
UMR-MEC Conference on Energy / UMR-DNR Conference on Energy

13 Oct 1977

Competition in National And Appalachian Coal Markets

Walter P. Page

Follow this and additional works at: <https://scholarsmine.mst.edu/umr-mec>



Part of the [Energy Policy Commons](#), and the [Mining Engineering Commons](#)

Recommended Citation

Page, Walter P., "Competition in National And Appalachian Coal Markets" (1977). *UMR-MEC Conference on Energy / UMR-DNR Conference on Energy*. 269.

<https://scholarsmine.mst.edu/umr-mec/269>

This Article - Conference proceedings is brought to you for free and open access by Scholars' Mine. It has been accepted for inclusion in UMR-MEC Conference on Energy / UMR-DNR Conference on Energy by an authorized administrator of Scholars' Mine. This work is protected by U. S. Copyright Law. Unauthorized use including reproduction for redistribution requires the permission of the copyright holder. For more information, please contact scholarsmine@mst.edu.

COMPETITION IN NATIONAL AND APPALACHIAN COAL MARKETS*

Walter P. Page
Associate Professor of Economics
West Virginia University

Abstract

Paper examines concentration ratios for Appalachian coal production and the output behavior of coal-oil merged firms in Appalachia.

*I wish to thank Neal Duffy, graduate student in economics, for his substantial contributions in gathering and organizing data. This study was partially funded by WVU through a Senate Research Grant. Funds for travel were generously provided by the WVU foundation.

1. INTRODUCTION

The "new age" for coal beginning in the decade of the 1960's brought with it coal-coal, coal-conglomerate and, since approximately 1966, coal-oil - "energy companies" - mergers. Sharp increases in coal prices during the 1969-71 period led to charges of anticompetitive behavior in the industry. In this period the Tennessee Valley Public Power Association, and others brought, on behalf of small electric utilities, conspiracy charges against coal operators [details in 10, pp. 268-274]. The Federal Power Commission ruled against several firms in the early 1970's and forced divestiture of specified coal holdings.

Particularly since 1973, there has been widespread interest in the coal-oil mergers and the issue of horizontal divestiture: forcing divestiture of oil ownership in productive capacity and/or reserves in other energy markets, principally in coal and uranium. The Interfuel Competition Act, S.489, is but one example of bills aimed at horizontal divestiture.

The question which arises, then, is whether or not the merger activity has created a higher probability of tacit collusion in the coal industry. If so, horizontal divestiture, as well as public policy aimed at coal-coal and coal-conglomerate mergers, makes sense. If not, such policies can only lead to large losses in social welfare due to reduced efficiency from smaller scale operations. We assess competitiveness in Appalachian coal production, and changes in the degree of competitiveness between 1966 and 1975. Because 1966 was the year of the first significant coal-oil merger in Appalachia, the comparison between 1966 and 1975 will reflect the competitive impact in Appalachian production of "energy companies". The one prior study of competitiveness in Appalachian production [4] was not able to deal with this question as data were not available beyond 1970. As two of the largest Appalachian mergers took place in 1968 [see Table 4], 1970 data would almost certainly not reflect the competitive impact of those mergers.

2. COMPETITIVENESS AND THE MEASUREMENT OF CONCENTRATION

Resources do not permit an investigation of oil company ownership of coal reserves. We examine the competitive impact of merger through ownership of production facilities in Appalachia. Focus on a single producing region is legitimate in the case of coal due to the strong influence of transport cost in regionalizing coal markets [see 4, 5]. Midwestern production is already known to have a relatively high degree of concentration [see 4, 9, 10 and Table 6]. Because we want to compare our results with similar calculations for the national coal market [reported in 2, 4, 7 and Table 6], we adopt the device of calculating 4, 8, and 20 firm concentration ratios. The standard interpretation of these ratios follows Bain's earlier work [1] and is as follows:

Largest 4-firm Shares	Likelihood of Tacit Cooperation
76-100%	High
51-75	Moderate
26-50	Low
0-25	Very Low

Courts have tended to view a 4-firm ratio of 50% as evidence of significant potential for anticompetitive behavior and hence a "critical" value [see discussion in 7 and 11]. The 8-firm and 20-firm ratios are also important both with regard to market structure and potential trends in concentration. While concentration ratios are a limited index of competitiveness [see "Introduction" in 2, II D in 4 and 1] and have some severe critics [see Adams' paper in 8], they are a widely used and accepted measure of competitiveness.

3. STUDY RESULTS

We have calculated concentration ratios, 1966 and 1975, for all operating coal producing companies in Appalachia. The areas included are delineated in Table 1 together with each area's market share in total production. A major shift in shares, 1966 to 1975, occurred with the sharp decline for West Virginia production and the similarly sharp increase for Eastern Kentucky coal. Our data includes both Anthracite and Bituminous coal as well as captive mines [see 4 for justification]. Because the three major mergers effecting Appalachia took place between 1966 and 1968 [Table 4], we selected 1966 as the base year. The last year for which data is currently available is 1975.

