

PRICE STUDIES

Number Three

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(Resolution of October 25, 1926, revised February 6, 1933)

Price Research in the
STEEL AND PETROLEUM
INDUSTRIES

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Preface

PETROLEUM and steel occupy positions of high strategic importance in the organization of a modern economy. They provide a substantial proportion of the power, the lubricants, and the material instruments of modern industrial life. Both industries came to positions of ascendancy in the United States in the late nineteenth and early twentieth centuries, and each has placed a deep impress on the industrial organization and on the social and economic life of our time.

The markets through which the products of the petroleum and steel industries are distributed provide laboratories of special interest to students of prices. Here are found a diversity of distributive devices. Here there are flexible prices, sticky prices, rigid prices, prices reflecting various shades and degrees of competition. The attributes of the contemporary price system may be examined in the markets to which these two industries cater; their price problems are those of modern business enterprise.

The reports that make up the present publication, number three of the series growing out of the activities of the Conference on Price Research, deal with these problems. The committees on price research in the petroleum and steel industries have been concerned with the definition of problems and the outlining of promising investigations, rather

than with substantive research. Each committee has deemed it desirable, however, to present an account of those operating characteristics of industry that affect pricing procedures, and to appraise the factual record now available to students of prices. A background is thus provided for the sections that outline research opportunities. These opportunities invite investigations of interest to both industrialists and economists. A successful study of the efficacy of oil and gasoline prices as regulators of the flow of investment and of the rate of operation of the petroleum industry, a study outlined by Dr. Watkins' committee, would have wide significance. An examination of the competitive repercussions of the elimination of inter-basing point price differentials and the establishment of new basing points in the steel industry, one of the enterprises proposed by Dr. Stratton's committee, would illuminate a score of vexing issues centering about the distribution of the products of heavy industries today. Not all the troubles of modern industrialism are rooted in prices, but the study of price policies, pricing procedures, and cost-price relations provides an approach to some of the most critical issues of the day. The two reports here presented constitute guides to such study.

These reports and those of other committees of the Conference on Price Research are products of voluntary and generous cooperation on the part of the committee members. Representatives of industry, of government, and of academic institutions have given time and energy to the task of outlining research that might clarify the problems faced by industry and contribute to realistic economic thought. In expressing appreciation of this generous participation in an arduous enterprise, the Conference on Price Research believe that they may justly speak for all who are concerned with the advancement of American economics.

FREDERICK C. MILLS, CHAIRMAN

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PART ONE

Proposals for Research on
Prices and Pricing Policies in the
Iron and Steel Industry

Committee on Price Research in the
IRON AND STEEL INDUSTRY

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I

OBJECTIVES OF THE COMMITTEE AND SCOPE OF THE REPORT

THE purpose of this report is to explore the possibilities for research on prices in the iron and steel industry. To accomplish this end the Committee worked toward the following objectives:

- 1) To describe briefly the economic characteristics of the industry that affect price research;
- 2) To survey certain of the more important sources of statistical data available to research workers in this field;
- 3) To formulate a research program, indicate specific projects that seem important and feasible, and suggest elements of a wider program that will stimulate the industry, individuals, universities, research bureaus, and appropriate governmental agencies to undertake studies designed to provide a better understanding of pricing problems in this industry.

A definitive and detailed program for research cannot be set forth in advance. As a research project develops the original program must be adjusted to the needs revealed by the preliminary findings. Progress will be terminated in certain areas by unforeseen obstacles, while promising vistas may open up in other areas not originally contemplated. Consequently, the Committee has not attempted to draw up complete specifications for research.

The first step is to study actual price patterns and price relationships. By grouping iron and steel products relevant classifications can be studied with a view to determining: (1) the manner in which prices are quoted, i.e., f.o.b. mill or at a basing point, with or without extras, nature and composition of tariff additions; (2) the behavior of prices over time; (3) price differentials among geographical areas;

(4) price differentials among product groups; (5) price differentials based on the character of the marketing agency, i.e., direct mill sales, jobber sales, warehouse sales, etc. Such a study would be primarily descriptive. Research of this general character is an essential preliminary to an interpretative analysis. This descriptive work should be supplemented by study of the pricing policies of producers, and of the price structure of the industry as affected by these policies. For under the conditions of imperfect competition that prevail in the steel industry, and in other industries, manufacturers do not produce goods without reference to the effect upon prices of their own actions in the market. In this report pricing policy means any rule or practice followed by a seller individually, or by a group of sellers, observing a common practice either by explicit agreement or by established custom. Policies in respect of prices and price differentials are made effective by sellers through such market control as they are able to exercise because of their relative importance in a market or markets. The term price policy takes into account, also, the concessions made to buyers as a result of imperfections in the market for steel products. Price structure means here the complex of prices of related products at a given time for different geographical districts, marketing agencies, and conditions of sale. The price structure is the resultant of all the forces determining prices, among which are the pricing policies of sellers.

In its interpretation of the mandate to formulate a program of research, the Committee has taken the view that the specific projects will be concerned with the present and past price structure of the industry and with the pricing policies and other factors that determine it. The initial task is to study existing price phenomena. Chapter II therefore describes some of the technical conditions and economic characteristics of the iron and steel industry that bear on price behavior. No attempt is made to present an exhaustive discussion of the economic characteristics of the industry.

The present state of data in the iron and steel industry

makes fruitful research on many price problems impossible. Reliable information concerning certain overhead costs is especially difficult to obtain. In the course of many mergers and reorganizations in this industry (as in many others) nominal capital may have long ago parted mathematical company with original costs, most conspicuously so in the case of such natural resources as ore deposits and coal mines. For these several reasons research may not be based upon the assumption that costs are to be accurately ascertained.

Even if cost data were available, the significance of cost analysis would be limited by the arbitrary character of allocations of joint and common costs. Byproducts appear at almost every stage of production; for example, gas, coal tar, ammonium sulphate, coke in the byproduct coke oven; flue gas and slag in the blast furnace. Blast furnaces and open-hearth furnaces are used to produce many different commodities; even rolling equipment is often non-specialized. The continuous mill may roll sheets, strip, black plate for tinning, the lighter gauges of plate, and the wider sizes of skelp. Since probably no two mills produce the same combination of products in the same proportions, and the allocation of joint costs inevitably involves arbitrary decisions, accounting costs are unlikely to be comparable. Engineering rather than accounting costs may therefore be of central concern to the investigator. Nominal price quotations, moreover, have a varying and problematic relationship to actual prices. Problems of this type are discussed in Chapter III, where important primary sources of data for price research in this industry are catalogued and appraised.

A program of proposed research is outlined in Chapters IV-VI. In Chapter IV specific research projects that seem feasible on the basis of the data available and the degree of co-operation to be expected from the industry are discussed. This list is restricted somewhat in Chapter V, which deals with a limited number of projects that seem particularly important. In Chapter VI the Committee sets forth a general program of research that is not conditioned by present limitations of data. Here an attempt is made to deal in a

fairly comprehensive and orderly fashion with the economic and industrial issues upon which price research in this industry should throw light. Not all the projects outlined in Chapter VI are immediately feasible. Materials not now available will be needed for the actual prosecution of some of these studies. Yet perspective is gained and the effectiveness of immediate research enhanced by placing particular problems in the framework provided by this broader outline.

II

CHARACTERISTICS OF THE INDUSTRY THAT AFFECT PRICES

To those not familiar with the iron and steel industry the brief review that follows will give a background for better understanding of the research program outlined in subsequent chapters. The summary of the industry's characteristics deals with (1) conditions of production; (2) methods of distribution; (3) the structure of prices.

CONDITIONS OF PRODUCTION

Individual enterprises in the iron and steel industry vary significantly in their degree of integration. From this viewpoint, they may be classified into four kinds of companies; integrated, semi-integrated, non-integrated, and merchant blast furnace. In the first group are companies that begin operations with the production of pig iron and carry on through successive stages of steel making to the finished rolled products. As may be seen from Table 1, the 18 fully integrated companies had 90 per cent of pig iron capacity and 85 per cent of finished hot-rolled capacity in 1937.¹ The 56 semi-integrated companies that comprise the second group begin with the production of crude steel and had 9 per cent of finished hot-rolled capacity. The 58 non-integrated companies that constitute the third group are

¹ *Directory of the Iron and Steel Works of the United States and Canada, 1938*, American Iron and Steel Institute.

TABLE I

Selected Data for Iron and Steel Companies, classified
by Degree of Integration, 1938

	FULLY INTEGRATED	SEMI- INTEGRATED	NON- INTEGRATED	MERCHANT FURNACE	TOTAL
Number of companies	18	56	58	27	159
Number of plants *	111	70	61	33	275
<i>Pig iron capacity</i>					
Gross tons	45,953,380	...	...	5,268,000	51,221,380
Percentage of total	90	...	...	10	100
<i>Steel capacity</i>					
Gross tons	65,951,300	7,096,592	...	...	73,047,892
Percentage of total	90	10	...	...	100
<i>Finished hot-rolled capacity</i>					
Gross tons	49,025,900	5,508,250	3,284,750	...	57,818,900
Percentage of total	85	9	6	...	100

Compiled from *Directory of the Iron and Steel Works of the United States and Canada, 1938*, American Iron and Steel Institute

* Includes plants equipped with blast furnaces, steel furnaces, and hot rolls.

concerned with the rolling of semi-finished steel, and had 6 per cent of finished hot-rolled capacity. The merchant blast furnace companies that make up the fourth group operate blast furnaces for the production of pig iron but do not manufacture steel in any form. They possessed 10 per cent of pig iron capacity.

Industrial concentration

From the above summary it is clear that despite variation in the degree of vertical integration, the industry as a whole is relatively highly integrated. This concentration of capacity in the hands of a small group of integrated producers who control an important portion of the source of

supply of raw materials of their less completely integrated rivals has a significant effect upon prices. Possibly even more significant has been the effect upon prices of the relative size of the United States Steel Corporation and its consequent price leadership.

This analysis of capacity according to degree of integration does not adequately reveal the dominant position of a few companies in the industry. In Table 2 is shown the steel ingot capacity of the five leading producers in 1938. The present concentration of capacity has an important bearing upon price problems in this industry.

TABLE 2

Steel Ingot Capacity of the Five Leading Steel Producers, 1938

COMPANY	GROSS TONS	PERCENTAGE OF TOTAL
United States Steel Corporation	25,790,000	35.3
Bethlehem Steel Company	10,042,000	13.7
Republic Steel Corporation	6,500,000	8.9
Jones and Laughlin Steel Corporation	3,671,200	5.0
National Steel Corporation	3,400,000	4.7
Total, five companies	49,403,200	67.6
Total, industry	73,047,892	100.0

Compiled from *Directory of the Iron and Steel Works of the United States and Canada, 1938*

Geographic concentration

Not only is the steel industry highly integrated, it is also characterized by geographical concentration of production in relatively few states. Pennsylvania accounted in 1938 for 32.5 per cent of total pig iron capacity and 32.7 per cent of finished hot-rolled capacity.² Ohio came second, with 21.7 per cent of pig iron capacity and 20.2 per cent of finished capacity. Indiana had 10.5 per cent of pig iron capacity and 11.9 per cent of finished capacity. These three states thus accounted for 64.7 per cent of pig iron capacity and 64.8

² *Directory of the Iron and Steel Works of the United States and Canada, 1938*, American Iron and Steel Institute.

per cent of finished hot-rolled capacity. The high ratio of transportation costs to raw material costs and the large amount of power required for producing a ton of finished steel have been factors in this localization of production capacity. Thus the cost of assembling coal and ore has been one of the determinants of the location of blast furnaces and hence of steel plants.

Steel making and steel rolling are also concentrated territorially since steel works frequently locate contiguously to blast furnaces because of: (1) the relative economy of shipment of steel products as they approach the finished stage; (2) the necessity of providing reasonably full utilization of the capacity of blast furnaces and open-hearths; (3) economies in heat conservation; (4) historical accidents of individual company expansion. Although the geographic distribution of the industry has been in good part determined by accessibility to coal and ore, differences among districts in production capacity and in its degree of utilization cannot be explained entirely by differences in assembling costs. Since the cost of shipping finished tonnage steel is high relative to the value of the products, the relative cost of transporting the finished product to consuming areas is also an important factor in accounting for location of capacity and differences in utilization among the several producing regions.

The role played by the price structure as an additional influence upon regional concentration and relative plant utilization, together with the effects of the present territorial distribution upon prices, raise important questions that invite study, particularly in view of changes in the price structure initiated in summer 1938. Since steel plant location is significant primarily with respect to the location of consuming industries, this study should comprehend the influence on consumers' locations of steel transportation costs as well as the price structure of steel.

