to 207.3 with an average of 190.6. Average production per man per day ranged from 7.3 to 13.7 tons with an average of 10.3 tons.

Generally speaking, the variation between counties for average days worked and tons per man per day were greater in the northern field than in the southern field for both surface and underground mines. In surface mining, days worked per man averaged 147.1 with a range of 66.0 to 201.8 and tons produced per man per day ranged from 13.7 to 70.1 with an average of 28.6. [3] In underground mining average days worked per man ranged from 55.9 to 234.3 with an average of 194.8. Tons produced per man per day averaged 14.8 with a range of 3.3 to 19.0.

Lost Production and Employment

As previously mentioned, it is assumed herein that the production and employment lost in the surface mining industry is directly and proportionally related to that amount of coal land deemed unminable due to the 20-degree-slope limitation, and the figures depicting these losses were computed under this assumption.

Due to the variability in average days worked per man, as discussed in the preceding section, employment data are presented in man days rather than number of employees. In the northern field, coal production would decrease by 4.9 million tons and employment by 173,725 man days. This represents nearly a 53 percent decrease in surface mine

production and employment. In comparison, production in the southern field would be decreased by 14.5 million tons and employment by 499,759 man days, a decrease of 88 percent.

Using the average days worked per man, 147.1 in the northern field and 121.6 in the southern field, total number of employees in the surface mine industry that would lose their jobs is found to be 1,181 and 4,110 in the northern and southern fields, respectively.

Direct, Indirect, and Induced Loss in Employment and Income

In addition to income and employment provided directly from the mining of coal, the coal industry creates other employment through businesses which provide the industry with supplies and services and many manufacturing plants which locate near coal supplying areas. Thus, any change in employment in the coal mining industry will also cause a change in employment in these other sectors. This interaction is known as the multiplier effect.

In analyzing the effect of the 20-degree-surface-mine-slope law both the Type I and Type II income and employment multipliers will be considered. Type I multipliers explain the direct plus indirect effects^{3/} upon employment and income due to the decrease in employment and income in the surface mining industry. Type II multipliers include direct and indirect plus induced effects.^{4/}

Using the unweighted average standard daily wage rate for surface and auger mines of \$39.13 [4] direct income loss was computed. Direct, indirect, and induced losses in employment and income were calculated by using the following multipliers, which were prepared for the Economic Development Administration, United States Department of Commerce [5].

	<u>Type I</u>	<u>Type II</u>
Employment	2.07	2.73
Income	2.24	2.88

The results of these calculations are reported in Table 1.

In the northern field the direct employment loss was 173,725 man days and the income loss was 6.8 million dollars. The direct plus indirect loss (Type I multiplier) was 359,560 man days and 15.2 million

^{3/} Direct changes result from the immediate response from employment and income in the surface mining industry. Indirect changes arise out of adjustments by sectors which directly and indirectly support the surface mining industry.

^{4/} Induced changes in employment and income result from changes in expenditures in those sectors involved directly and indirectly with the surface mining industry.

Table 1
 Direct, Indirect, and Induced Losses in Employment and Income
 Due to Prohibition of Mining on Land with Greater Than 30 Percent
 Slope: Northern and Southern Coal Fields, West Virginia

County	Direct		Direct and Indirect		Direct, Indirect and Induced	
	Employment (Man Days)	Income (\$000)	Employment (Man Days)	Income (\$000)	Employment (Man Days)	Income (\$000)
N O R T H E R N F I E L D						
Barbour	35,247	1,379	72,961	3,089	96,224	3,972
Braxton	518	20	1,072	46	1,414	59
Brooke	5,072	199	10,499	445	13,847	572
Gilmer	1,170	46	2,422	103	3,194	132
Grant	19,572	766	40,514	1,716	53,432	2,206
Harrison	23,264	910	48,156	2,039	63,511	2,622
Lewis	11,603	454	24,018	1,017	31,676	1,308
Marion	2,915	114	6,034	256	7,958	329
Mineral	2,762	108	5,717	242	7,540	311
Monongalia	5,699	223	11,797	500	15,558	642
Preston	29,994	1,174	61,976	2,629	81,884	3,380
Randolph	13,160	515	27,241	1,154	35,927	1,483
Taylor	1,433	56	2,966	126	3,912	162
Tucker	3,596	141	7,444	315	9,817	405
Upshur	15,736	616	32,574	1,379	42,959	1,773
Webster	1,984	78	4,169	174	5,416	224
Total	173,725	6,799	359,560	15,230	474,269	19,580
S O U T H E R N F I E L D						
Boone	99,934	3,910	206,863	8,759	272,820	11,262
Clay	2,170	85	4,492	190	5,924	245
Fayette	31,655	1,239	65,526	2,775	86,418	3,568
Greenbrier	5,573	218	11,536	489	15,214	628
Kanawha	73,170	2,863	151,462	6,413	199,754	8,246
Logan	38,734	1,516	80,179	3,395	105,744	4,365
McDowell	38,061	1,489	78,786	3,336	103,907	4,289
Mercer	3,824	150	7,916	335	10,440	431
Mingo	37,413	1,464	77,445	3,279	102,137	4,216
Nicholas	27,621	1,081	57,175	2,421	75,405	3,113
Raleigh	92,394	3,615	191,256	8,099	252,236	10,412
Wayne	591	23	1,223	52	1,613	67
Wyoming	48,619	1,903	100,641	4,262	132,730	5,479
Total	499,759	19,556	1,034,500	43,805	1,364,342	56,321

