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PART ONE

Characteristics of the Industry that have a Bearing on Price Problems

A COORDINATED program of research must necessarily be formulated with reference to the organization and operation of the industry under consideration and the problems and conditions that determine its price structure as well as its price trends and policies. For this reason the major economic characteristics of the bituminous coal industry that have a bearing on price and related problems are summarized briefly to give those not familiar with the general conditions in this industry a background for a better understanding of the program of studies outlined in Part II. Because of limitation of space and, more especially, because of the lack of essential data concerning important aspects of the industry, this statement of economic characteristics is sketchy. It should be modified and amplified as the studies proposed in Part II are made.

A THE BITUMINOUS COAL INDUSTRY

Bituminous coal holds a strategic place in the industrial order as a vast storehouse of heat and power, the utilization of which involves the livelihood of some 462,000 wage earners as well as tens of thousands of proprietors and salaried officers and employees. In 1935 it contributed 19.0 per cent of the total value of all minerals and 29.2 per cent of the

value of all fuels produced in the United States. Only the petroleum industry surpassed it in value of product and these two industries accounted for 46 per cent of the total value of all mineral products. Table 1 indicates the greater importance of the fuel industries, particularly petroleum and bituminous coal, as compared with gold, silver, copper, iron ore, and zinc mining.

TABLE 1

Value of Mineral Products, United States, 1935[1]

PRODUCT	VALUE OF PRODUCT	PERCENTAGE OF TOTAL
Metals		
Copper, sales value	$ 63,295,000	1.7
Gold	124,115,915	3.4
Iron ore	82,864,000	2.2
Silver	33,080,576	0.9
Zinc, sales value	36,272,000	1.0
Fuels		
Anthracite coal, Penna.	207,600,000	5.6
Bituminous coal	699,900,000	19.0
Natural gas	422,000,000	11.4
Natural gasoline	73,400,000	2.0
Petroleum	994,000,000	27.0
Total metallic products	721,600,000	19.6
Total mineral fuels[2]	2,397,000,000	65.0
Total non-metallic products[3]	553,000,000	15.0
Unspecified	16,400,000	0.4
Total mineral products	3,688,000,000	100.0

[1] *Minerals Yearbook, 1936*, pp. 41–43.
[2] Approximate.
[3] Exclusive of mineral fuels.

As usually defined, the bituminous coal industry includes only the mining of bituminous coal and its distribution by those who produce it. With respect to the issues involved in an examination of price levels and price policies, this definition is too restricted in scope; for a substantial portion of the total production of bituminous coal is marketed by sales agencies that are not affiliated with operating companies and the mine price is, and has been for over a decade, determined largely by market rather than by mine factors.

The conversion of bituminous coal into heat and power requires the services and cooperation of three industries. The first is mining, which involves the recovery of coal, its preparation for the market, and its delivery to railroad cars, barges, or trucks at the mine.

The second industry is transportation, by rail, inland and coastwise water carriage, and truck. Of the coal loaded at the mines for shipment in 1934, 90.2 per cent was transported by rail, 4.4 per cent by waterways, and 5.4 per cent by trucks or wagons. These figures conceal the considerable tonnage that is carried by combined rail and water routes to Tidewater and the Great Lakes trade. The trucking of coal has been increasing rapidly since 1929. The importance of bituminous coal to the railroads is indicated by the percentage it constitutes of their total freight—from one-fourth to one-third. Because coal is dumped from mine cars into railroad cars, barges, and trucks—the storage of coal at the mine being at present held impracticable by the operators—mining and transportation are frequently regarded as one continuous process. The student of prices, however, must treat these two services as distinct, since transportation charges constitute a substantial portion of the total price paid by the large industrial consumer—on the average an amount somewhat larger than that paid to the mine operator. Important also is the tendency of freight rates to rigidity, while mine prices are subject to marked fluctuations. As a result, the combined prices, f.o.b. cars on the tracks at destination, are far more stable than mine prices alone.

The third allied industry is marketing. In a typical week during the winter months of 1934 the bituminous coal mines loaded about 131,000 railroad cars holding approximately 7,000,000 tons of coal. These 131,000 cars were gathered from some 6,000 mines in thirty odd states and the coal was delivered to at least 90,000 carload lot buyers and to millions of consumers, mostly householders, who purchase coal in less than carload lots.

To understand the behavior of bituminous coal prices the

impact of the prices paid for competing fuels must be studied as well as the prices paid for the services performed by each of the three interrelated industries. However, the price problems of competing sources of energy fall outside this Committee's assignment.