It is pertinent to inquire also into the extent to which the producing capacities of the individual corporations are geographically concentrated. Analysis of the territorial dis-

tribution of steel plants indicates that in 1938 only 17 companies in the entire industry had establishments in more than one of the wage districts established under the NRA code and that only 9 companies had plants in more than two districts. This concentration has an important price significance because of its effect upon the degree of competition within production areas and the competitive interrelations among them.

Technological factors

Another factor of considerable importance to price behavior is the tremendous fixed investment required for steel production and the resultant burden of overhead costs and rigidity of production facilities. Blast furnaces, steel works, and rolling mills represent investments in units of equipment on such a large scale that it is not feasible to enlarge or alter the capacity by small increments or to shift production capacity quickly among regions. (The highly specialized nature of some steel production equipment contributes to the inflexibility of plant and gives rise to characteristic pricing problems.) Since overhead costs constitute a large proportion of total costs, the average or unit costs of production, as computed by orthodox accounting methods, are highly sensitive to changes in the rate at which capacity is utilized. Extreme shifts in demand, together with the cyclical inflexibility of prices and the apparent relative inelasticity of demand for many products, have contributed to the notoriously wide fluctuations in operating ratios in this industry. As a result of these fluctuations average unit costs have been subject to violent changes. The preponderance of overhead costs together with the amplitude of their per unit fluctuations³ suggest the need for more accurate cost data. Collection of information about overhead cost, however, involves serious difficulties because it is questionable whether the method of evaluating fixed assets followed by some firms yields cost information appropriate

³ These fluctuations depend upon the method of allocating overhead cost, which differs considerably among companies.

for most price research problems. The actual relation between heavy fixed investments (with consequent inflexible and immobile capacity and violently gyrating per unit costs) and prices is little understood and needs further study.

To summarize, the production of iron and steel is characterized by certain conditions that have an important bearing upon price research: (1) a high average degree of integration, combined with complex variation in completeness; (2) concentration of production capacity in the hands of a few highly integrated producers; (3) concentration of production capacity in a few states; (4) restriction of the production capacity of individual companies to a few geographic regions; (5) large investments in highly specialized plants with consequent large and unstable overhead costs and inflexible and territorially immobile production capacity. These conditions are not peculiar to the steel industry. In varying degree they are found in most of the heavy industries that have developed with the rise of mass production and large scale enterprises. They have, however, placed a characteristic stamp upon the iron and steel industry which necessitates study of its price problems with reference to them.

METHODS OF DISTRIBUTION

Because of the large number of the industry's products and the wide variety of products and grades its distribution characteristics cannot be adequately summarized in a brief treatment. Nevertheless, the methods by which iron and steel products are marketed may be broadly delineated. Much steel-making pig iron is used by the integrated company that produces it, whereas merchant pig reaches the consumer primarily through the medium of agents and brokers, or is sold directly to industrial consumers. Certain rolled steel and semi-finished steel products are shipped directly from the producer to non-integrated mill customers. Also, much finished tonnage rolled steel is sold through the sales organization of the mills and shipped directly from them to the buyers' premises. The jobber's function in the

sale of tonnage rolled steel is limited to 'fill-in' orders for immediate delivery and supply of small fabricators. Further finished steel products are more often sold through independent middlemen.

SOME CHARACTERISTICS OF IRON AND STEEL PRICES

In view of the complexity of the industry's price structure, we describe separately the distinctive characteristics of the prices of pig iron, iron and steel scrap, semi-finished steel, finished steel, and special steels.

Pig iron

The price structure of pig iron is relatively simple and data are readily available although the degree of departure of actual from quoted prices is not known. As a result, the price behavior of quoted pig iron prices has often been carefully analyzed and interpreted. Unfortunately, however, a study of pig iron prices contributes little to an understanding of the price problems and structure of the industry as a whole, for only a relatively small percentage of the pig iron produced is ever sold on the market. Although the production of pig iron is the first stage in the manufacture of steel products, more than 80 per cent of steelmaking pig iron is delivered in molten condition directly to the steel furnaces, usually being merely transferred from one department to another within integrated establishments.

Pig iron prices prior to the NRA code were customarily quoted on an f.o.b. furnace basis. The low value of pig iron relative to its bulk and weight tends to delimit the geographical areas within which it can be shipped to advantage. Nevertheless, the price differentials among furnaces, and the character of changes in them, invite study to determine the nature and degree of imperfection of competition. Not only the degree of competition in the purchase and sale of pig iron, but also the relationships of its prices to the prices of its raw materials, e.g., ore, coke, and limestone, and to the prices of other steel and iron products require further investigation.

Iron and steel scrap

Data on the behavior of the prices of iron and steel scrap are fairly adequate. Scrap has become an important raw material for the production of steel products. Within certain limits it is, for this purpose, a significant substitute for pig iron. Scrap prices seem highly sensitive to shifts in demand. A distinctive feature of the marketing of iron and steel scrap derives from the few buyers, especially large buyers, in this market. Investigation of the nature and extent of the interrelationships between the prices of scrap pig iron and other basic raw materials and the prices of other steel products might reveal much about price behavior in this industry. -

Semi-finished steel products

A classification of steel products is essential to an understanding of the structure of steel prices. Three classes of steel products may be identified: special steels and two types of tonnage steel—semi-finished and finished. Semi-finished steel is subject to further processing either in another department of an integrated concern or by independent non-integrated producers. The economic characteristics of the production of semi-finished steels and the price behavior of this group of products are similar in many respects to those of pig iron, with certain important differences. A large proportion of pig iron produced for sale is made by independent merchant furnaces, whereas a large proportion of the total output of semi-finished steel products is made by integrated steel mills which convert this steel into finished steel products as well as sell it to non-integrated mills. Such non-integrated mills thus become not only customers of the integrated concern but also its competitors in the sale of finished products. Both this relationship and the fact that the buyers for purposes of further processing are not numerous affect the price behavior of these semi-finished products. There is some evidence that prior to the code prices for these products were some-

what more flexible than those of many finished steel products, but less flexible than the prices of pig iron. This requires further investigation. Much depends upon how faithfully actual prices follow nominal price quotations and what techniques are used to measure flexibility.

Finished steel products

Finished steel products, e.g., plates, bars, sheets, are produced by both integrated and non-integrated concerns. Although the consumption of certain of these products is concentrated in regions contiguous to the steel producing centers and restricted to relatively few purchasers, this group of products as a whole is sold to a large number of consumers, scattered geographically, whereas they are produced by a small group of mills concentrated in a few geographical areas. Most of these steel producing regions tend to have capacity in excess of demand in contiguous areas.

Most tonnage steels, more particularly those designated 'finished', are sold under a basing point price quotation system, that is, prices are quoted not f.o.b. mill but at destination, the destination price being usually computed on all-rail freight rates from so-called basing points. Thus, under a basing point system, the price received by the mill for finished steel varies, in the absence of change in the basing point prices, in accordance with the location of the customer and mill relative to the basing point and to each other.

The relation between the degree of price flexibility or of price control and the method of quotation invites further research. Analysis of price fluctuations under a basing point system of quotation must obviously encompass recognition not only of changes in prices at given basing points, but also changes in the number of basing points and in price differentials among various basing points. The number of quotation points has been increased from time to time since 1924. In the summer of 1938 several new basing points for certain types of products were established. But more im-

portant, most differentials among basing points were eliminated. In the few exceptions they were substantially reduced. At the same time prices quoted for most products at Pittsburgh were drastically lowered. Although not all mills have become basing points, such points have been established in most important steel producing centers. The influence of technological progress on basing points is suggested by the fact that every basing point for hot-roll sheet and strip (except Pacific Coast ports) is now the location of a continuous mill, and that almost every continuous mill is now within 50 miles of a basing point. Furthermore, the differential price reduction has tended toward equalization of the cost of delivered steel at the major producing centers. These modifications of the basing point system present unusual opportunity to study the economic consequences of this system of price quotation, and their effects upon cross hauling, the degree of utilization of production capacity in various areas, profit margins in various areas, location of new production capacity and of consuming industries.

Special steels

Special steels include highly alloyed and cutting steels of all grades. They are produced, for the most part, in small electric furnaces by companies specializing in these products. Special steels constitute a relatively unimportant product group, when measured by the tonnage produced. Their value, however, in relation to weight is considerably greater than that of 'tonnage' steels. Consumers of special steels are likely to be primarily interested in physical and chemical characteristics, such as toughness, hardness, resistance to acids. The importance of price as a factor influencing the purchase of these steels, however, requires investigation. Moreover, producers have fostered product differentiation by means of patents, brand names, and consumer specifications. Hence, direct price comparisons are made difficult and have therefore not played an important role in this branch of the steel industry except in the case of a few kinds of standardized special purpose steels.

The preceding discussion should serve not only to reveal important price problems involved in the production and distribution of iron and steel products but also to indicate the need, in dealing with price behavior in this industry, of taking cognizance of the different characteristics of various groups of products.

III

STATISTICAL DATA

PERTAINING TO THE PRICE STRUCTURE

IN OUR description and appraisal of important available material relating either directly or indirectly to price problems in the iron and steel industry we cover only primary sources of data.¹ Many of the sources of published data listed below refer merely indirectly to price information; that is, they include information on costs of materials, quantity and value of output, capacities, balance sheet figures, and other data that might be useful in analyzing price problems in the industry.

PRIMARY SOURCES OF DATA BEARING DIRECTLY OR INDIRECTLY UPON PRICE RESEARCH IN IRON AND STEEL

American Iron and Steel Institute

1) *Directory of the Iron and Steel Works in the United States and Canada*. Most issues contain information on rated capacities for making all raw, semi-finished, finished hot-rolled, and other further finished products by plants for each operating company in the United States and Canada. (The 1935 Directory did not contain data on semi-finished capacities.) Moreover, they describe furnaces and other equipment, often giving the year of construction or of last reconditioning. The more recent issues include also summary tables giving total capacity for products by states. The fifteenth edition of this Directory was published in 1901

¹ The ultimate primary sources of most data are, of course, the records of the individual companies. Such data, however, are not usually available to the research worker.

and subsequent issues have appeared in 1904, 1908, 1912, 1916, 1920, 1926, 1930, 1935, and 1938.

2) *Annual Statistical Report*. The *Annual Statistical Report* contains the most comprehensive group of production and price statistics for the iron and steel industry. Production figures are given for pig iron and ferro-alloys, by use, grade, fuel, states, and in Pennsylvania and Ohio by local districts. The Report gives also average daily production figures, information on materials consumed and changes in number of blast furnaces and in capacities, by types of fuel, by states, and in Pennsylvania and Ohio by districts. Each issue gives information on furnaces abandoned and new furnaces constructed.

The information on steel production pertains to kind of steel, by states or groups of states; active and idle steel works, by states; and construction and dismantling of steel furnaces and rolling mills. Several tables relate to production of hot-rolled products. For all kinds of finished rolled products, information is presented by states, and in Pennsylvania and Ohio by districts. Statistics for each important hot-rolled product are given in some detail especially for rails, structural shapes, plates and sheets, tin plate, and pipes and tubes. Some annual reports contain tables relating to capacities by products and states; the production and shipment of iron ore, coal, and coke by source of supply and in general by destination. These figures, however, are not equivalent to consumption figures. Special tables give production statistics for the Youngstown district and for Allegheny County, Pennsylvania; and imports and exports by article.

The price series extend back over the preceding decade and consist of monthly quotations from *Iron Age*, *Steel*, and private sources for most major products at major basing points. These prices are going prices or reported prices and may or may not be invoice prices. The price section also includes information on iron ore and Connellsville coke. Certain financial data, such as investments, earnings, net income, and dividends for a group of companies comprising

over 90 per cent of the capacity in the industry, as well as some additional information on production figures in Canada, on price figures in England, and on world figures on the production of iron ore, pig iron, and steel are also included. These statistical reports have been issued annually since about 1870, first, by the American Iron and Steel Association, and in 1908 and since, by the American Iron and Steel Institute. In the annual statistical reports since 1933 several tables have been omitted, notably those for production districts in Ohio and Pennsylvania.

3) *Steel Facts*. These bulletins have been issued irregularly, usually every month or so, since October 1934. They contain miscellaneous news items concerning production, wage rates, hourly earnings, relative operations, description of operations, and operating rates. Occasionally notes are included on trends in steel prices in comparison with trends of prices of other metals, on investment in new equipment, and on the tax burden of the industry.

4) Freight tariffs.

No. 1 Water Routes—South Atlantic, Gulf, and Pacific Coast ports

No. 2 Railroads—official territory

No. 3 Railroads—Southern territory

These rate schedules cover most iron and steel products and are revised from time to time.

5) Newspaper releases. Each week the Institute releases to newspapers information on the operating rate for the steel industry, and each month the only monthly production figure for steel ingots. Occasional releases relate to other production and also to price matters.