Tables 2 and 3 report the results of our calculations and Table 5 reports changes in coal production between 1966 and 1975 for major Appalachian producers. Table 6 presents in tabular form the results of studies completed to date.

From Tables 2 and 3, it is clear that concentration in Appalachian production is very low and certainly does not warrant the assumption of anticompetition behavior. To reach a "critical" ratio of 50% requires the largest 20 firms, and 4-firm ratios in both 1966 and 1975 are only 25.2 and 27.2 respectively. While the 4-firm ratio has risen slightly between 1966 and 1975, the recent trend has actually been downward. From Table 6, the 4-firm ratio was 25.2, 28.2 and 27.2 in, respectively, 1966, 1970 and 1975. This is very similar to the national experience [2, 4 and 7] reported in Table 6. The 8-firm ratio has behaved similarly while the 20-firm ratio has continued to show moderate increases; 49.4, 51.9 and 52.3 in, respectively, 1966, 1970 and 1975.

TABLE 1
OUTPUT OF ANTHRACITE AND BITUMINOUS COAL IN THE
APPALACHIAN COAL FIELDS, 1966 and 1975

State	1966 ^a	Percentage of Appalachian Output	1975	Percentage of Appalachian Output	Percentage Change
Alabama	15,158,796	3.9	22,644,000	5.6	+49.4
Kentucky ^b	46,426,862	11.9	87,257,000	21.7	+87.9
Maryland	- ^c	-	2,606,000	- ^d	-
Ohio	42,701,861	10.9	46,770,000	11.6	+9.5
Pennsylvania	93,755,633	24.0	89,227,000	22.9	-4.8
Tennessee	6,348,587	1.6	8,206,000	2.0	+29.3
Virginia	35,386,958	9.0	35,510,000	8.8	+3
West Virginia	151,470,104	38.7	109,283,000	27.2	-27.9
<u>Region Total</u>	<u>391,248,801</u>		<u>401,503,000</u>		<u>+2.6</u>

Sources: Calculated from Keystone Coal Industry Manual, appropriate years

^a Estimated as no 1966 state totals reported in Keystone Coal Industry Manual

^b Eastern (Appalachian) fields only. That is, the Kentucky counties in District 8.

^c Reported with Pennsylvania total.

^d Included with Pennsylvania data for consistency between 1966, 1975 calculations of percentage shares.

TABLE 2
RANK ORDER AND CONCENTRATION RATIOS OF LEADING 20 OPERATING
APPALACHIAN COAL COMPANIES, 1966.

Rank	Company	1966 Output	Percentage Share of Appalachian Region	Cumulative Percentage
1	Consolidation Coal Co.	37,414,750	9.6	9.6
2	Peabody Coal Co.	4,942,461	6.1	15.7
3	Island Creek Coal Co.	20,795,158	5.3	21.0
4	U.S. Steel	16,438,000	4.2	25.2
5	Pittston Co.	15,614,345	4.0	29.2
6	Eastern Gas & Fuel Associates	11,839,957	3.0	32.2
7	Bethlehem Mines Corp.	10,770,023	2.8	35.0
8	Westmoreland Coal Co.	6,100,951	1.6	36.6
9	North American Coal Corp.	6,100,297	1.6	38.2
10	Republic Steel Corp.	5,398,270	1.4	39.6
11	The Valley Camp Coal Co.	5,000,000	1.3	40.9
12	Winding Gulf Coals Inc.	4,179,780	1.1	42.0
13	Kentucky Clintwood Coal Co.	4,136,000	1.1	43.1
14	Carbon Fuel Co.	3,843,000	.98	44.1
15	Rochester & Pittsburgh Coal Co.	3,680,307	.94	45.0
16	Oglebay Norton Co.	3,527,900	.90	45.9
17	Ohio Power Co.	3,454,000	.88	46.8
18	Ranger Fuel Corp.	3,451,233	.88	47.7
19	Amherst Coal Co.	3,442,701	.88	48.6
20	Barnes & Tucker Co.	3,219,000	.82	49.4

CONCENTRATION RATIOS

Sources: Calculated from Keystone Coal Industry Manual, appropriate years.	4 firm	=	25.2
	8 firm	=	36.6
	20 firm	=	49.4

TABLE 3
RANK ORDER AND CONCENTRATION RATIOS OF LEADING 20 OPERATING
APPALACHIAN COAL COMPANIES, 1975.