B KINDS OF BITUMINOUS COAL

Bituminous coal is a general term embracing several coals that vary in chemical composition, physical structure, and burning characteristics. The engineer classifies them on the basis of the moisture, fixed carbon, and volatile matter content, the controlling factors being the fixed carbon and the volatile matter. On this basis the coals commonly designated as bituminous are ranked, in descending scale, as bituminous, subbituminous, and lignite. Each rank includes two or more subclasses. The border lines between the several ranks are not clear-cut. Chemical analysis reveals differences in coals that affect their burning characteristics—important variations with respect to such factors as the moisture, sulphur, ash, phosphorous, fixed carbon, and volatile matter content as well as heat value and fusibility of ash. Other characteristics of coals that affect their suitability for certain uses and are not yet subject to exact measurement include friability, grindability, and free burning, coking, and caking qualities.

Coals are commonly classified—on the basis of volatile matter contained—into low, medium, and high volatile. There is a wide difference of opinion among bituminous operators as to where the lines should be drawn. The most authoritative definition is contained in the tentative specifications for classification of coals by rank adopted by the American Society for Testing Materials on the recommendation of a committee of the American Standards Association: low volatile, more than 14 but not more than 22 per cent; medium volatile, more than 22 but not more than 31 per cent; and high volatile, more than 31 per cent. The volatile contents are on a dry basis.[1] Within any one grade as

[1] Proceedings of the 39th Annual Meeting, Vol. 36, 1936, Part I, p. 813.

well as between grades there are gradations in chemical and physical characteristics and therefore in quality that determine both the suitability of coals for various uses and the prices they can command in competitive markets.

In the commercial market, coal is classified primarily on the basis of the 'use' to which it is to be put, such as domestic (mostly household), steam, gas, bunker, coking, by-product, and smithing. Certain coals may fall into several use classes, each of which may be subdivided to meet consumers' requirements or preferences and the type of burning equipment utilized. Size is another factor that enters into the use classification. The variety of commercial sizes is surprisingly large, depending upon the size and shape of the screen openings in use and the consumer's needs or preferences. The broad classes, in order of size, are lump or block, egg, nut, and slack or screenings. A single mine may produce and sell forty or more sizes as the result of mixing in varying proportions and combinations two or more of the primary sizes. Coal not screened is termed 'mine run'.

The above analysis makes it clear that there are many kinds of bituminous coals and that these coals differ in chemical composition, physical structure, burning characteristics, and as a result in the uses to which they may be put. These differences in bituminous coals are found not only between seams, but also in different beds of the same seam and not infrequently at the same mine. Differences in rank, variations within any one rank or grade due to delicate gradations in quality, and the specifications of consumers with respect to quality, size, and quantity all serve to create an intricate price structure which does not easily lend itself to economic analysis.

C CONSUMERS OF BITUMINOUS COAL

Few industrial commodities have so diverse a market or are so widely consumed as bituminous coal. Notwithstanding substantial economies in coal utilization as well as a considerable displacement by competing fuels, bituminous coal continues to be the principal source of total mechanical

energy in the United States. In 1929, a year of peak industrial activity, the railroads were the largest single group of consumers, accounting for approximately 26 per cent of total consumption exclusive of exports. General manufacturing industries, next in importance, purchased about 18 per cent. The coke ovens consumed approximately 17 per cent, the electric utilities 8.6 per cent, the steel works (not included in 'general manufacturing' above), including also iron blast furnaces and rolling mills, 4½ per cent, the bunker trade 1½ per cent, and household and other buyers about 24 per cent. Approximately 75 per cent of the primary energy used in manufacturing industries in 1929 was supplied by bituminous coal, and 75 per cent of the energy used by public utilities in 1934, and 83 per cent of that used by railroads for locomotive power in 1933 came from bituminous coal.[2]

In 1929 eighty-five of the 3,000 odd counties in the United States consumed about 72 per cent of the coal used in general manufacturing establishments, iron and steel mills, gas plants, railroad shops, and coke ovens.[3] About 93 per cent of this coal was consumed east of the Mississippi River. Two states, Pennsylvania and Ohio, used 38 per cent, and all the states north of the Ohio and Potomac Rivers and east of the Mississippi about 80 per cent. The 519,555,000 tons of bituminous coal consumed in that year were distributed to at least 90,000 carload lot buyers and to millions of household and small industrial consumers. Every state in the union used bituminous coal in generating energy for the production of light, heat, and power.

D DISTRIBUTION OF BITUMINOUS COAL

Bituminous coal is distributed through several channels. The simplest and most direct marketing arrangement occurs in the case of captive tonnage, i.e., coal shipped by mines to affiliated, controlling, or owning corporations.

[2] Carter vs. Carter, In Equity No. 59374, pp. 19 and 20.

[3] These consumption figures do not include coal used by railroads for locomotive fuel and coal consumed by electric utilities, the bunker trade, coal mines, other mines and quarries, and household and miscellaneous users.