Code authority for the iron and steel industry

(During the life of the National Recovery Administration, the Board of Directors of the American Iron and Steel Institute acted as Code Authority.)

1) Uniform Extras and Deductions for Products of the Iron and Steel Industry under the Code of Fair Competition, 1934

These releases were used during the Code period in an effort to see that uniform prices held on all iron and steel products and that the prices varied with any significant variation in the shape or quality of the products.

- 2) Code of Fair Competition for the Iron and Steel Industry: Regulations and Commercial Resolutions
- 3) Miscellaneous notices concerning jobber agreements, jobber lists, labor

Governmental agencies

- 1) United States Bureau of the Census

The Bureau of the Census collects information from the iron and steel industry by establishments on production, by products, by consumption of materials, by employment, and by consumption of fuel and purchased electric energy. Most of the data relate to the United States as a whole, but value figures for production, cost of materials, and employment are given by states and in a few instances by industrial areas. From value figures, average per unit selling values can be obtained. The production figures are broken down according to whether the products are consumed in the works, transferred to other plants, or sold. Moreover, the tables present detailed information on the products manufactured from finished rolling mill products. Census information contains also tables describing the equipment and indicating whether it is active. In 1929 for the first time the *Census of Manufactures* contained information on the distribution of sales by type of outlet. For industries other than iron and steel it is possible to obtain some information on the consumption of heavy iron and steel.

Before 1899 the *Census of Manufactures* was issued decennially. From 1899 to 1919 it was issued every five years, and since then every two years. The information for a given year is usually not available until the second following year.

Census of Distribution, published for 1929. Contains information on sales by type of outlet, by industry. However, the iron and steel information is lumped in one total, except for that on scrap iron.

Census of Business. For 1933 and 1935 the information collected here is similar to that collected for 1929 by the *Census of Distribution*. In 1935 it includes Distribution of Manufacturers' Sales.

Census of Mines and Quarries

Census of Occupations

Distribution of Sales of Manufacturing Plants, 1929

- 2) National Recovery Administration
 - Code of Fair Competition for the Iron and Steel Industry, 1933, and (revised code) 1934
 - Geographic and Population Differentials in Minimum Wages, undated
 - Report of the National Recovery Administration on the Operation of the Basing Point System in the Iron and Steel Industry, 1934, with five appendices and a supplement
 - Control of Geographic Price Relations-under Codes of Fair Competition, by Gustav Seidler, Jr., Work Materials No. 86, March 1936

- 3) United States National Labor Relations Board

- 4) United States Federal Trade Commission
 - Federal Trade Commission vs. United States Steel Corporation et al., Docket 760
 - In the Matter of Federal Trade Commission vs. Bethlehem Corporation et al., Docket 962
 - War-Time Profits and Costs of the Steel Industry*, issued in 1925 contains detailed cost data, mainly for the War period, for coke, pig iron, steel ingots, and rolled products; also data on investments and earnings, by companies making these products.
 - Report of the Federal Trade Commission to the President with respect to the Basing Point System in the Iron and Steel Industry, 1934
 - Practices of the Steel Industry under the Code*, report of the Federal Trade Commission to the United States Senate, mainly with respect to pricing problems in the industry.

5) Bureau of Labor Statistics

Monthly Labor Review. Presents information on hours and earnings and also on wholesale prices for general groups of commodities. From time to time it publishes also iron and steel prices, obtained from trade journals and not directly from the trade.

Miscellaneous monographs. From time to time the Bureau of Labor Statistics publishes bulletins on wages and hours in the iron and steel industry (such as Bulletin 567 in 1931 and Bulletin 513 in 1929) and also on productivity of labor (such as Bulletin 474 in 1928) on merchant blast furnaces and Bulletin R-240 in 1930 on 'Labor Costs of Iron and Steel'.

6) Bureau of Internal Revenue

Statistics of Income for various years. Contain information from income tax reports on earnings in different industries among which is iron and steel.

7) United States Tariff Commission

Iron in Pigs, issued by the Tariff Commission in 1927. Presents information on costs and prices for merchant blast furnaces in various sections of the country and comparisons with foreign production and price figures.

Iron and Steel, issued in 1938 as Report 128, second series. Presents information on domestic and foreign price policies, domestic and international trade, and tariff problems. Few new primary data are included.

8) Bureau of Foreign and Domestic Commerce

Survey of Current Business, monthly release of the Department of Commerce. Contains information on many price and production series relating to the iron and steel industry as well as indexes and price quotations for other general groups which might be used for other comparative purposes.

Basic Metal Markets in the United States, the Iron and Steel Industry, 1936. Contains statistics and maps on the distribution of production capacity by products, nearly all of which were obtained from the American Iron and Steel

Institute, *Directory of the Iron and Steel Works of the United States and Canada, 1935*

- 9) United States War Department
Report of the Chief of Engineers, United States Army, issued annually. Contains information concerning the movement of goods on internal waterways and at ports.
- 10) United States Bureau of Mines
Mineral Resources, now called *Minerals Yearbook Statistical Appendix to Minerals Yearbook*. Contains information on the production of iron ore, coal, and occasionally includes their prices.
Classification of Iron and Steel Scrap, 1936
- 11) Federal Court Records
Federal Trade Commission vs. United States Steel Corporation et al., Docket 760, also known as Trial Examiner's Report of the Pittsburgh Plus Case
For the District Court of Delaware, No. 1060, in Equity: United States of America vs. Weirton Steel Company, 1935
For the District Court of Delaware: United States and Weirton Steel Company, 7F Supp. 25, 1934
United States Circuit of Appeals for the 5th Circuit, National Labor Relations Board vs. Jones and Laughlin Steel Corporation
Others
- 12) United States Senate
62d Cong., 1st Sess.: Report on Conditions of Employment in the Iron and Steel Industry in the United States, Senate Doc. 110
73d Cong., 2d Sess., Committee on Education and Labor: Hearings on S. 2926
73d Cong., 2d Sess.: Report of the Federal Trade Commission, Practices of the Steel Industry under the Code, Senate Doc. 159 (1934)
74th Cong., 1st Sess., Committee on Education and Labor: Hearings on S. 1958
74th Cong., 2d Sess.: Hearings before a subcommittee of

the Committee on Education and Labor on Senate Resolution 266

74th Cong., 2d Sess.: Hearings before the Committee on Interstate Commerce on Senate Resolution 4055, A Bill to Prevent Uniform Dealing Prices (short title) (1936)

13) The Temporary National Economic Committee

a) Public hearings on domestic and export price practices and policies in the iron and steel industry (including iron ore) were held in Washington before the Temporary National Economic Committee from November 1 to 15, 1939. Further hearings will be held in January 1940, at which time steel companies, and especially the U.S. Steel Corporation, will present analyses of economic and other factors conditioning price policies as well as the results of their operations. The record of these hearings, with exhibits filed by the Department of Justice and by the steel companies, is expected to provide information on price problems in the industry hitherto unavailable.

b) As a part of the monopoly investigation, the Department of Justice is supervising a study of pricing in the iron and steel industry. The following questionnaire forms were sent out to iron and steel companies in December 1938 and in January 1939: Form A, *Distribution of Selected Carbon Steel Products*; Form B, *Distribution and Pricing of Selected Steel Products*. The former applies to tonnage shipped by individual plants in each of the three years 1936-38 and covers eighteen selected steel products. The latter covers the distribution of ten selected steel products from selected mills to major consuming districts during February 1939. It includes data for tonnage, invoiced delivered value, freight added to base price, actual freight, and total extras. An analysis of these data will be presented, along with other information, to the Temporary National Economic Committee and will therefore be available to students.

Other primary sources

- 1) Iron and Steel Operating Companies
 - Annual Reports to Stockholders
 - Books on Prices and Extras, issued from time to time
 - Lists of Products in Stock at Given Warehouses
- 2) Trade publications
 - Iron Age*, a trade journal, issued weekly. Contains complete lists of prices for iron and steel products at all recognized basing points and changes in those prices from week to week. Moreover, each month it publishes production figures on pig iron by districts. From time to time all pertinent available information on prices, capacities, production, shipments, and consuming industries is included.
 - Steel*. Covers same field as *Iron Age*.
 - Daily Metal Trade*
 - American Metal Market*. Both daily and in its annual statistical handbook called *Metal Statistics* includes a broad list of statistics on production, trade, and prices, most of which is gathered by the American Iron and Steel Institute or trade journals.
 - Coal Age*. Contains current information on coal prices and output by districts.
- 3) Financial services
 - Moody's. Material collected mostly from annual corporation reports.
 - Poor's. Same.
 - Standard Statistics Company Releases. This Company presents from time to time studies of individual industries and more particularly an analysis of the operating and financial condition of individual corporations.
 - Brookmire's Service
 - Other services
- 4) Trade associations other than the American Iron and Steel Institute
 - National Flat-Rolled Steel Manufacturers
 - American Steel Warehouse Association

American Institute of Steel Construction
Central Fabricators' Association
Steel Plant Fabricators' Association
Institute of Scrap Iron and Steel, Incorporated

These associations from time to time issue information on the consumption of heavy iron and steel products, but few or no data on prices are available.

5) Daugherty, de Chazeau, and Stratton, *The Economics of the Iron and Steel Industry*. Contains considerable previously unpublished material, including:

Engineering estimates of assembly costs for making pig iron by districts

Many special tabulations made by the U. S. Bureau of the Census for the Bureau of Business Research, University of Pittsburgh, relating to capacity and production by size of operating company, degree of integration, producing districts, and by type of product.

Statistics on price filings obtained from the Code Authority. Several special tabulations furnished by the American Iron and Steel Institute relating to operating and financial conditions of operating companies.

6) Worthing, Marion, *Comparative Assembly Costs in the Manufacture of Pig Iron*, *Pittsburgh Business Review*, January 1938, pp. 21-5, recent comprehensive tabulations.

7) E. G. Nourse and Associates, *America's Capacity to Produce* (Brookings Institution, 1934). In Ch. XII and on p. 585 are presented data on the capacity for making pig iron, both 'rated' and 'practical' capacity.

APPRAISAL OF AVAILABLE DATA RELATING DIRECTLY OR
INDIRECTLY TO IRON AND STEEL PRICES

Most published prices of iron and steel products are prices as of recognized and generally accepted basing points. These prices are usually quoted in cents per pound for specified quality, size, and amount of a given product, not necessarily for *typical* specifications. The extent to which

these prices are an adequate indication of actual sales prices and changes in prices for any given steel product is almost impossible to determine. Their appropriateness, however, is modified by two considerations: the extent to which the purchase on base specifications of steel is characteristic of purchases in general and the extent to which these published base prices are actually used for the indicated product.

To the base quotation for a standard purchase of a given steel product are usually applied extras or allowances relating, in the main, to size, shape, quality, or special treatment. These are usually uniform for the industry, and carefully defined. Thus, "quantity extras and deductions are determined by total weight of a size (one gauge or thickness, one width, and one length) of one grade, one analysis, and one finish, released for shipment to one destination at one time."² The base price, in other words, may be merely a part of the invoice price. In fact, it is usually only the starting point from which invoice prices are computed, even when the quoted price is adhered to as a base. Relatively little of the steel actually sold may be of the kind described by the base price. Though steel is often referred to as a bulk product, the necessity of meeting different consuming requirements for special chemical composition and heat treatment may mean that one producer will sell as many as 600 different 'kinds' of steel in a year. Many 'steels' are practically custom-made to suit the specifications of individual customers.

Variations from published prices may result from either price concessions or premiums. Although price behavior in the industry was made much more nearly uniform by the actions of the Iron and Steel Code Authority under the NRA, many effects of which are still apparent, special discounts to both consumers and jobbers still exist. These may take the form of waiving extras relating to shape, quality, or treatment or of charging non-uniform extras. Or, on the other hand, speedy delivery which usually results in special

² See the last page of any issue of *Daily Metal Trade*.

costs may be made without extra charge. In order to grant a price rebate to some consumers, they may be classified as jobbers and given special agency discounts, or, if a purchaser is both a jobber and consumer, he may receive a jobber discount on all the steel he purchases. Under the Code, however, there was a prohibition against making special jobber or agency agreements in order to allow trade discounts to concerns not primarily jobbers. Price concessions in the form of special jobber discounts were allowed, however, under the Code to certain large consumers, such as railroads, oil drillers, and to some manufacturers (wire products manufacturers, e.g.) upon agreement that they would use and not resell the steel they had purchased. In the main, these special discounts seem to have been extra discounts for purchases of large quantities. Furthermore, price concessions have resulted from classifying good steel as 'seconds' or in improving the quality of the 'seconds.' This, in effect, constitutes price cutting on prime or near prime material. At times it has been reported that steel producers have waived extras for special treatment, such as annealing; cutting, treating, coupling. Under such circumstances, the superior material may even have been billed as being of a lower grade. Price concessions would also result from allowing extra weight in a shipment and billing the buyer for a smaller, agreed-upon amount.