Rank	Company	1975 Output	Percentage Share of Appalachian Region	Cumulative Percentage
1	Consolidation Coal Co.	46,004,697	11.5	11.5
2	Peabody Coal Co.	4,848,311	7.6	19.1
3	Island Creek Coal Co.	18,465,101	4.6	23.7
4	Pittston Co.	14,717,417	3.5	27.2
5	Bethlehem Mines Corp.	14,139,955	3.5	30.7
6	U.S. Steel	13,224,504	3.3	34.0
7	Eastern Associated Coal Corp.	11,078,926	2.8	36.8
8	Westmoreland Coal Co.	7,900,000	2.0	38.8
9	North American Coal Corp.	7,661,497	2.0	40.8
10	National Steel Corp.	6,532,209	1.6	42.4
11	Blue Diamond Coal Co.	5,592,098	1.4	43.8
12	Falcon Seaboard	5,308,420	1.3	45.1
13	Gulf Resources & Chemical Corp.	4,511,000	1.1	46.2
14	R & F Coal Co.	4,300,000	1.1	47.3
15	Alabama By-Products Corp.	4,213,000	1.0	48.3
16	Rochester & Pittsburgh Coal Co.	3,942,562	.90	49.2
17	The Drummond Co.	3,699,900	.92	50.1
18	United Coal Companies	3,600,000	.89	51.0
19	Valley Camp Coal Co.	3,481,605	.86	51.9
20	Pennsylvania	3,285,316	.82	52.7

CONCENTRATION RATIOS

4 firm	27.2
8 firm	38.8
20 firm	52.3

Sources: Calculated from Keystone Coal Industry Manual, appropriate years.

TABLE 4
OWNERSHIP PATTERNS OF APPALACHIAN OPERATING COAL COMPANIES
PRODUCING 10 MILLION OR MORE TONS IN 1966 and 1975

<u>Coal Operating Company</u>	<u>Parent Company</u>	<u>Parent Industry</u>
Consolidation Coal Co. ^b	Continental Oil Co.	Oil
Peabody Coal Co. ^a	Kennecott Copper Corp.	Metal
Island Creek Coal Co. ^a	Occidental Petroleum	Oil
U.S. Steel Corp.	U.S. Steel Corp.	Steel
Pittston Co.	Pittston Co.	Other
Bethlehem Mines Corp.	Bethlehem Steel Co.	Steel
Eastern Associated Coal Corp.	Eastern Gas & Fuel	Other

Sources: T.D. Duchesneau, Competition in the U.S. Energy Industry, Table 2-53, pg. 83.

^aAcquired in 1968

^bAcquired in 1966

TABLE 5

CHANGES IN COAL PRODUCTION, 1966-1975, OF APPALACHIAN OPERATING
COAL COMPANIES PRODUCING 10 MILLION TONS OR MORE

Company	Output		Percent Change 1966-1975	Percent of Appalachian Output	
	1966	1975		1966	1975
Consolidation Coal Co.	37,414,750	46,004,687	+23	9.6	11.5
Peabody Coal Co.	4,942,461	4,848,311	+28	6.1	7.6
Island Creek Coal Co.	20,795,158	18,465,101	-12	5.3	4.6
U.S. Steel	16,438,000	13,224,504	-20	4.2	3.3
Pittston Co.	15,614,345	14,717,417	- 6.8	4.0	3.5
Eastern Associated	11,839,957	11,078,926	- 6.5	3.0	2.8
Bethlehem Mines Corp.	10,770,023	13,355,111	+24	2.8	3.3

Source: Calculated from Keystone Coal Industry Manual, appropriate years.

TABLE 6

NATIONAL AND REGIONAL PRODUCTION CONCENTRATION
RATIOS FOR COAL PRODUCTION

		<u>A. National Level</u>		
		Concentration Ratios		
		1965%	1970%	1972%
1. Duchesneau study:				
	4 firm	26.6	30.2	30.4
	8 firm	36.4	40.7	40.4
	20 firm	49.5	55.9	55.1
2. Federal Trade Commission report:				
		Concentration Ratios		
		1965%	1970%	
	4 firm	26.5	30.7	
	8 firm	36.3	41.2	
	20 firm	50.1	56.5	
3. Markham, et al. study:				
		Concentration Ratios		
		1965%	1970%	1974%
	4 firm	26.6	30.7	26.6
	8 firm	36.3	41.2	36.7
	15 firm	45.6	52.2	46.5
	20 firm	50.1	56.5	51.2
4. Moyer study of Midwest:				
		<u>B. Regional Level</u>		
		Concentration Ratios		
		1960%	1962%	
	4 firm	52.3	54.6	
	8 firm	69.7	74.2	
	20 firm	89.2	N.A.	