From 20 to 25 per cent of total tonnage is handled in this way. The rest of the coal is sold either by the sales departments of operating companies or by separately incorporated sales agents, by independent wholesalers, by dock companies (which combine wholesaling in carload lots with retailing), and by retailers. In general, the large companies maintain their own sales departments and the small companies sell through independent wholesalers or jobbers. Retailers, who handle from 15 to 20 per cent of total production, purchase their coal from the mine or the wholesaler, and, in the Northwest, from the dock companies. Very little is known concerning the amount of coal handled by each type of distributor, their methods, or the cost of their services.

Bituminous coal "flows from its many producing fields by a maze of hauls and crosshauls to meet in competition for the markets of the country". In 1929 only about one-fourth of total shipments of bituminous coal were intrastate. The rest of the coal, except that used as railway and bunker fuel, moved across state lines to compete with coal from other areas and with other sources of heat and power in the domestic fuel markets. Not a single coal producing state supplied its entire coal requirements. A fairly representative city, Indianapolis, obtained 53 per cent of its all-rail coal deliveries from Indiana mines and its other shipments from mines in 25 districts in 8 other states.[4]

Producing fields are so widely scattered geographically and so numerous, coals vary so markedly in their composition, and freight rates are so high in proportion to the price of coal that the market areas to which various fields may ship coal tend to be limited. Consequently, there are many regional markets, each served at any one time by its own combination of producing fields. The flow of coal from producing fields to various markets, however, does not follow crystallized channels. Minor adjustments in mine prices or freight rates may greatly modify the movements.

[4] F. E. Berquist and Associates, *Economic Survey of the Bituminous Coal Industry under Free Competition and Code Regulation* (National Recovery Administration, Division of Review, March 1936), p. 140.

E THE PRICE STRUCTURE

In the bituminous coal industry there are no 'administered' prices,[5] unless we so regard the nominal charges (many of which are merely book values) that captive mines record for shipments to owning or affiliated companies. If these may be called administered prices, then approximately one-fifth of total production falls in this category. Prices of the rest are determined under extremely competitive conditions.

In the marketing of bituminous coal we find three types of price: (1) mine prices, f.o.b. cars, which in captive tonnage may be book transactions or arbitrary prices; (2) the prices reported for commercial coal f.o.b. cars on the track at destination, f.o.b. piers, f.a.s. ship, and at docks; (3) retail prices, which include the f.o.b. mine price, transportation charges, and the retailers' margin. The price charged by the wholesaler is an f.o.b. mine price which includes his margin.

Because of the downward trend of prices from 1923 to 1932 and the substantial shifts in the flow of coal from producing fields to consuming markets, the price structure in this industry has been extraordinarily flexible. At any one time there are literally thousands of coal prices. The innumerable price variations may be explained to a considerable extent by the following factors, some of which have been considered above. Differences in:

a) the rank or grade of coal
b) size specifications
c) the uses to which coal may be put
d) the preparation given the coal
e) the competitive situation within market areas. The price charged at the mine on a given day for a given size frequently varies for different markets. To illustrate, the minimum price for lump coal, 4 inch and over, asked by group A mines in the Clearfield district of Central Pennsylvania on January 1,

[5] Gardiner Means has defined an administered price as one set by administrative action and held constant for a period of time. For scientific purposes there is some doubt as to the value of this concept.

1935 was $2.50 per ton for coal sold to market areas 1 and 1a, $2.90 for coal shipped to market areas 2 and 3, and $2.85 for other market areas. The prices for all classes of mines in the Clearfield district to market areas 1 and 1a ranged from $2.20 to $2.50 per ton, and those to market areas 3 and 4 from $2.65 to $2.90.[6] Variations of this kind are characteristic of the industry and are occasioned by differences in freight rates, partial absorption of freight rates by operators, location, transportation facilities, the competitive situation in the markets supplied, costs of production, and similar factors.

f) the period covered by the sales contract. Sales of coal in carload lots are divided into contract sales and spot sales. The basis of classification is the time that elapses between the date of sale and the date of final delivery, sales requiring delivery within 30 days usually being designated as spot sales.

g) the quantity purchased

h) seasonal fluctuations

i) the bargaining position of consumers

The trends and differentials in the prices charged for coals of different grades and ranks, and for different uses, market areas, types of consumer, etc., have not as yet been analyzed. This is one of the 'blind spots' that is especially in need of study and research.

The difficulties inherent in securing satisfactory reports on coal prices, the inadequacy of present methods of collecting price data, and the need for improving current information on prices are recognized as fundamental problems by those who publish prices of coal. The following quotations are typical of statements made to the Committee during the course of its work:

"We are having considerable difficulty with bituminous coal prices."

"Our experience indicates that coal is one of the most difficult commodities for which to get uniform and reliable price quotations."