Under the basing point system, delivered prices practically always are computed on the basis of railroad freight rates from designated basing points. When the Code of Fair Competition under the National Industrial Recovery Act was drawn up for the iron and steel industry, it was provided that all prices should be delivered prices determined by reference to designated basing points for each product. This action was both the recognition and the strengthening of previous practice. Since railroad rates are published and relatively stable, they offer the most convenient basis for agreed transportation charges. Together with certain arbitrary switching charges, they have been issued from time to time as rate books by the American Iron and Steel Institute.

Special price concessions are probably made on transport costs, especially in those instances where delivery from the mill is actually made by water.

Many of these practices of granting concessions are accentuated during business depressions when a buyer's market exists. During a severe recession, when plants are operating at a low percentage of capacity, it is, in fact, generally understood that considerable concessions are made from published prices, with respect both to the price itself and to advantages granted to customers in quality, conditions of sale, terms of delivery, and other billing conditions.

On the other hand, during periods of prosperity, actual prices may exceed printed quotations. Several independent producers have been known to accept price premiums for prompt delivery during such periods. Some evidence of price premiums is noted in the trade publications from time to time, as, for example, during spring 1937. Moreover, during periods of prosperity, a customer's decision to purchase steel from a particular producer is likely to be determined by some special consideration as to the terms of sale, including speed of delivery.

At present no adequate information is available on how much steel is sold at a given price by specific mills in particular consuming areas. Nor is specific information available on the geographic distribution of shipments. A study by the National Recovery Administration for the second quarter of 1934 showed shipments of products produced at and shipped from mills operating within 50 miles of Pittsburgh to defined consuming districts. The study indicated the absorption or addition of freight on such shipments segregated according to the basing point on which price was computed. No data were presented for individual products. A study being made for the Temporary National Economic Committee for February 1939 will show the distribution of selected products from selected plants to particular geographic areas. In addition to tonnage information each works will report for shipments into each area the total invoice delivered value, the freight charges added, the actual

freight paid, or allowed, and the amount of extras included in the delivered price. These data will be reported separately for each product for each selected steel works and for each basing point on which price was computed. For a larger selection of steel products (18 in number), shipments from each works of all the important companies to each defined consuming district mentioned above will also be made available for the T.N.E.C. for each of the calendar years 1936-38. These data will be compiled for individual products also but will show tonnage alone.

The records of the American Iron and Steel Institute contain price filings of members of the Code of Fair Competition of the Iron and Steel Industry over the approximately two years during which that Code was in effect. Additional collateral material might be obtained from the United States Bureau of the Census and from other governmental bureaus. But such associations and agencies are not likely to permit free access to their records and would probably release information, if at all, only on the basis of requested tabulations. Considerable study would be necessary to decide what forms to use in such instances.

In the event that price research involves the use of capacity figures, it may be well to emphasize here the nature of the present data. The issues of the *Directory of the Iron and Steel Works of the United States and Canada* published at intervals of several years by the American Iron and Steel Institute present capacity figures by plants for existing units even though they have been idle for some time and may never be used again. On the other hand, since 1925, the capacity figures presented in the *Annual Statistical Report of the American Iron and Steel Institute* exclude these obsolete and idle capacities. These figures have been called 'rated' capacities. All estimates of blast furnace capacity now issued by the American Iron and Steel Institute are based upon a 360 day year and make allowances for time lost in relining, rebuilding, and otherwise repairing equipment. For open-hearth furnaces an allowance of 12½ per cent is made. The figures for 'practical capacity' for making pig

iron presented in *America's Capacity to Produce* are roughly 11 per cent less than the figures issued by the Institute.

For finished rolled capacity the method of estimation was changed in the 1935 Directory. At that time, all capacities for finished products were related to the available steel supply or to actual performance in production. As a result, in some plants the capacities reported for rolling mill units were thus reduced to the equivalent capacity that could be supplied by the plant's furnaces.

APPRAISAL OF DATA

USUALLY RECORDED ON INVOICES TO CUSTOMERS

Even approximately to ascertain actual prices for steel requires invoice analysis. But apart from the fact that a large steel company may have upwards of 20,000 invoices in a single month, the invoice is a very unsatisfactory document for analysis. With some exceptions: (1) a single invoice may cover several kinds and specifications of steel products; (2) extras are not shown either as a total or by products; (3) the basing point on which price was computed is omitted; (4) the freight from basing point to destination is not shown. Furthermore, the price on which the delivered value shown is computed depends on the underlying contract and, unless prices have been falling, this is likely to differ from published base prices even in the absence of base-price concessions. Deliveries even on quarterly contracts often overlap the beginning of a new quarter, while many products are sold on long term requirement contracts (contracts for plates, shapes and bars extend 6 to 9 months or more; for tinplate, until the beginning of this year they held for a 9 months' season; contracts for semi-finished and finished rolled steel sold to non-integrated producers are often for several years; etc.). Finally, there is nothing on the invoice to indicate special allowances in the form of rebates, credit arrangements, etc.

It is not practical, therefore, to propose for either a private or governmental agency a periodic evaluation of actual steel prices by an invoice analysis, no matter how

large or skilled the staff may be. It is desirable nonetheless that the data necessary for the spot-checking of actual prices should be available on invoices.

It is futile for either governmental agencies or research institutions to attempt accurate studies of the actual behavior of steel prices from an examination of existing invoices. Until such time as steel companies may adopt invoice forms that record essential price information, any investigating agency must rely on statements of company executives for the elements entering into the delivered price.

IV.

PROGRAM OF FEASIBLE RESEARCH PROJECTS

This and the following chapter deal with research projects in the iron and steel industry that appear to be practicable in view of the availability of data and the degree of necessary industrial or governmental co-operation. Chapter VI includes a broader outline of projects, discussed without regard to their immediate feasibility.

It will be obvious that some of the projects overlap in varying degrees. The study of prices leads of necessity into all the complexities inherent in the economic structure of an industry. Hence an attempt to eliminate any apparent duplications in the projects suggested would only result in an arbitrary and sterile delineation of research areas. It is believed, however, that the *objectives* implicit in each project do not overlap and that any monographs developed from them will be complementary but not repetitious.

It has been pointed out elsewhere in this report that the iron and steel industry is a multiple not a single industry. Its products may be grouped according to the economic and technological conditions of production, the economic mobility of the product, the concentration—geographic or corporate—of buying power, the availability of substitutes, and the degree of overlapping, on the part of integrated

firms, of stages of manufacture or processing. It is imperative then that the student of iron and steel prices approach his subject on a 'group-commodity' basis. To this end, many commodities customarily blanketed in a given category under a general name (e.g., 'sheets') must be subdivided in accordance with the competitive influences affecting their sale and distribution. Although in some projects reference will be made to specific commodity problems, these must be considered illustrative rather than exhaustive.

One further warning cannot be overemphasized. Every student of price and pricing policies should recognize that price, either the published quotation or the actual dollar value per unit paid by the buyer, may be a nominal and, in some transactions, a secondary consideration. It is impossible to understand pricing policy in iron and steel if one confines one's analysis to the narrow concept of price and implicitly or explicitly assumes an atomistic view of sales. It is true that steel (neglecting specialties) of a given specification is homogeneous irrespective of source but it is not true that each steel company provides the same delivery service (even relative to a contract schedule) or that each has the same percentage of rejections. Again, a monetary concession given when steel capacity is underutilized, if allowed to divert patronage from one source to another, may result in poorer service when the rate of utilization of steel capacity is high. Finally, a host of considerations of mutual advantage or pressure (engineering services, the reciprocal purchase and sale of other products and services, common financial interests) may be the determining factors in sales. Other sources of modification in quoted prices will be found in direct concessions by rebates, the waiving of extras, special credit terms, 'freight absorption', and peculiarities in the freight rate structure, such as fabrication-in-transit rates. The student of price and pricing policies in the iron and steel industry must always be alert to these and other conditions of sale which affect directly or indirectly the apparent characteristics of the prices he is analyzing. Although these qualifications are not made explicitly in each case, they

must be considered to qualify the research projects here suggested.

In a rough way these projects are grouped according to the type of agency best fitted to undertake them. Three types of operating agency are specified: governmental bodies, research institutions, and individual investigators. It will be apparent, however, that this is an arbitrary classification. Aside from a proposed revision of governmental statistics, whether a project can best be undertaken by a governmental body or a research institution depends largely on the confidence and co-operation it stimulates or commands. Most projects suggested for research institutions might be so broken down on a commodity or area basis as to make possible significant contributions from individuals with proper guidance and industrial connections.

A PROJECTS SUITABLE FOR GOVERNMENTAL AGENCIES

Some of the most elementary statistics for research in price economics in the iron and steel industry have not yet been published. Published base prices (the period of the Code of Fair Competition excepted) are known to be nominal but the extent of their divergence from actual prices, which varies from time to time, has never been accurately ascertained. Indirectly involved in any explanation of price behavior in the industry, but likewise unavailable, are shipments of iron and steel by products to geographical areas or to industry classes and production of iron and steel by products together with their inventories.

In recent years the larger steel companies have installed machine tabulation systems for the mechanical analysis of their shipments but the punch controls are far from uniform. Some record, among other items, tonnage and value shipments from each works to counties, cities, or states (or some combination of these areas) together with the basing point on which price was computed, the freight added in the delivered price, and the freight allowed on the shipment to destination. Some companies record sales alone, rather than shipments, and distribute sales according to the location of

the purchaser's office rather than the destination of the product. A majority of companies have no mechanical tabulating systems and record manually much more abbreviated data. Many keep no records of shipments whatsoever. No companies record extras and very few indicate this price element even on invoices.

Although this is a problem with which the Temporary National Economic Committee is known to be concerned and on which it may be expected eventually to make certain recommendations, the following projects are enumerated as being peculiarly within the scope of a governmental agency. In presenting these projects the Committee has not attempted to take a position on the general issue of whether the iron and steel industry should be required by law to make more adequate statistical reports to governmental agencies. The Committee does, however, desire to urge that neither private nor governmental agencies should attempt to generalize with respect to the complex economic problems associated with the industry's pricing structure and price policies unless the sort of data indicated in this study can be made available.

1 Formulation of a Uniform Reporting Plan for Essential Statistics, including Production, Shipments, Inventory, Delivered Prices and Extras

This project would require an analysis of: (1) the methods by which steel companies now record these data for their own purposes; (2) the actual geographical distribution of iron and steel by products and possibly by industry classes within such areas; (3) installed capacity by products and by company works in relation to geographical location of works and consuming areas.

Lack of uniformity in steel company records does not necessarily imply a difference in either interests or problems. It may mean no more than that the system has grown without rational or long range direction. At any rate, it would be the object of investigation (1) above to attempt a standardization of product definition or product groupings

so that comparability could be obtained without burdensome expense or the sacrifice of important company objectives. It is not necessary that all companies keep such records or make reports. The decision in each case must be made with relation to the size and importance of the company for the particular product on which reports are to be made.

Analysis of the actual distribution of products by areas and industry classes will facilitate a more intelligent delineation of consuming districts for which reports might be made in the future. The lack of coincidence between political and economic boundaries is too obvious to be labored. In some states many areas, some overlapping state boundaries, are required for significant analysis; in other regions, a satisfactory consuming district may comprehend several states. The determination must rest on the economic characteristics of the region as a consuming area for iron and steel products and the location of steel works and basing points modified by the enhanced cost of compilation where areas are unwieldy in number. To allow maximum use of data, consuming districts should be identical for all products currently reported and should be uniform for all companies.

If price or distribution data are to be made even approximately comparable, it is imperative further that the extras and deductions applicable to given shipments be recorded on the invoices, punched on the tabulating cards, and aggregated and reported for shipments of each product into each consuming district. Since steel products are ordered to specifications adapted to particular uses, the list price for base specification is no more than the basis on which actual price is computed. The extra list is a complex price list which may be varied for particular uses or users without disturbing the published price. Its significance in the final price is naturally dependent on the degree of standardization in the finished product. But so long as extras are used, only the broadest and most general price analyses can ignore them. Notation on the invoice by products would make possible a spot check from time to time to determine

whether published extras were in fact charged. Current reporting of aggregate extras for shipments by products into each consuming district would minimize improper interpretations of reported data.

The areas for which data—production, inventories, shipments, prices—should be published raises an administrative and a political issue, the question of disclosure. Irrespective of the ultimate decision, however, it is evident that actual reports should be made for each separate works or works group where several may be operated as an integrated unit. Monthly data would be ideal but the frequency of reports must be adjusted to the clerical burden imposed on reporting companies and on the agency chosen to aggregate and release the data. Quarterly reports would probably prove adequate for most purposes.