dollars. When the induced effect (Type II multiplier) was included the loss was 474,269 man days and 19.6 million dollars.

In the southern field the direct loss was 499,759 man days and 19.6 million dollars, direct plus indirect loss 1,034,500 man days and 43.8 million dollars, and direct, indirect and induced loss 1,364,342 man days and 56.3 million dollars.

A more meaningful employment figure may be one that is expressed in number of employees, rather than man days. As previously mentioned the average number of days worked per man in the surface-mine industry in 1971 was 147.1 in the northern field and 121.6 in the southern field [3]. This indicates that there is considerable underemployment in the surface-mine industry. For purposes of comparison, man days lost were converted to number of full-time employee equivalents lost, using 230 days as full time. In the northern field the number of equivalent full time employees that would be lost is 755 direct, 1,563 direct and indirect, and 2,062 direct, indirect and induced. In the southern field these losses would be 2,173, 4,498 and 5,932 respectively.

Increased Underground Mining Potential

The preceding analysis assumed that the loss in employment due to decreased surface mining activity would be permanent. However, due to the massive coal reserves that could be mined by underground methods, it is possible that all production lost through restricted surface mining could easily be made up by increased underground mining. The effect upon employment and income in this case will now be considered.

As previously noted, tons produced per man day in surface mining is considerably greater than in underground mining. For this reason, in order to produce the equivalent amount of coal lost by restricting surface mining, employment in underground mining would have to increase more than the decrease in surface mine employment.

Using the average tons produced per man day in underground mines, 14.8 in the northern field and 10.3 in the southern field, man days required in underground mines to produce an equivalent amount of coal that could be lost in surface mining due to prohibition of mining on land with greater than 30 percent (20 degree) slope was calculated. In the northern field man days required were 424,179 and in the southern field 1,429,968. This compares to 173,725 and 499,759 man days in the north and south, respectively, to produce the equivalent amount of coal from surface mines.

Multipliers will again be used to determine what direct, indirect, and induced effects expansion of the underground mining industry will have upon employment and income. Due to the deferences in the degree

of interdependence within the economy, multipliers for underground mining and surface mining are different. Estimates of employment and income multipliers for the underground mining industry are as follows [5]:

	<u>Type I</u>	<u>Type II</u>
Employment	1.14	1.60
Income	1.12	1.43

Using these multipliers the impact upon employment and income, due to expansion of deep mine activity, was estimated.

It was found that in the northern field the direct effect on employment would be an increase of 424,179 man days and 16.7 million dollars in income (Table 2). Direct plus indirect effects increase employment by 483,564 man days and income by 18.7 million dollars and when induced effects are included, employment increases by 678,797 man days and income by 23.9 million dollars.

In the southern field the increases are 1,429,968, 1,630,164 and 2,285,307 man days in employment and 56.1, 62.6 and 80.3 million dollars in income, respectively.

Again for comparison purposes man days were converted to full-time employees using 230 days as being full time. In the northern field the direct increase in employment would be 1,844 full-time employees. The direct plus indirect increase would be 2,102 and the direct, indirect and induced increase would be 2,950. In the southern field the respective increases would be 6,217, 7,088 and 9,948 full-time employees.

Summary

Two hypotheses as to what could happen to the economies in the northern and southern coal fields upon passage of a 20-degree-slope law were explored. The first postulate was that all production, employment and income lost is permanently lost and people will move to other areas or, at least in the short run, be unemployed. In the second case, it was postulated that production lost will be absorbed by additional employment in the surrounding deep mines and in the long run the economy will benefit.