[6] The mine groups and market areas refer to the classifications established by the Code Authorities under the Bituminous Coal Code for the purpose of setting minimum prices.

"At present, and for some months back, we have been quoting only coal prices at Chicago for the reason the markets elsewhere have been peculiarly difficult to quote. For that matter, Chicago is no exception, but we seem to have been able to get a better coverage there."

F FACTORS THAT DETERMINE PRICE LEVELS AND PRICING POLICIES

The factors and conditions that affect prices may be grouped as those which are primarily common to the industry at large and influence the average level of coal prices, and those which vary from field to field and determine the prices a given operation may command. Such a classification is more or less arbitrary. Obviously both the level of prices in the industry and a given mine price are interrelated and are determined by both industry-wide and local or regional forces and conditions. It is believed, however, that this form of presentation will help to clarify the price problems that characterize the industry.

CHARACTERISTICS OF THE INDUSTRY THAT AFFECT THE AVERAGE LEVEL OF COAL PRICES

In this analysis the several factors are grouped according to their major influence upon capacity and production costs or selling prices and demand. These aspects of price determination interact, of course, and therefore alter the component forces that affect each.

Factors influencing Capacity and Production Costs

Certain factors and conditions are continuously exerting pressure on the owners of coal land to increase existing capacity and on the operators to produce coal. The more important are:

Abundance and accessibility of coal deposits

This country is well supplied with bituminous coal deposits. They and the relative ease with which mines may be opened or reopened are ever-present inducements to the

owners of coal lands to begin production at the first propitious opportunity.

Cost of holding undeveloped coal lands

A very large portion of our undeveloped coal resources that are mineable at current price levels are in the hands of mining companies and individuals. Taxes as well as interest charges and, in some cases, the cost of supervision are continually recurring items of expense. Since there is no revenue until coal is marketed, these resources tend to be developed as soon as a favorable opportunity presents itself. Often this means a price that gives only a small return above production costs and carrying charges on outlays for development.

Decentralization of the industry

Coal is mined commercially by more than 6,000 mines scattered over thirty odd states. In 1929 these 6,000 odd mines were operated by some 4,000 companies. These figures, however, overstate the degree of decentralization, since four states (Pennsylvania, West Virginia, Kentucky, and Illinois) produce more than 70 per cent of coal mined annually. This wide geographic distribution of mines serves to preclude voluntary concerted action on the part of producers to balance capacity with demand or to establish any semblance of control over prices.

Highly specialized character of the industry's capital equipment

Mining equipment cannot be used for other purposes, the costs of development cannot be recovered except by producing coal, and overhead and maintenance costs go on when the mine is closed. In the absence of any regulation of either capacity or price, mining is continued until not even the out-of-pocket costs are forthcoming. Should this practice lead to bankruptcy, the mine is often operated under new management with greatly reduced capital charges and is thus able to sell at still lower prices; this aggravates fur-

ther the economic position of other existing commercial operations. The ordinary adjustment of capacity to current demand by means of price changes is thereby hampered.

Time required to develop new mining properties

The process of opening up a new mine takes time, three years or even longer being required to bring a new mine up to its maximum rate of production. Once started, the undertaking is usually completed, and as a result additional capacity is frequently brought into being several years after demand has been curtailed. How this factor affects capacity "is well illustrated by the growth of mine capacity during the war period. The normal annual 'birth rate' before the war was about 300 new mines of commercial size. In their first year of production these mines would turn out perhaps 8 million tons of coal, but by the third year of their life the same mines would be turning out 18 or 20 million tons. Now, as soon as the price shot up in 1916 the 'birth rate' greatly increased. In that year 454 new commercial mines were opened, and in 1918 the number jumped to 1,573. . . . The first-year output of the new mines opened in 1918 was 24 million tons, and their mature output was probably well over 50 million tons. The figures of new and abandoned mines show that the properties opened in the three years 1916 to 1918 so far exceeded those abandoned during the same time as to add at least 150 million tons to the annual capacity of an already overdeveloped industry. But these increments in capacity did not greatly affect the market until the high price of the war had gone, partly because of the time required to bring new mines to maturity and partly because when they were projected there was no surplus of labor to man them. In fact, much of the new capacity came into mature productivity in the depression year 1921, during which the producing power of the industry increased by 64 million tons." [7]

[7] D. L. Wing and F. G. Tryon, *The Bituminous Coal Industry in Prosperity and Depression;* a paper presented before the mining session of the American Statistical Association, December 28, 1923.