2 Appraisal of the Effectiveness of the Iron and Steel Schedules of the Census of Manufactures as Tools for the Analysis of Pricing Problems in the Industry

Research workers on price aspects of the industry would be greatly benefited if they had for reference a careful appraisal of existing census data. Such appraisal should indicate not only the limitations of usefulness of the data for certain problems but also methods for classifying existing data to the end that they could be made useful for recording more accurately the major trends in costs, values, and production.

Included in this project might also be recommendations for practicable modifications of the schedules. For example, it would be desirable to have incorporated in the schedules returned by the iron and steel industry detailed information on the value of important specific products sold by it. Information for identical products should be obtained under 'materials purchased' from the principal consuming industries. If possible, these data should be collected in such form that figures reported by the steel industry for a special product would be comparable with figures reported for the same product by the consuming industry, i.e., such items as transportation charges should be excluded or listed separately.

3 *Use and Effects on Pricing Structure of Standard Extras*

The book of extras and deductions constitutes a complex, arbitrary, and varying price system—a source of confusion in actual pricing and of potential discrimination among buyers. Published extras and deductions are practically identical among sellers at any given time, irrespective of type of mill or utilization of capacity. In actual pricing, however, extras constitute a fertile source of price concessions or price change without disturbing base prices. The entire significance of the base price quotation may be altered by varying the specification of steel to which it is applied.

The classification of products, determination of extras, and establishment of basing points for such product classifications may likewise be employed as a means of insulating 'products' arbitrarily in accordance with use and the character of markets to be served. For example, light plates, skelp, black plate for tinning, strip and sheet may be and often are rolled on the same mill. Arbitrary delimitations of width, length, size, and gauge serve to separate one from the other for pricing purposes. It is plain, of course, that the marketing conditions surrounding the manufacture and sale of black plate (a stage in the production of tinplate and, therefore, containers), for example, are quite different from those affecting sheet or strip (important raw materials of the automobile industry, among others). By insulating the one from the other, their respective base prices may be adjusted to the competitive pressures in their respective markets.

Finally, without alteration in base prices or extras but through variations in the American Society for Testing Materials standards for physical performance, tensile strength, tolerances, etc., the entire significance of price with relation to the requirements of consuming industries may be altered.

It may be assumed that a governmental agency undertaking this project would be intent upon improving the intelligibility of price data in the industry. Hence it would

be appropriate for such an agency to study the (1) historical development of the use of standardized extras in quoting steel prices; (2) extent to which such extras are indicative of attempts to adjust prices to varying costs; (3) extent to which they may be used to segregate products, manufactured under conditions of joint costs, according to the marketing conditions applicable to such products; (4) extent to which the significance of base prices for an analysis of the steel price structure is modified by the use of standardized extras.

The problem here presented is twofold. On the one hand, it involves the whole system of extras and deductions for any given steel product. What factors determine the base specification and variations in that base specification from time to time? Is the base specification characteristic in the sense that most sales are made in that range or is it adapted to the requirements of important consumers? Does the range of extras approximate the costs of off-base specifications or is it determined largely by factors other than the direct costs involved? (This question requires analysis according to the size and integration of works, type and rate of utilization of equipment. The extras are uniform among mills but the economic and technological conditions of production are different). Is it possible to devise a list of extras and deductions less cumbersome in detail and more revealing as to its true function?

On the other hand, product classification within the range of products rolled on a given mill should be analyzed with relation to the extras applicable. Is there sufficient variation in production costs or in applicable physical standards or tolerances to justify differential pricing? Is product differentiation of this type chiefly a means of obtaining the advantages of differing conditions of demand in various industries?

The issues suggested here are both broad and narrow. They are narrow in that the significance of extras for any given consumer or consuming industry can be measured approximately. The characteristic specifications of steel commodities required in that business over a period of

years can be ascertained and the variation in costs due to extras can be computed from the extra book. This change in cost would then be related to changes in the base prices for the steel commodities respectively and, by reference to the applicable standards, to changes in quality. The issue is extremely broad in that it involves the whole pattern of steel prices, potential price rigidity on an industry-wide scale, and the price relationship between large and small customers as well as between different consuming industries. This is clearly a problem for a governmental agency.

B PROJECTS SUITABLE FOR RESEARCH INSTITUTIONS

1 Competitive Repercussions of the Elimination of Interbasing Point Price Differentials and the Establishment of New Basing Points

In June 1938 the United States Steel Corporation, through the Carnegie-Illinois Steel Company, announced a price reduction at Pittsburgh and, at the same time, quoted prices at Birmingham and Chicago equal to those at Pittsburgh. This revolutionary action—the elimination of time honored interbasing point price differentials—precipitated a general readjustment of pricing points in the industry. A series of new basing points were set up by companies in their respective areas and, with negligible exceptions, the price quoted was identical with the Pittsburgh price. Thus new bases were established for plates at Cleveland, Youngstown, and at Claymont, Delaware. Cleveland, Youngstown, and Middletown, Ohio, became basing points for hot-rolled sheets, hot-rolled strip, and cold-rolled sheets while Chicago, Buffalo, and Sparrows Point were also made bases for sheets. Gary became a basing point for strip; Chicago and Buffalo for cold-rolled sheet; Cleveland and Chicago began to quote on cold-rolled strip. During the second quarter of the preceding year, 1937, the Granite City Steel Company had established a base at Granite City for several products including sheets, black plate, and tinplate. A slight price differential over other basing points, however, was retained at Granite City.

A study of the causes and consequences of the establishment of a basing point comprehends the economics of production and distribution and the whole gamut of competitive and monopolistic forces focusing in pricing policy. Fortunately, however, in many of the changes mentioned in the preceding paragraph, the location of a single large works at a given basing point, both before and after the change, allows a measure of isolation that makes possible fruitful research. Since in a delivered price system the establishment of a basing point at a company's works is not a prerequisite either to 'meet competition' or to make a price for any given customer or market area, the reason for setting up a base is far from evident. 'Excess' capacity for the product in question, low production costs, public opinion, advantages of simplification of pricing and selling within the basing point area,¹ pressure from influential customers, retaliation against prices quoted at existing bases, shifts in the major market for the output of the plant—these, or even more intangible factors like prestige, may dictate the decision.

In addition to the reasons for the changes in the system in June 1938 there are two broad studies (or groups of studies) suggested by the increase in the number of basing points and the concomitant elimination of most interbasing point price differentials. (1) Repercussions of the change in the pricing system on the competitive situation of particular consumers, consuming industries, or consuming regions. (2) Repercussions of the change in the pricing system on the competitive situation of the steel company or companies involved. Both subjects may be investigated on a comprehensive or narrow basis and, though different in approach, each project is but a phase of the larger problem—the economic significance of the establishment of a basing point.

¹ Given the prices quoted at existing basing points and assuming that delivered prices are strictly computed, each 'basing point area' might be delimited for any given product by an analysis of freight rates. When the 'formula' is honored in the breach (apparently, the normal situation for important customers at least), the labor involved in such a computation is not justified by the significance of the results. Some arbitrary definition of areas may prove reasonably satisfactory.

1) Pertinent data for the consumer approach would include statistics (preferably monthly or quarterly) on the consumption of steel by products during a period of years before and after the establishment of the basing point, showing (a) quantity of steel purchased; (b) delivered cost per unit; (c) source of steel purchased; (d) method of delivery of purchased steel; (e) other business or cost factors that might modify the significance of steel price changes during the period. Extras, if possible, should be separately distinguished and delivered costs less extras could then be compared over the period with delivered prices computed from published base prices and freight rates.

Basic queries this study should clarify are: Was the cost of steel substantially reduced to consuming industries in the regions affected by the establishment of the base or did the new base merely recognize a *de facto* price situation? What effect, if any, did the change have on the competitive advantage of local consuming industries; on the source from which steel was purchased; on steel purchases? Did the establishment of the new base affect in any way the method of delivery; the inventories of steel carried?

2) For the steel company approach, more detailed data would be required but the labor involved could be lightened by sampling (it being understood that some commodities for which the works had capacity but did not set up a base should be studied along with basing point commodities). (a) Product capacity, production, and rate of utilization of capacity by products should be ascertained throughout the period, including the charge for sample base and nonbase commodities, and results should be compared with those for the industry as a whole. (b) Distribution of shipments by products from the new base works to selected consuming districts should be compared before and after the change. (c) Mill-net prices received on shipments of particular products into particular areas should be compared over time and related to the average mill net on all shipments. (d) Shipments to particular customers or regions (cf. customer analysis above) should be analyzed. (e)

Changes, if any, in methods of delivery and selling or warehouse distribution, and in pertinent cost items should be studied. (f) Other reasons for or effects of the change might be ascertained from interviews or from company files, if available.

Major issues to be analyzed in this phase of the study may be suggested. Did the establishment of the base alter or materially affect the steel company's distribution of its shipments; its sales, amount of freight absorption or its mill-net price for steel; method of delivery? Was the base adopted in conformity with any substantial shift in the steel company's markets for particular products (i.e., regional specialization in its markets); the acquisition or development of important steel customers; any change in the freight rate structure; a reduction in its production costs; an increase in its capacity to produce particular products? Why was a base set up for some and not for other commodities manufactured? Was there any substantial difference in the company's 'excess' capacity for such commodities; the geographic distribution of its shipments of them; the size and concentration of consumers of those products; the method of distribution employed? At what point are possible economies of large scale production and utilization of capacity offset by high freight charges to consuming areas (i.e., freight absorption)?

The opportunity presented by the changes in June 1938 for a study of these issues in areas in which the forces at work may be most adequately isolated can best be realized if this project is undertaken by a research institution prepared to conduct its inquiry over an extended period.

2 Analysis of the Competitive Significance of Non-producing Basing Points

Some steel is produced on the Pacific Coast but the western seaboard states are supplied primarily by eastern mills. No steel is produced in the Southwest. Nevertheless basing points, for certain products, have been established on the Pacific Coast and at Gulf ports. The primary objective of

this project should be to inquire into (1) the reasons for the establishment of such basing points and (2) their effect on the price structure of the industry. The following queries will indicate the major issues involved.

1) Have the prices established at these basing points shown sensitivity to variations in the volume of imports in such regions?

Have these prices reflected variations in the prices at which imported steel was sold?

Is there evidence that prices established at these points were maintained with fixed differentials over prices at producing basing points, for example at Pittsburgh?

What evidence is there that other factors, e.g., competitive pressure of large buyers, may have determined price variations at these points?

2) To what extent has the chaotic price situation in the Southwest been caused by diversion in transit, at inland points, of products priced on a Gulf port base? (e.g., products sold on a Houston, Texas, base and shipped by rail from Chicago might be stopped at Dallas, for instance, at a price advantage equal to the freight rate from Houston to Dallas. Furthermore, products sold for delivery at Corpus Christi (water-rail via Houston) with rail freight allowed might be diverted at Houston. The net cost to the buyer would then be lower than the base price. The latter is customarily identical at all Gulf ports.)

3 Historical Behavior of Published Prices by Products: An Analysis of Similarities and Dissimilarities in Price Trends

A first step in price research in the iron and steel industry is to segregate from published price series or list prices those commodities which evidence similarities in fluctuations or trends over an extended period. Since trend is more important than cyclical variation for this purpose, the nominal character of published base prices may be ignored and the study confined to prices quoted at a single basing point. Because it alone is a basing point for most steel products,

Pittsburgh would be desirable. To ensure comparability in the quoted prices for each given product over time, however, changes in base specifications, in standard quality characteristics, and in extras would have to be ascertained and discounted.

The initial grouping of products in accordance with the degree of correlation in their price fluctuations and trends will itself pose questions, the answers to which are fundamental in any appraisal of price characteristics or price policy in the industry. Are commodities, similarly priced, commonly rolled on the same mill? Are they sold under similar competitive conditions? (By "similar competitive conditions" is meant the number, size, and geographical concentration of buyers, the ability of buyers to produce their own steel requirements; the economic availability of substitutes; the economic mobility of the product; the characteristic methods of distribution; the relative importance of steel cost in the price of the finished product; reciprocity between buyer and seller; etc.). Are iron and steel products, similarly priced, substitutes for one another in any important use or at any range of prices (e.g., pig iron and heavy melting scrap in the production of open-hearth steel)? Is the definition of products in any given group related to use and market requirements or to methods of production? For products manufactured in whole or in part on the same mill but displaying different price characteristics are there any special factors in production sufficient to explain their differences (e.g., special labor, raw material, processing, or handling costs)? Do products, originally rolled on different mills but subsequently rolled on the same mill (e.g., flat-rolled steel on the continuous mill), alter their price characteristics with changes in their methods of production? These questions are illustrative of many others relative to production, use, and distribution that should be raised to account for the dissimilarities as well as the similarities in historical price behavior.