TABLE 6
(Continued)

5. FTC study of Midwest:

Concentration Ratios	
1970%	
4 firm	65.6
8 firm	85.6
20 firm	97.0

6. FTC study of Appalachia:

Concentration Ratios	
1970	
4 firm	28.2
8 firm	39.8
20 firm	51.9

7. Page study of Appalachia:

Concentration Ratios		
	1966%	1975%
4 firm	25.2	27.2
8 firm	36.6	38.8
20 firm	49.4	52.3

Sources: T.D. Duchesneau, Competition in the U.S. Energy Industry; R. Moyer, Competition in the Midwestern Coal Market; Federal Trade Commission, Concentration Levels and Trends in the Energy Sector of the U.S. Economy; J.W. Markham, et al., Horizontal Divestiture and the Petroleum Industry.

The percentage share of each of the top 20 firms in Appalachia is very similar to shares, 1970 and 1972, for the top 20 firms in national output [see 2 for national shares]. The only significant difference is that the second ranked firm nationally has 10.6% of total output while in Appalachia the second ranked, 1975, had only 7.6%. This accounts for the larger 4-firm ratio nationally.

These calculations suggest, then, that (1) concentration in Appalachian coal production certainly does not suggest anti-competitive market behavior, and (2) the impact on competitiveness in Appalachian production of the three major mergers - two of which are coal-oil - has certainly not induced higher degrees of concentra-

tion. In short, the evidence from Appalachia fails to support horizontal divestiture.

With regard to the two coal-oil mergers, from Table 5, one coal company, Consolidation, has substantially increased output since the merger. The other, Island Creek, has decreased output. For coal-oil mergers to be potentially anticompetitive there needs to exist interfuel substitution potential between the two firms' output. Consolidation was purchased by Continental Oil Co. which, as a U.S. refiner, is heavily oriented toward gasoline rather than heavy utility fuel, the substitute for coal in electric utilities [see 7]. Island Creek was purchased by Occidental Petroleum which is an overseas company with no

refining or marketing operations in the U.S. In 1975, Occidental produced only about 7,200 barrels of crude a day in the U.S. Clearly Occidental's oil output is not competitive with coal. For whatever reason Island Creek output fell between 1966 and 1975, it clearly would not have been a deliberate coal supply restriction by Occidental in order to increase U.S. sales of heavy utility fuel.

4. CONCLUSIONS

This preliminary work, then, offers no support for divestiture actions in the case of Appalachian production and certainly no support for horizontal divestiture of coal-oil mergers. On the contrary, Appalachian production appears to be characterized by a high degree of competition.

BIOGRAPHICAL SKETCH

Walter P. Page received a Ph.D. in Economics from the University of Kansas in 1968 and is a member of the economics faculty, West Virginia University. Contributions to economics have appeared in The Review of Economics and Statistics, the Southern Economics Journal, the Journal of Environmental Management, Energy Communications, the Atlantic Economic Journal and other professional journals. He also currently serves as a consultant to the Energy Division, Oak Ridge National Laboratory and is the principal investigator on an EPA grant to provide a supply model of the ORBES region and serves on the ORBES core research team. Current research includes, among other things, an investigation of the structure of production in major energy sectors, exploratory statistical techniques for the specification of dose-response relationships between air pollution and human health in U.S. cities, and spatial disease and pollution characteristics for formation of

References

- (1) J.S. Bain, Industrial Organization (New York: John Wiley and Sons, 1959).
- (2) Thomas D. Duchesneau, Competition in the U.S. Energy Industry (Cambridge: Ballinger Publishing Company, 1975).
- (3) K. G. Elzinger and T.F. Hogarty, "The Problem of Geographic Market Delineation in Anti merger Suits," The Antitrust Bulletin, Spring 1973.
- (4) Federal Trade Commission, Concentration Levels and Trends in the Energy Sector of the U.S. Economy (Washington: U.S. Government Printing Office, 1974).
- (5) Ming Nwang and T. Campbell, "Spatial Analysis of Coal Markets," unpublished manuscript.
- (6) Kern O. Kyrun and Walter P. Page, "The Structure of Energy Production," presented at the August 15-18, 1977, meeting of the American Statistical Association. Forthcoming in ASA Proceedings for 1977.
- (7) Jesse W. Markham, et al., Horizontal Divestiture and the Petroleum Industry, (Cambridge: Ballinger Publishing Company, 1977).
- (8) W. S. Moore, Horizontal Divestiture, (Washington: American Enterprise Institute, 1977).
- (9) R. Moyer, Competition in the Midwestern Coal Industry, (Cambridge: Harvard University Press, 1964).
- (10) R. Moyer, "The Coal Industry," and "Price-Output Behavior in the Coal Industry," Appendices D and F in T. D. Duchesneau, Competition in the U.S. Energy Industry, (Cambridge: Bollinger Publishing Company, 1975).
- (11) L. Weiss, "Quantitative Studies of Industrial Organization," in M.D. Intriligator, ed., Frontiers of Quantitative Economics (Amsterdam: North Holland Publishing Co., 1973).