Complicated structure of freight rates

Under natural conditions the more distant producing fields would have a haulage cost that would be a heavy liability except where the coal is of exceptional quality or the burden can be shifted to the wage earners in the form of lower wages and longer hours. This disadvantage is offset in part by an intricate structure of freight rates which, by reflecting factors other than differences in distance of haul, encourages the development of outlying coal resources. By lower ton-mile rates for long hauls and by the extension of railway facilities to new coal lands, the railroads have made it possible for coal from remote fields to compete in the nearby markets of the older fields. Thus the railroads have contributed materially to the overdevelopment that has characterized this industry throughout much of its history. Because freight charges constitute such a large portion of the consumer's purchase price and because competition is based upon the delivered price, freight rates play an extremely important part in determining the prices, f.o.b. the mine, for certain markets.

Increase in mechanization

Since 1920 extraordinary progress has been made in the mechanization of mines, in preparing coal for the market, and in methods of storage. Limitation of space prevents consideration of the extent and nature of the progress in the field of engineering. Some idea of these advances may be obtained from the increase in output per employee. For the industry as a whole the average output per man per day rose 32.5 per cent between 1920 and 1931—from 4.0 to 5.3 tons. Employee output has since declined, particularly in 1934 when the reduction in daily hours of work from eight to seven caused output per day to fall to 4.4 tons. The following year daily output increased to 4.5 tons.

Joint costs

While a considerable amount of coal is sold as a mine-run product, most of it is screened into numerous sizes to meet

the requirements or preferences of consumers. As no size can be produced without a resultant (i.e., by-product coal of other size or sizes in addition to the principal product), costs cannot be definitely allocated. Preparation practices aggravate the supply problem in that the resultant of one group of mines may be the primary size of other mines. The attempt to unload the resultant affects materially the market of the producers whose major output happens to be similar to the resultant of other mines. This condition affects the supply of certain sizes of coal and therefore the price they can command in the market at a given time. Adjustments are difficult because the combination of sizes demanded is not constant throughout the year.

Other Factors Influencing Selling Prices and Demand

Demand for bituminous coal, which prior to 1919 moved steadily upward, except for fluctuations with the business cycle, has in recent years fallen below the 1920–23 average. The basic forces and conditions that account for this significant change and that affect the demand for this fuel generally are summarized below:

Character of demand

In the short run, total demand for coal is not likely to be substantially modified by price changes. Power and heat are items in consumption that cannot be dispensed with and shifts to substitute fuels take time. The consumer's coal bill constitutes so small a proportion of his total expenses (usually well under 10 per cent) that there is no strong incentive to change to competing fuels unless the price differentials are greatly altered or the supply of coal is frequently cut off by labor disputes. Furthermore, equipment generally used to burn coal is too costly to discard and in many instances the expense of adapting it to the use of other sources of energy is considerable. In addition, because mine prices constitute approximately one-half of the delivered price to large industrial consumers and from one-fifth to one-fourth of the retail price, only substantial ad-

justments in mine prices materially modify delivered prices. Over a period of years, however, equipment must be replaced. Prolonged high prices, especially when accompanied by periodic general strikes, may cause shifts to other fuels and encourage greater care in firing and improvements in the design of fuel-burning equipment. These may alter appreciably the demand for coal. Post-War developments in this industry have demonstrated that in the long run demand for bituminous coal is surprisingly flexible.

Seasonality

Shipments fluctuate from month to month. For the industry as a whole production drops materially in March or April and continues at a level considerably below the average for the year until August. The active period is from September to January or February and sometimes March. This seasonal pattern of the industry must not be taken as representative of individual companies or fields. The curve of monthly shipments varies from field to field, and those for certain fields, notably the regions supplying the lake trade, differ widely from that of the industry as a whole.

Decline in the rate of growth of important consuming industries

As pointed out by F. G. Tryon, the virtual completion of the railroad net of North America, the shift in manufacturing from crude, heavy products to lighter products requiring less fuel, and the great increase in the volume of secondary metal returned by industry in the form of scrap have definitely retarded the growth of virgin pig iron consumption. As the iron and steel industry has been the second largest single consumer of bituminous coal, these changes helped to check the growth in demand that characterized the coal industry prior to 1919.[8] In part this decrease in demand has been offset by gradually increasing consumption in some of the processing industries. Undoubtedly, the de-

[8] *The Trend of Coal Demand* (Ohio State University Press, Columbus, 1929), pp. 6 and 7, and Carter vs. Carter, In Equity No. 59374, pp. 36 and 37.

cline in the rate of growth of population in this country has retarded the former rapid increase in the consumption of heat and power for industrial uses.