It is apparent that this project may be made as wide or as narrow as the resources and the ability of the investigator

may dictate. In its broadest interpretation it necessarily overlaps other projects suggested in this section. In its more restricted sense, it could be confined primarily to a statistical analysis of relevant price, production, and man-hour data.

4 Reciprocity as a Factor in Pricing Policy

By reciprocity is meant all considerations that determine the purchase or sale of iron and steel products other than price or price concessions in the form of shading the base quotation, waving extras, granting rebates, or 'absorbing' freight.

Steel companies are large purchasers of a wide variety of products: raw materials—firebrick, coal, oil, gas, limestone, iron ore, various alloys, various metals, palm oil, and a host of others; equipment and construction materials for furnaces, rolling mills, warehouses, fabricating shops, and office buildings; services—transportation, public utility, financial, agency; and a multitude of consumers' goods and services for company retail stores and commissaries. At the same time steel companies sell many commodities only indirectly associated with steel—byproducts in the manufacture of coke or the operations of blast and open-hearth furnaces; coal produced in their own mines but not of proper grade or size for their own use, products further fabricated from iron or steel, etc., and provide a variety of specialized services such as engineering, laboratory testing, drafting, experimentation. Industries from which purchases are made are often themselves large users of steel in the form in which it leaves the rolling mills or of steel products in which the source of steel used may be specified by the purchaser. Here, then, is a fruitful field for the exercise of bargaining pressures through an allocation of steel company purchases among sellers who are in a position directly or indirectly to specify sources for the purchase of steel products. This power over the potential buyer of steel may frequently be a function of the size of the steel company and the variety of its operations—possibly an important

consideration in the development of huge corporations in the iron and steel industry.

Only a frank discussion with steel company sales executives and consumer purchasing agents or a thorough file search could be expected to illuminate this phase of sales policy. But the influence of reciprocity on pricing policy might be approached indirectly through an analysis of steel company purchases. To what extent do reciprocity deals alter the competitive relationships between large and small steel producers? In what industries is reciprocity relatively important and what steel products are most directly involved? Is there a significant difference in product price behavior where reciprocity is important and where it is negligible? Are there other factors that account for the price characteristics observed? Are prices more or less flexible where reciprocity is important?

5 Potential Price Control Through Vertical Integration of Production Processes

Vertical integration, for the present purpose, excludes the combination of processes involved in the manufacture of a rolled steel product in a single works or group of works (i.e., coke ovens, blast furnaces, open-hearth or bessemer furnaces, rolling mills). It also neglects operations characteristically carried on in the same works, such as galvanizing and tinning. It is concerned primarily with further-finishing operations like the manufacture of pipe and tubes, the drawing of wire and manufacture of wire products, the fabrication of bridges, structurals, etc., the construction of ships and barges, and the manufacture of culverts, roofing, and other steel products. These and other activities that require distinct breaks in the continuous integrated production of steel may be regarded as distinct industries. 'Integrated' steel companies dominate further-finishing processes, shipbuilding, and the structural industry. They are important factors in many other manufacturing activities. When steel companies, through purchase or otherwise, own or control important operating units in these steel-using

fields, vertical integration may have a profound effect on the competitive situation, both among steel companies and within the industry invaded, and on the level and stability of the prices of steel used in those industries. This project is important, then, both for an understanding of price and price policy for certain commodities and for an appraisal of competitive forces in the steel industry. The following questions will suggest some of the basic issues involved.

1) In terms of capacity, production, sales, size, and location of producing units, how important is each steel company in the particular industry invaded? What steel products are consumed by the industry in question and what proportion of the output of each steel product is customarily taken by it? What proportion of the steel products consumed in each such industry is supplied by the integrated steel company? Is there any evidence that the fabricating units or subsidiaries of the 'integrated' steel companies use their competitive power in the steel-consuming industry to capture the most desirable business or to force independents to purchase their steel requirements from themselves or their affiliated companies? Are the prices of steel commodities primarily sold to consuming industries in which integrated steel companies are a dominant factor more or less stable than those of commodities taken by 'independent' industries? Do relative price trends of such commodities reflect the competitive pressure of the integrated steel mills?

2) Has the margin between the prices of semi-finished or finished rolled steel (purchased as a raw material by non-integrated consumer-competitors) and the prices of the further-finished steel products widened or narrowed over time? Are there any cost factors that might account for the variations in the margin observed? (Contract rather than published base prices for steel purchased by non-integrated companies would be required accurately to determine these conversion margins.) Are the markets for the finished products of the non-integrated steel companies limited by the activities of fabricating units of integrated steel companies

in consuming industries? What economies, if any, are available in the vertical integration of further-finishing processes, fabrication, and manufacture with the production of rolled steel products? Is there anything in the location or operation of works or in the methods of sale and distribution that indicates that such potential economies are important considerations for management?

Like the analysis of new basing points, this project may be handled piecemeal from the viewpoint of individual consumers, consuming industries, or regions. Thus the scope of the project and the character of the investigation may be adapted to the resources and contacts of the investigator or research agency.

6. Price Competition in the Distribution of Steel Products with special reference to Mill Stocks

Most steel is distributed directly from the mill to destination in order to reduce handling charges to a minimum. Indirect distribution through jobbers or from jobber stocks is important primarily in further-finished products such as wire and wire products, pipe and tubes, galvanized and formed roofing products, which are used in relatively small quantities by ultimate consumers or consuming fabricators over wide areas, and in other steel products for fill-in orders and small users. Pipe and tubes traditionally have been distributed through consignment stocks, a practice probably extended to other products since the Code period. The operating margin of the independent jobber is derived from jobber discounts on some products, commissions on others, and the difference between large and small quantity prices (i.e., purchases in sufficient quantity to avoid extras for small quantity and to earn carload freight rates and sales in smaller quantities at extras above base prices). In certain areas, especially tonnage-deficit areas like the Southwest and the West, the large integrated steel companies have established mill warehouses from which shipments are made to jobbers and consumers in the areas served.

This project has two objectives, either of which may be

studied independently: (1) Pricing practices used in conjunction with mill stocks and consignment stocks may be used by the large integrated companies to undermine the competitive position of their smaller, more specialized rivals. (2) Such tactics further raise the issue whether distribution of steel products through mill warehouses and consigned stocks is more efficient or socially more desirable than through jobbers. A few of the major questions with which these investigations would be concerned are:

1) At what locations, on what dates, and by what companies have mill warehouses been established? What iron and steel products are stocked and what is the customary inventory of each? Are sales from warehouse stocks made to jobbers or to other customers or to both? Are prices the equivalent of mill or of warehouse prices? Are quantity extras usually charged? Is business solicited on a mill-price basis? What effect, if any, did the establishment of mill warehouses in the region studied have on the proportionate distribution of total regional sales and of sales to jobbers by integrated and non-integrated steel companies? What effect, if any, did mill warehouses have on the number and distribution of consignment stocks and the number of commodities sold on that basis? To what extent may chaotic price conditions in certain areas such as the Southwest be attributed to the use of mill stocks, consignment sales, vague or lax jobber classification? Have customers in the area benefited in price or service from the distribution methods employed?

2) Are the services performed by legitimate jobbers—warehousing, incidental fabricating, selling—in any way inferior to those performed by mill warehouses? Are the costs of operation for the former in any way greater or less than those of the latter? Does the use of consignment and mill stocks stimulate competition or does it increase distribution costs, price discrimination, and controlled sales?

The competitive impact of mill warehouse price policies on the jobber trade and on the relation of integrated to non-integrated steel companies might be studied in any

region, but it is especially important in those southern and western areas served primarily by eastern mills.

7. *Influence of the Freight Rate Structure on the Pricing of Iron and Steel Products*

The freight rate structure obviously affects the desirability of location for both steel mills and consuming industries and is an important factor in both the establishment of basing points and the determination of pricing policy followed at such points. Three phases of rate making particularly pertinent to steel price structure give rise to the following queries:

- 1) What is the extent of interterritorial freight rate discrimination? Are differential rates which depend on the direction of haul significant for the relative competitive position of steel mills in Pittsburgh and Birmingham, for example? Are zone rates in part responsible for the peculiar pricing system in Texas? Do long-haul as contrasted with short-haul rates modify the apparent competitive advantage of location of western mills in comparison with mills in the Pittsburgh-Youngstown districts? Is such modification of competition, particularly striking when the latter mills ship to western and southern markets via rail-water routes? To what extent are steel company owned railroads, barges, and steamships used to force rate concessions from railroads?
- 2) What is the effect of fabrication-in-transit rates on the competitive position of fabricators? To what extent does the practice of shifting inbound bills of lading, so as to maximize freight rebates, effectively exclude some steel mills from supplying certain fabricators on certain projects? To what extent does this practice give 'outside' fabricators a competitive advantage over local fabricators? To what extent has this practice forced price concessions equivalent to the fabrication-in-transit privilege? Does a significant amount of 'cross hauling' result from the practice? Has this practice been an important stimulus to the invasion of the fabricating industry by steel producing companies?
- 3) What is the effect on the steel price structure of

freight rebates on products manufactured for export? This query is particularly pertinent with respect to prices of tin-plate and black plate used in the manufacture of containers.

It is obvious that this project might be limited, if desired. For example, a study might be based on the operations even of an individual fabricating concern. Answers to the questions in section (2) above could then be sought in a study of the firm's sources of steel and its markets over a given period.

8 Competitive Significance of the Price and Quality of Iron and Steel Scrap

Although scrap may be substituted for iron ore in the blast furnace with a consequent saving of coke and flux as well as ore, its major importance in the steel industry lies in its partial or complete displacement of pig iron in the manufacture of steel. Other conditions being favorable, a charge of 80 per cent scrap in an open-hearth furnace is common and some plants run almost entirely on scrap. Limiting factors in the substitution of scrap for ore or pig iron are the relative prices of each, the supply of scrap of known chemical composition, the volume of steel ingots produced, and the technical characteristics of installed equipment. This project, therefore, is concerned primarily with three basic trends in the industry: (1) operating practice as modified by relative prices of ore and scrap, pig iron and scrap, and volume of steel ingots produced; (2) changes in the supply of scrap of known chemical composition as compared with shifts in production from heavy to light steel products and from carbon to alloy steels; (3) the competitive significance of these trends for integrated versus semi-integrated works, for the determination of advantageous location of steel works, and for price competition among rolled steel products.

These broad objectives of the study suggest certain lines of investigation illustrated in the following groups of questions.

- 1) What has been the ratio of the production of pig iron

for steel-making purposes to the total production of steel ingots—open-hearth, bessemer, and electric—since the beginning of the century? (These data should be compiled on a monthly basis.) What has been the ratio of the heavy melting scrap price to the price of pig iron and how is it correlated with the amount of scrap used relative to the total output of steel ingots? What has been the ratio of iron ore used to the output of pig iron? Does this ratio reflect blast furnace practice in the use of scrap? What limitations of relative cost, of technical operating conditions, or of other factors limit the use of scrap in the blast furnace? in the open-hearth furnace? in the electric or open-hearth furnace in the manufacture of alloy steel? To what extent has scrap been substituted for other materials in the production of alloy steel?

2) Of the total scrap used what has been the proportion of home-produced to purchased scrap over time? of carbon and alloy scrap? What has been the trend in supply of scrap of various known chemical specifications (i.e., carbon and various alloys)? To what extent is supply correlated with production of these respective classes of steel? What is modern practice in the segregation of scrap among scrap dealers and from what sources is scrap collected?

3) What has been the trend in the number of works operated entirely or predominantly on scrap? What reduction does the construction of works designed to operate substantially on scrap alone effect in the minimum efficient capacity of plant? in the total investment in plant? in the location of plant? Is there any evidence of increased price competition among steel mills because of the use of scrap, either through reduced costs or increased decentralization of works location? What influence, if any, has the increasing use of scrap had on the control or ownership of ore properties by integrated steel companies? on the beneficiation of ores? on the economic availability of ores?

Although the potentially revolutionary implications in the use of scrap render it desirable that this project be con-

ducted along a broad front by a research institution, certain phases might be investigated by a qualified individual.

9 The Flow of Capital, including the Growth and Decline of Firms, and the Direction of New Investment in Particular Products and Areas relative to Changes in Prices, Pricing Patterns, Production, and Major Technological Developments

Parts of this project would carry investigators beyond the field of prices proper, but it should be conducted with major emphasis upon the relation of prices, price policies, and price patterns to the flow of capital. The study would involve an attempt to answer the following questions, among others:

- 1) Has the source of new capital in the industry been predominantly reinvested earnings, borrowed capital, or share capital?
- 2) Has the rate of flow of new capital been correlated more nearly with price changes, shifts in demand, or technological innovations?
- 3) To what extent have individual firms lost their corporate existence or their corporate independence?
- 4) To what extent has the capacity of such firms been eliminated?
- 5) To what extent has new investment taken the form of increases in existing capacity at existing locations?
- 6) To what extent has new investment led to shifts in capacity at basing point vs. nonbasing point locations?
- 7) To what extent has the direction of new investment been influenced by changes in markets, transportation, prices and availability of raw materials and labor?