Mining industry characteristics, in regard to production, employment, and income were examined and it was found that even though underemployment in the mining industry exists, especially in surface mining, the mining sector is important in the economic structure of most coal producing counties. Type I and Type II employment and income multipliers were utilized in an effort to ascertain what effect the 20-degree-slope law would have under the two aforementioned postulates.

Table 2
 Direct, Indirect, and Induced Effects on Employment
 and Income If an Equivalent Amount of Coal, Lost in
 Strip Mine Production, Is Produced in Underground Mines:
 Northern and Southern Coal Fields, West Virginia

County	Direct		Direct and Indirect		Direct, Indirect and Induced	
	Employment (Man Days)	Income (\$000)	Employment (Man Days)	Income (\$000)	Employment (Man Days)	Direct (\$000)
N O R T H E R N F I E L D						
Barbour	110,799	4,404	126,311	4,933	177,278	6,298
Braxton	3,507	138	3,998	154	5,611	197
Brooke	9,991	392	11,390	439	15,986	561
Gilmer	2,632	103	3,000	116	4,211	148
Grant	25,302	993	28,844	1,112	40,483	1,420
Harrison	45,229	1,775	51,561	1,988	72,478	2,539
Lewis	71,883	2,821	81,947	3,160	115,013	4,035
Marion	5,548	218	6,325	244	8,877	312
Mineral	7,382	290	8,415	325	11,811	414
Monongalia	12,557	493	14,315	552	20,091	705
Preston	43,770	1,718	49,898	1,924	70,032	2,457
Randolph	30,919	1,214	35,248	1,359	49,470	1,735
Taylor	6,746	265	7,690	297	10,794	379
Tucker	13,295	522	15,156	584	21,272	746
Upshur	30,955	1,215	35,289	1,361	49,528	1,738
Webster	3,664	144	4,177	161	5,862	206
Total	424,179	16,705	483,564	18,709	678,797	23,890
S O U T H E R N F I E L D						
Boone	204,138	8,012	232,717	8,974	326,621	11,458
Clay	8,962	352	10,217	394	14,339	503
Fayette	122,055	4,791	139,143	5,366	192,288	6,851
Greenbrier	19,697	773	22,455	866	31,515	1,106
Kanawha	260,729	10,234	297,231	11,462	417,166	14,634
Logan	130,040	5,104	148,246	5,717	208,064	7,299
McDowell	90,509	3,553	103,180	3,979	144,814	5,080
Mercer	8,495	333	9,684	373	13,952	477
Mingo	142,084	5,577	161,976	6,426	227,334	7,975
Nicholas	83,796	3,289	95,527	3,684	134,074	4,703
Raleigh	246,019	9,656	280,462	10,415	393,630	13,808
Wayne	620	24	707	27	992	35
Wyoming	112,824	4,428	128,619	4,960	180,518	6,333
Total	1,429,968	56,126	1,630,164	62,643	2,285,307	80,262

In the first case, i.e., if all employment, and therefore income, is permanently lost, it was found that the direct, indirect, and induced losses (Type II multiplier) would be equivalent to 2,062 full-time employees and 19.6 million dollars in income in the northern field, and 5,932 full time employees and 56.3 million in income in the southern field. In the second case, all lost production in surface mines was assumed to be recovered by increased employment in underground mining industry, it was found that total employment would increase by 2,950 full-time employee equivalents and income by 23.8 million dollars in the northern field and 9,948 full-time employee equivalents and 80.3 million dollars income in the southern field.

The actual impact upon the economy is measured by the difference between the employment and income lost in surface mining and the employment and income gained in underground mining. It was found that in the northern field these differences were a net gain of 888 full-time employee equivalents and 4.2 million dollars income. In the southern field the net gains were 4,016 employees and 23.9 million dollars income.

Conclusions

The preceding data indicate that, in the short run, passage of the 20-degree-slope law would deal a severe blow to the economies of many of the rural coal producing counties in West Virginia. However, if the lost surface mine production is recovered by underground methods, income and employment will actually increase, thereby expanding economic activity within these counties. It is physically possible to greatly expand underground production and, given favorable market conditions, this will probably occur. From this point of view, passage of the 20-degree-slope law would, in the long run, have a favorable impact upon the rural coal producing counties.

Another factor, not discussed in this paper, which may tend to be in favor of restricting surface mining is that, the long range costs of surface mining may far exceed its gains. These costs, which are difficult to measure, are in the form of such things as environmental damage, acid drainage, soil erosion, siltation and many other adverse effects. Continuous build up of these conditions may lessen the chances of encouraging other types of economic development within the rural coal producing counties. Various other social, economical and political factors, too numerous to mention herein, will affect the degree of impact brought about by surface mine restrictions.

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