Competition of other sources of energy

Competing sources of energy, notably oil, gas, and hydro-electric, listed in the order of importance, have encroached upon the markets of bituminous coal. Of the annual supply of energy obtained from mineral fuels and water power in the United States the percentage contributed by bituminous coal dropped from 69.5 in 1918 to 46.3 in 1934. This does not mean, however, that competing fuels have directly displaced bituminous coal to this extent. Much of the growth in the total energy supply has been due to the extensive utilization of gasoline in motor vehicles and of oil and gas for uses that can be said to be merely in indirect competition with coal. It has been estimated that less than one-fourth of the 1929 consumption of fuel oil and about half of the natural gas consumption entered directly into competition with coal.[9] Much of the fuel and gas that competes with coal is consumed in the Southwest and Far West.

Economies in the use of coal

The largest single factor accounting for declining demand for bituminous coal is increasing efficiency in the use of fuel. It began in 1909, but its effect upon national demand was not significant until after 1920 when the post-War price level was a strong incentive. The average percentage reduction in fuel consumed per unit of product between 1909 and 1929 as estimated by F. G. Tryon and H. C. Rogers is presented herewith. The authors point out that these savings are due to the cumulative effect of small economies and the general application of improvements and practices developed by the more efficient companies. "The aggregate consumption of fuel and hydro-power in industries and steam transportation at the efficiencies actually attained in 1929 was only 67 per cent of what it would have been had

[9] Berquist and Associates, *op. cit.*, pp. 25 and 26.

the wasteful practices of 1909 continued unchanged."[10] Data for subsequent years indicate that the movement for fuel economy has continued, but at a much slower pace. Materially decreased rates of reduction are shown in the consumption of coal per unit of product for electric public utilities, blast furnaces, and locomotives in freight service.

INDUSTRY OR SERVICE	PERCENTAGE REDUCTION IN FUEL CONSUMPTION PER UNIT OF PRODUCT 1909–1929
Electric public utility power plants	66
Steam railroads	40
Petroleum refining	36
Iron furnaces, steel works and rollings mills	25
Cement mills	21
All other manufacturing, approximately	21
All industries or services listed above	33

In some instances at least a temporary halt in the progress of efficiency in the use of coal is indicated.[11] Consumption of coal per passenger train car-mile by locomotives for passenger service has actually increased because of the reduction in number of passenger cars per train and the increase in speed.

Economies in the use of coal are also being applied to households, by means of insulation, more efficient radiation, automatic heat controls, and improved standards of furnace construction.[12]

This analysis of the factors and conditions that influence the general level of coal prices indicates, and factual studies substantiate the conclusion, that, on the one hand, there is continuous pressure on the owners of coal land to increase existing capacity, and for the operators to continue to sell coal at prices that do not cover production costs, and, on the other hand, a number of forces and conditions are causing a drastic decline in the rate of increase in the demand for bituminous coal.

The working out of these factors over a period of years

10 *Statistical Studies of Progress in Fuel Efficiency* (Transactions, 2d World Power Conference, Vol. 6, Sec. 12, 1930), pp. 343–65.

11 Shore, Tryon, and Mann, *Minerals Yearbook*, 1935, p. 636.

12 Berquist and Associates, *op. cit.*, p. 25.

has resulted in idle mines and low utilization of capacity. "From 1900 until the beginning of the World War the percentage of capacity utilized was fairly uniform. Since the World War, demand has been checked at about 500 million tons production, but capacity continued to increase and reached a peak in 1923. Subsequent liquidation of War-time capacity improved somewhat the ratio of use to capacity, but even in 1929 it was not back to the pre-war level. In that year 17 per cent of the capacity of active mines was unutilized, and idle mines would have added another 17 per cent." [13]

The introduction of the seven-hour day and the five-day week in April 1934 has tended to reduce excess capacity. This tendency, however, has been offset at least to some extent by the further introduction of two- or even three-shift operations. It is frequently asserted that overdevelopment has disappeared. However, in 1935 bituminous coal mines worked on an average only 179 days or approximately 71 per cent of a full working year of 252 days.[14] It is a matter of conjecture whether seasonality in this industry requires such a large proportion of inactive capacity. The mere presence of surplus capacity as well as more adequate transportation facilities may have encouraged over a period of years the commercial buyers of bituminous coal to purchase on a hand-to-mouth basis or to reduce to a minimum the stock carried in storage.

CHARACTERISTICS INFLUENCING CERTAIN MINE PRICES

In the preceding analysis attention was centered on characteristics common to the industry at large. This section will examine the forces and conditions that vary from field to field and materially affect the prices a given mine may command.

[13] *America's Capacity to Produce and America's Capacity to Consume.* A digest of the studies made by the Brookings Institution under a grant from the Maurice and Laura Falk Foundation of Pittsburgh, Pa.

[14] The full working year of 252 days has been computed by taking into account that the wage contract provides for a five-day week and by deduction of the holidays usually designated in the trade agreements.