This project should be divided into studies on a regional, finished product, and an integration basis (i.e., the relation between finished rolled products, semi-finished rolled products, ingots, and pig iron).

Although some of the individual questions raised by this project might be undertaken by one investigator working

alone, the complexity of the issues and the evident need for industry co-operation would suggest that the project as a whole would require the staff of a recognized research institution.

10 Changes in Corporate Structure and in the Degree and Types of Integration in relation to Prices, Pricing Patterns, and Production

This study contemplates a twofold objective: It essays primarily to appraise trends in concentration of financial control and internal organization of firms for production and sales. Further, so far as may be possible it would deal with the claims and evidence of relative economies of integration, specialization, size, and distribution efficiency, to indicate whether and how far industrial concentration has been dictated by financial motives associated with monopoly control and how far by operating economies. Special attention should be given the following aspects of this problem:

1) Outright ownership, interlocking directorates, intercompany investments, intermanagerial agreements among iron and steel companies and agreements between these companies and (a) their sources of raw material such as coal, iron, scrap suppliers; (b) consumers of their byproducts such as utility, chemical, fertilizer, and cement companies; (c) consumers of their steel products.

2) Community of interest in common banking connections (with or without representation) as well as possible ties between these banking groups.

3) The effect, if any, of patented processes on iron and steel prices.

The investigating agency should have sufficient financial support to conduct a field study supplemented by questionnaires in addition to the examination of governmental and other documents.

11 The Influence of the Byproduct Coke Oven on the Location, Amount, and Concentration of Capacity; the De-

gree of Integration; Production and Pricing Patterns in the Iron and Steel Industry

This project requires specialized knowledge and some industry co-operation for success. It might, therefore, be properly carried out by a research institution.

12 Influence of the Continuous Rolling Mill on the Location, Amount, and Concentration of Capacity; the Degree of Integration; Production and Pricing Patterns in the Iron and Steel Industry

Changes in basing points for hot-rolled sheet and strip in July 1938 were apparently influenced by the installation of continuous mills for making these products.

Probably this project could be carried out successfully only if conducted by trained research workers under competent direction. Hence it is suggested that it be undertaken by an institution rather than by an individual.

C PROJECTS SUITABLE FOR INDIVIDUAL RESEARCH WORKERS

The projects listed below could be undertaken by individual research workers. They are intended to be suggestive of the type of research that would enhance economists' knowledge of the price structure and pricing policy in the industry. In each instance the individual research worker would expand or restrict his investigation in accordance with the funds and data available.

Interbasing point price differentials

In view of the more thorough analysis of this subject included in research project B-1 above, this study is suggested primarily as a statistical analysis by products of the quoted price differentials over a considerable period.

Changes in quality of a given steel product relative to changes in its price, i.e., its base price and the extras applicable, over a given period

An outstanding illustration of quality change is found in rails, especially in the development of lighter and more durable rails through the use of alloys and of welding. Similar changes

in structural steel may alter profoundly the character of the so-called heavy steel industry.

The relation of wages, materials, etc. to prices (as developed from Census data)

Price differentials between semifinished and finished products especially in relation to changes in integration, e.g., a study of conversion margins .

Changes in terms and conditions of contracts for various iron and steel products as related to pricing policies or pricing patterns (an historical study)

For example, contract prices for tin containers, covering packers' requirements over three to five years, are determined by formula from the published price of tinplate. There is, therefore, little advantage to can manufacturers in attempting to force a reduction in the published price of tinplate. This is probably a significant factor in the relative rigidity of tinplate prices.

Theoretical vs. practical capacity in relation to changes in prices

The relation between tariffs and prices of some particular steel product

For example, over what area would a reduction in existing tariffs extend the shipments of the imported steel product? How important is the marketing area thus affected to domestic steel companies?

V

ANALYSIS OF

TWO IMPORTANT RESEARCH PROJECTS

IN THIS chapter we discuss the details of two projects that seem particularly important (though not necessarily immediately practicable): (1) effect of the basing point price practice upon regional economic development; (2) elasticity of demand for individual iron and steel products. By an intensive analysis of these two problems it is hoped to illustrate the difficulties that beset price research in this field. Needed data are not available and in many cases do not

exist. In order to collect (or prepare) the essential information, the co-operation of the industry and, perhaps, of governmental agencies must be secured. The two problems here outlined are likely to prove enlightening to the economist, practically useful to the industrialist, and significant to those concerned with broad social considerations.

EFFECT OF THE BASING POINT PRICE PRACTICE
UPON REGIONAL ECONOMIC DEVELOPMENT

No study of iron and steel prices can ignore basing point pricing and its effects on the relative competitive advantage of consuming industries, the economic development of regions, the efficiency of production and distribution of iron and steel products, and the general level of iron and steel prices. It should be recognized, however, that the basing point practice is but one element in the complex of selling conditions, which also includes rate books, official territories, etc.

This is not one but a series of fundamental economic problems associated with the multiple basing point system of pricing. These problems have their origin in price discrimination—differences in the mill-net price of steel—in-avoidable under any system of pricing other than sale at the mill door at prices uniform for all buyers purchasing under similar conditions.

Under any given basing point system, price discrimination by products may indicate: (1) the relative desirability to the dominant interests in the industry of one selection of basing points as opposed to another; (2) the market areas in which discrimination is revealed (which provides a factual basis on which to devise a corrective); (3) the extent to which there may be cross-hauling and therefore economic waste; (4) the extent to which the general level of prices of the products in question may be affected by the method of pricing.

Drastic changes in summer 1938 increased the number of basing points and substantially reduced the differential between Pittsburgh and other basing points. Although these

changes reduce the amount of 'phantom freight' in the delivered price (and, therefore, meet one of the objections to the pricing system), the essential character of the basing point method (i.e., delivered price quotations and freight absorption) is unchanged and the major research problems remain. Instead of removing these problems, these recent changes offer a valuable opportunity to study them by observing the effects of changes in price discrimination upon the above mentioned production and consumption conditions.

In discussing these problems, emphasis is placed upon the (1) dearth of relevant data, (2) influence of a basing point system on consumer location, (3) effect upon producer location.

Dearth of data

Data that would make possible such an analysis of the existing basing point system for any given product or group of products are not available.

1) The data required for a factual picture of discrimination are shipments from individual mills or groups of mills (within a given basing point area) to destination (at least by states and preferably by smaller areas) showing the amount and type of each product according to: (a) the basing point on which price was calculated; (b) whether actual freight paid the railroad was greater than, equal to, or less than the freight charges added in the delivered price. Since these data would be available only in aggregated amounts covering a series of shipments, an internal check on their accuracy as well as their significance could be provided only by requiring for each classification the aggregate amount of extras included in the aggregate price shown. Such information has never been assembled. The NRA made a start in this direction when it secured the co-operation of most steel producers, within 50 miles air-line of Pittsburgh, who provided shipment data for three months during 1934 (issued as Supplement 1 to the NRA Report on the Basing Point System). But by failing to secure a

product differentiation or even a classification according to equality between freight paid the railroad and freight added to the basing point price, not to mention the amount of extras in the price aggregates given, the data were too ambiguous for definitive analysis.

2) The data indicated under (1) would make it possible to determine (a) the percentage of total shipments for which freight added in the delivered price was equal to, greater than, or less than the actual freight charges; (b) the percentage of total shipments for which the mill-net was less than, equal to, or greater than the base price at the nearest basing point; (c) the locations at which these aspects of discrimination revealed themselves; (d) the amount and direction of actual market area interpenetration, i.e., the extent of cross-hauling.

A further correction of the data is required if one would distinguish between special allowances provided in the prices quoted on sales of certain products within given areas and low mill-nets voluntarily accepted through a willingness to absorb freight charges.

Effect on consumer's locational advantages

The impact of a given basing point system upon the relative competitive advantage of consumers' locations involves both an historical and analytical approach. One phase of an historical study of the influence of a basing point system that has long affected consumers' location of plants would give attention to the original natural advantages and the modification thereof introduced by the general system of prices that existed before the summer of 1938. Another aspect of an historical study could be framed in terms of the effects of changes in the number of basing points and in the differentials among basing points upon the locational advantages of major consumers. The changes of the summer of 1938 are particularly suitable for such an historical study because they were sudden, comprehensive, and drastic. These changes will be expected to confer advantages on some consuming plants and disadvantages on others. So

far as the previously existing price structure may have conditioned consumers' location or expansion of productive facilities, the effects of these changes on profitability of operations are clearly fortuitous. An analysis of the net effect upon competitive advantages and upon subsequent location or expansion of facilities will provide historical evidence of the repercussions of a basing point system upon the regional development of consuming industries.

An analytical approach to this problem might also be attempted. If data were available the computation of phantom freight in the delivered price at any given consumer's location is straightforward enough. The extent to which freight charges from basing point to place of delivery included in the delivered price *exceed* actual transportation costs from the mill to the place of consumption via the medium actually used will measure the amount of phantom freight. Whether the price paid for a product at a given consumer's location would, under an f.o.b. mill system, differ from the delivered price under a basing system depends in the long run not alone on the amount of phantom freight but also on (1) relative assembly costs of materials and production costs at the mill location; (2) the size of the consuming area that may be reached at a price advantage over other mills; (3) the relative importance of this 'natural' market area as defined by (2) to other mills concentrated, by reason of assembly costs or other factors, in areas within which demand is inadequate to support capacity; (4) the extent to which the mill is forced consequently to give effect to its total influence on price, irrespective of its existing cost situation, in determining its pricing policy. Examination of the adjustments of rival producers to the recent changes in basing point differentials will provide important evidence.

Research along the lines suggested in this section would contribute to an understanding of the following problems associated with the price structure in iron and steel: (1) the effect of iron and steel pricing policies and methods on the prices of other products; (2) the extent to which the basing point system does in fact affect the location of consuming

industries and the use of transport media other than railroads; (3) the extent to which the cost of crosshauling may be offset by a saving in inventory and storage costs; (4) the economic effects upon consuming industries of expanding or altering the list of established basing points.

With proper direction by a large research organization to ensure a unified aim and proper scope, these studies could be undertaken on a regional, an industry, or even a plant basis and therefore might be adjusted to the research facilities of a university bureau or even to the resources of a graduate student.

Effect on producer's locational advantages

A further problem associated with the effects of the basing point practice concerns the relative advantage of basing point and non-basing point location for the iron and steel producer. A basing point system may protect investment in steel producing capacity and even stimulate its expansion in existing location and obstruct the growth of capacity at points economically more desirable. On the other hand, especially as the number of basing points increases, a location away from a basing point may prove financially advantageous.

1) The analysis of this problem is rendered extremely difficult not only because of the lack of data on costs, regional production, regional sales, and mill-net prices, but also because of long use of basing point differentials and freight differentials which conditioned the erection and extension of productive capacity. The utilization of productive capacity for specific products in various basing point and non-basing point regions over a period of years could not, in itself, be expected to provide a measure of relative advantage of location but, if modified by data showing the average mill-net price received for each product, it would constitute an important step in the analysis. If, at the same rate of utilization, mills within basing point areas received a higher mill-net, there would be a presumptive advantage in basing point location assuming substantially equal costs. The opposite result, however, would not justify a presumptive

advantage in the non-basing point location until correction had been made for differences in assembly and production costs in the respective regions.

2) Capacity in the immediate vicinity of a given consuming area may enjoy a high rate of utilization from local demand; yet the dispersion of the rest of the market may be such as to preclude any further concentration of capacity in this area under either a basing point or a mill base system. The consideration of this further factor necessitates a distinction between pig iron, steel making, and rolling mill capacities, and the economies of their interrelation. In the location of facilities for production of the finished product two factors are important: (a) the economic mobility of the product increases as its value increases relative to its bulk and transportation charges become a smaller proportion of its value; (b) the product becomes more specialized to a particular use and the capacity devoted to its production is consequently more subject to risk of uneconomic utilization with changes in demand. The first factor encourages a wider dispersion of non-integrated and semi-integrated firms (especially since the development of an adequate scrap market and the consequent freedom from excessive pig iron transport charges). The second factor encourages a greater expansion of rolling capacity in the immediate vicinity of existing iron- and steel-making capacity, because variety of rolling facilities allow a high utilization of steel- and iron-making capacity independent of changes in demand (not to mention economies in heat conservation). Hence the economy of mill location depends only in part on relative assembly costs and the magnitude of local demand for a particular product. It depends further on the conformation of the market for each product and for the group of products that may economically be produced together. For example, the recent expansion of rolling capacity in the Pittsburgh or Chicago District may reflect the economies associated with integration and the advantage of Pittsburgh or Chicago location relative to the market for no one of the finished products but, on the average, for the group.