Factors influencing Production Costs

Minimum Price Area No. 1, established by the Bituminous Coal Conservation Act of 1935, comprises the producing fields of Iowa and of all states east of the Mississippi River except those of Alabama, Georgia, and Southern Tennessee. In 1934 it produced 89 per cent of the total output of the United States. Its production costs per ton of coal mined by commercial operations (Table 2), which do not include

TABLE 2

Production Costs Per Ton of Coal Mined by Commercial Operations in Minimum Price Area No. 1,* 1934

COST ITEMS	DOLLARS PER TON		PERCENTAGE OF TOTAL
Labor			
Daymen	.3784		23.9
Mining	.5264		33.3
Yardage and deadwork	.0560		3.5
Mine supervisory and clerical	.0710		4.5
Total labor cost		1.0319	65.2
Supplies			
All supplies except power and fuel	.1760		11.1
Power purchased	.0670		4.3
Mine fuel	.0097		0.6
Total mine supplies		.2527	16.0
Other Production Costs			
Salaries and expenses	.0213		1.4
Taxes	.0229		1.5
Insurance	.0073		0.4
Depreciation	.0891		5.6
Royalties	.0523		3.3
Compensation insurance	.0486		3.1
Depletion	.0421		2.6
Company house expense (less income)	−.0023		−0.1
Mine office, code authority, and operators association dues	.0167		1.1
Unassigned credit	−.0018		−0.1
Total other production costs		.2962	18.8
Total Production Costs		1.5808	100.0

*Compiled by the Industrial Research Department, University of Pennsylvania, from *Bituminous Coal Code Statistics, 1933 to 1935* (Division of Research and Planning, NRA). Minimum Price Area No. 1 comprises the coal fields of Iowa and of all states east of the Mississippi River except those of Alabama, Georgia, and Southern Tennessee.

selling costs, administrative expenses, interest on investments, and most taxes, disclose the importance of labor costs in this industry. Approximately two-thirds of production costs were paid out in wages and salaries; 60.7 per cent were paid to workers other than supervisory and clerical employees. The cost of supplies amounted to 16 per cent, of which 70 per cent was for supplies other than power and fuel. Of the other production costs, which accounted for about 19 per cent of total production costs, 62 per cent was set aside for depreciation, royalties, and depletion.

Average costs for so large an area conceal the great variations in costs from district to district and field to field, as is shown by Table 3. Not only are there marked differences in the important cost items among districts but also among the component fields of a given district.

The factors that account for these variations are:

Geological factors and conditions

Natural conditions such as the thickness, pitch, faults, and irregularities of the seam, purity of the coal (that is, freedom from such foreign bodies as slate, sulphur balls, and flinty nodules), roof and floor conditions, drainage, relative hardness of coal are major determinants of cost. These conditions, when they deviate from the optimum, adversely affect output per man per day, labor and supply costs, and the economic use of machine loading.

Degree of mechanization

Companies that can introduce mechanical loading and otherwise mechanize the mining processes are able to increase output per man per day and to lower their labor cost. As pointed out above, the economic use of mechanical loading is limited by seam conditions.

Differences in the rates of pay and the proportion of wage earners employed in different occupational groups

Standard wage rates are not in effect throughout the industry. The rates of piece workers usually vary from district to

TABLE 3

Labor, Supply, and Other Production Costs of Commercial Mines, Selected Coal Fields, 1934*

DISTRICT	LABOR COSTS		SUPPLY COSTS		OTHER PRODUCTION COSTS	
	Avg. for district	Range for component fields	Avg. for district	Range for component fields	Avg. for district	Range for component fields
Eastern Pennsylvania	$1.22	$1.13—1.52	$.301	$.266—.449	$.305	$.252—.381
Maryland–Upper Potomac	1.25	1.25—1.26	.235	.225—.248	.277	.238—.307
Western Pennsylvania	1.14	1.00—1.30	.241	.173—.292	.359	.224—.515
Ohio	1.09	1.05—1.22	.219	.209—.270	.260	.224—.307
Northern West Virginia	.93	.89—1.23	.187	.171—.260	.257	.208—.394
Southern Subdivision No. 1	1.09	1.02—1.20	.260	.243—.281	.327	.300—.349
Southern Subdivision No. 2	1.03	.78—1.21	.231	.196—.266	.290	.245—.352
Alabama	1.33	1.18—1.89	.366	.330—.575	.317	.288—.343

* Compiled by the Industrial Research Department, University of Pennsylvania, from *Bituminous Coal Code Statistics 1933 to 1935* (Division of Research and Planning, NRA).

district, among the fields within a given district, and sometimes at a given mine. Even the rates of the men who are paid by the day are not standard throughout the industry. Important differentials in day rates prevail not only between the North and the South but also between groups of fields in both the northern and southern areas and between the districts or groups of fields in the East, the Middle West, and the Far West. The division of work between mining, cutting, and loading employees and the day men also varies by districts. These differences may influence labor costs.

Differences in operating time per month

Per ton production costs for coal rise with great rapidity as the number of tipple starts approaches zero, because the cost items on a fixed lump-sum basis, as well as Sunday and holiday costs and idle-day labor and supply costs, constitute a growing proportion of total per ton costs as the number of days worked during a given period falls. Tipple time fluctuates from month to month and varies by districts, fields, and mines. The differences may be accounted for by the factors that affect the demand for particular coals at given prices and by loss of time due to accidents at the mine, car shortage, lack of sufficient labor, and strikes or lockouts.

Miscellaneous factors

Other factors also influence production and total costs:

Type of mining, i.e., whether shaft, drift, slope, or surface
Age of mine and character of mining, i.e., whether mining on the advance or the retreat, or robbing pillars
Variations in payments for royalties, in the amounts set aside for depletion and depreciation and in salaries paid to executives and officials
Differences in the amount of preparation given to the coal
Efficiency of labor
Efficiency of management

Degree of obsolescence of mining equipment
Depth of mine
Rate of employee compensation insurance
State and local taxes
Amount of reserve acreage

Factors influencing Selling Prices and Demand

Some of the forces and conditions that determine whether a given operator can sell his products in competition with other producers and other sources of energy are:

Quality of the coal

As pointed out in Section B, coals differ in chemical composition, physical structure, burning characteristics, and as a result in the uses to which they may be put. This factor is of especial importance.

Location of the mine

Location is closely related to freight differentials which determine accessibility to coal markets. Coals produced in outlying fields away from the large consuming markets are at a disadvantage unless offsetting factors are present. Mines with access to several railroads or to both rail and water or ocean transportation are in a more advantageous position.

Competitive situations in the markets supplied

Some markets and market areas obtain coal from many fields. Moreover, all markets are not affected to the same extent by inroads of competing sources of energy and by economies in the use of coal.

Changes in the sizes of coal demanded

These changes affect certain fields whose coal is not sufficiently firm in structure to make screening profitable because of degradation resulting from handling. As a result, mines in these fields cannot take advantage of the market for household sizes.

Types of consumer

Household buyers pay higher prices and their purchases are less affected by depressions than are those of most other buyers of coal. Even among the carload lot buyers one would expect considerable variation in the response of purchases to the ebb and flow of business cycles. Certainly the amount of coal sold to public utilities would be less affected by a depression than that sold to manufacturing establishments.

Changes in the freight rate structure

The present complicated structure of freight rates on bituminous coal is the result of frequent adjustments to meet changing conditions in the industry over many decades. The extension of railway facilities to new fields far from the important consuming markets led to the establishment of lower ton-mile rates for long hauls, which made it possible for some of the outlying fields, notably those in Southern West Virginia, Eastern Kentucky, and Southern Illinois to encroach on the important coal markets formerly supplied by the older and more strategically located fields. The differentials in freight rates that had evolved over many years have been modified from time to time, affecting markedly the competitive position of competing fields. It is because minor adjustments in these rates may give rise to important modifications in the movement of coal that changes in the freight rate structure are so important to those whose livelihood depends on the mining of coal.

Competing forms of transportation

Competing forms of transportation also affect the price structure and the movement of coal from producing fields to markets. An outstanding example is the increase in the movement of southern coals to New York and New England via Hampton Roads and coastwise barges and the decline in the all-rail movement from Central Pennsylvania to these same markets. Since 1929 the trucking of coal has gained substantially. Although in 1934 only 5.4 per cent of

the total coal landed at the mines for shipment was handled by trucks, the continued growth of this form of transportation may essentially influence the ability of competing fields to sell in important consuming markets.

The preceding analysis suggests the complexity of the problems with which a program of research must deal. In addition to the natural conditions, most of which vary from field to field and materially influence the cost of production, there are economic forces, many of which are more or less common to all coal fields but vary markedly in duration, degree, and intensity. This combination of factors has created intense competition and has led to ruinous price-cutting except during periods of shortages or when the industry was subject to governmental control. This situation has been further aggravated by a high and even increasing degree of seasonality. During many years the industry has been characterized by idle mines, idle men, and low returns to wage earners, producers, and investors. And the consumer has not derived the degree of benefit that it is generally believed he obtains from free competition, since mine prices are only about half of the delivered price to large industrial consumers and from one-fifth to one-fourth of the retail price.

The forces and conditions described above have not, of course, had the same effect on all fields and areas. On the contrary, certain areas have improved their position relatively, and, during many years, absolutely. Consequently, research, to be effective, should concern itself at the outset primarily with major producing and marketing regions and with specific functions and aspects of production, distribution, and consumption, rather than with the industry as a whole.