The fundamental changes in the differentials among basing points in the summer of 1938 provide an opportunity to study the size and configuration of consuming areas for particular iron and steel products in relation to location and concentration of production capacity by analyzing differences in regional costs, production, shipments, and mill-net prices associated with two price structures. Such a study cannot be made, however, unless production, cost, and shipment data by products and consuming areas are available. Furthermore, it must take cognizance of different effects associated with different stages in the production process and different degrees of integration.

ELASTICITY OF DEMAND FOR IRON AND STEEL PRODUCTS

Although producers may make rough estimates of the probable effects upon sales of slight changes in price, demand elasticity is probably one of the most vacuous of our 'empty economic boxes' in the industry. A knowledge of demand elasticity would be helpful in understanding: (1) the behavior of prices of iron and steel products under either competitive or monopolistic conditions; (2) the relation of steel prices to other prices and to productive and distributive processes in the economy as a whole; (3) the appropriate regulatory policies required to protect the public interest. Such an analysis of demand elasticity might also be expected to yield results of value to the industry.¹

¹ In undertaking an analysis of demand elasticity confusion will be obviated if several kinds of demand phenomena are sharply distinguished:

- 1) Elasticity in demand, i.e., the relation between increments in price and in quantity sold at various points on a given demand schedule.
- 2) Changes in the elasticity of demand, i.e., changes in the shape or slope of the schedule. The demand for steel may be less sensitive to changes in price at some phases in the business cycle than at others.
- 3) A cyclical shift in the position of an entire demand schedule, such as is noticeable in the course of a business cycle in the steel industry, when the quantity taken at a given price increases.
- 4) A long term shift in the position of the entire schedule such as transcended cyclical fluctuations during the expansion of demand between 1860 and 1929.

To be meaningful a study of demand elasticity must be in terms of individual iron and steel products, or of a closely related group of products for which the conditions of production, distribution, and demand are similar.

Demand elasticity may be approached in two ways: (1) a correlation analysis of the variation in quantity taken, which is associated with the variation in price of a given steel product; (2) an analysis of the reciprocal substitution of a given steel product for both competing and completing goods as affected by variations in their prices.

Correlation analysis

Statistical analysis of demand elasticity is beset by many difficulties. In the first place, data relating to the actual prices of given steel products are imperfect and inadequate. Under the NRA Steel Code, with uniform extras, filed base prices, and enforced regulations governing transport media and special adjustments, delivered prices could be estimated from known base prices. With respect to conditions existing before the Code and since its demise, accurate estimates are impossible.

This condition may be illustrated by pointing out the assumptions that R. H. Whitman had to make in a study of demand reported in *The Statistical Law of Demand for Producers' Goods as Illustrated by the Demand for Steel* (*Econometrica*, Vol. IV, No. 2, p. 138, 1936). These remarks are not a criticism of Mr. Whitman who himself recognized the limitations of his analysis. In the absence of actual price data, Mr. Whitman was forced to use the composite price of finished steel products published in *Iron Age* and, in lieu of actual sales data, the monthly figures of steel ingot production, corrected by unfilled orders, as published by the United States Steel Corporation. The finished steel composite is a simple arithmetic average of prices at Pittsburgh of "steel bars, beams, tank plates, wire, rails, black pipe, sheets, and hot-rolled strips". Before the Code period these were not filed prices; they represented the judgment of that trade journal's representative as to the going price. They

were recognized as nominal; important producers could purchase steel from \$2 to \$4 per ton less than the published price. Even if accurate as base prices, they did not represent actual cost to the consumer, for this would vary with the extras, imposed or waived, relative to quantity or specification and with the transportation charges, made or absorbed by the mills, used in calculating delivered price. Even if accurate in all these respects, they could hardly be considered as motivating total 'sales' unless it could be assumed that interbasing point differentials did not change; in other words, that changes in Pittsburgh prices accurately measured changes at all basing points. Finally, as an unweighted average, it had to be assumed not only that the prices of products included in the index were representative of steel prices generally, which was dubious, but also that no shifts in demand from one type of steel to another had taken place over the period studied, which was demonstrably false.

A second obstacle to correlation analysis of demand is that it is not possible to ascertain the actual production, shipment, or sale of a given steel product on a monthly basis. Sales data have never been divulged by the industry, even to its Code Authority, except in lump form for the calculation of relative voting power under the Code (hereafter to be destroyed without record). Production data are available on an annual basis alone, and shipments by products according to destination have been assembled only for special purposes.²

The difficulties encountered by Mr. Whitman illustrate this obstacle also. An index of 'sales' derived from monthly production of steel ingots corrected by unfilled orders is equally ambiguous. Without attempting to be exhaustive, we may mention the following difficulties: (1) the steel ingot

² E.g., in the Bethlehem-Lackawanna Case before the Federal Trade Commission, by the Association of Flat-Rolled Steel Manufacturers for their members over certain years (now discontinued), and for the NRA for three months in 1934 (these, however, were not byproducts and were for mills in the Pittsburgh area alone). Destination in all three instances was defined in terms of a wide geographic area, usually by states.

is a raw material for all other finished steel products, the production of each of which varies in quantity, according to conversion losses associated with further processing, and in value, according to the labor and processing associated with finishing operations and requirements; (2) steel is usually purchased on a contract basis, the contract being regarded by both parties as an option within maximum and minimum amounts to be taken up or not within the contract period (usually three months, although often longer) at either the contract or the going price, whichever is lower, at the time at which specifications are issued by the customer. Actual shipments are not billed at the price existing at the time of shipment or at the price existing when actual specifications were issued by consumers unless the price trend has been downward. Specifications are issued more nearly with reference to the expected trend of prices (and sometimes price changes have been announced a month in advance) rather than with reference to actual prices. This imparts an apparently inverse character to production data—an increase with a rise in price, a decrease with a fall—which is a result of the contract relations on the one hand and the derived nature of the demand for steel on the other, and is properly associated not with true elasticity but with speculation; (3) finally, it has been the practice of many steel companies to quote special price concessions to jobbers during off-peak periods which would confuse the relation of either production or shipment data to apparent price.

A third difficulty is encountered in the form of complex intermarket relationships. Even if a single mill or group of mills could be prevailed upon to provide the necessary price and sales data, the effect of price change upon the quantity sold would be inextricably merged with the phenomenon of market interpenetration.

Finally, if all the foregoing difficulties could be overcome, one would still be confronted with problems associated with contract sales, speculative buying, and changes in the underlying conditions of demand for the products in which steel is used.

If, however, the problem of data could be overcome through co-operation with the steel industry, it might be possible to show the effect of various pricing policies on cyclical shifts in steel demand and, therefore, on the price policy that promotes stability of steel consumption.

Substitution analysis

An analysis of substitutability provides another and distinct possibility of approaching the problem of demand elasticity. Here the answer sought is of a quite different nature than that just discussed, but the difficulties presented by such an approach also seem great.

A basic condition underlying the demand function of a given steel product is the existence, economic importance, and displacement potentialities of available substitutes. In studying this phenomenon it is essential to study substitution as it relates to an individual product, rather than to iron and steel as a whole. The industry produces a multitude of products that are not comparable either in the economics of their production and distribution or in the circumstances that condition their demand. No significant result can be derived from an analysis that ignores these differences. Even the demand for a single type of product (e.g., steel sheets) cannot be treated as a unit, since substitutability for galvanized sheets in the form of roofing products differs basically from that for automobile sheets. The analysis must, therefore, be conducted on a product basis, 'product' being defined not in terms of broad categories but in terms of basic characteristics of production and use.

Analysis of substitution as it pertains to a particular steel product involves such questions as:

- 1) What amount of the product (including conversion losses) is used in the production of major finished products for which the steel product is a raw material? (Some rough attempts have been made to obtain such information by certain individuals and by the Association of National Flat-Rolled Steel Manufacturers)

2) What quantities of other products could be substituted for steel or vice versa, in view of their respective technical characteristics and the technical requirements of the finished product? Although an engineering problem, its solution is essential to indicate the economic range of substitution. Costs incidental to the use of substitutes, such as special equipment or labor costs, must be ascertained as well as the degree of inflexibility in the required equipment adjustments and also the compensating quality differentials.

3) What are the conditions of demand and supply of competing or completing products? What are the actual limits of variability in the prices of these substitutes? To what extent do the prices of substitutes fluctuate synchronously with the price of the steel product? Answers to these questions would contribute to a determination of the probable range of substitution.

4) What effect could a given change in the price of a steel product be expected to have on the price of finished products?

5) What is the probable elasticity of demand for the finished products in the production of which the steel product is used?

6) What are the differential costs associated with production of the steel product at various rates of output? This information, at present unavailable, would provide a basis for determining the extent to which steel prices might be made flexible in the short run if such a policy were justified by conditions of demand.

A program of price research directed along the lines indicated above would encounter obvious difficulties because of dearth of needed data and because of the important role played by engineering estimates and forecasts of technological changes. There is some promise, however, that it might prove a feasible approach to the study of demand. Co-operation of the industry would be needed in obtaining data. Such a project would be of value only if it were broad in scope, thorough in treatment, and conducted by a compe-

tent group of properly trained investigators. It would have to be sponsored by a large and accredited research organization, although some phases, such as the price characteristics of substitute products, could be handled by smaller research agencies.

VI

OUTLINE OF PRICE RESEARCH PROBLEMS

THE two preceding chapters have dealt with selected research projects believed to be feasible with materials at present available to research workers. In this chapter an attempt is made to present a somewhat more comprehensive program of price research in this industry. This program, although not complete,¹ will nevertheless suggest in orderly form certain important research projects. It is hoped that such an outline will serve as a general guide to price research in iron and steel, and will indicate the nature of the difficulties that confront research workers in this field.

Both the general program for research and the separate problems into which it logically divides have been formulated without regard to the immediate practicability of an attempt to carry out the program suggested. In certain instances the requisite data simply do not exist; in more instances the data are to be found only in company files, where they are recorded in such form that enormous labor would be required to summarize them in terms suitable for research problems. The great variety of products, conditions of sale, etc., moreover, will make it necessary to scale down many of the problems by restricting them to a few important product classes, territories, etc. The likelihood of obtaining such information from steel company executives

¹ W. L. Thorp suggests that price research should be focused upon three fundamental issues: (1) the factors that determine price, (2) the characteristics of the resulting price, (3) the impact of such prices on other elements of the economic system. To apply this threefold objective exhaustively to any broad economic problem associated with prices in the iron and steel industry would entail an analysis of virtually every phase of production and distribution of iron and steel, if not of the economic system as a whole.

must be carefully appraised by the individuals or institutions that elect to attempt research of this type.

GENERAL PATTERNS

Prices have been classified according to the pattern of their behavior into flexible and inflexible. Although the class in which any given commodity is placed depends upon the position of an arbitrarily drawn dividing line, and upon the methods employed to measure flexibility, the criterion of classification is clear: namely, the frequency and magnitude of temporal changes in price. The prices of certain steel products are frequently cited as examples of relatively inflexible prices. Further study of the methods of measuring flexibility and the extent of variation in flexibility among various iron and steel products seems a promising field.

Prices may be classified also according to another behavior characteristic, the degree of monopoly control over the sale of the product. Here again the criterion is clear: namely substitutability among products and the number of sellers in a given market. There is practical absence of substitutes and a single seller at the monopoly pole, product homogeneity and a number of sellers so great that each has a negligible effect upon the total supply function at the competitive pole.² Between these two extremes lies the normal's land of imperfect or monopolistic competition. And it is one of the problems of price research in the steel industry to determine the position, in this uncertain area, of each steel product. This position probably varies not only with the product but also with the customer type, geographic region, phase of the cycle, etc. These two classifications are often confused. The distinction should be kept sharp between classification on the basis of the frequency and magnitude of price change and on the basis of the degree of monopoly control. The strength and nature of the relation between inflexible and administered prices should not be merely assumed; it should rather be made the subject of price research.

² A classification may also be set upon the basis of the number and independence of buyers, that is, the degree of monopoly control over purchasing.

SOME CHARACTERISTICS OF THE PRICE STRUCTURE IN THE
IRON AND STEEL INDUSTRY

Behavior of prices as reflected in price relations and patterns

The general character of price behavior of the various iron and steel products at each producing point as indicated by the following considerations:

Definition of the price of steel

Methods of price quotations (e.g., delivered vs. mill, with extras vs. without extras)

Relation of actual to quoted prices (i.e., what prices actually are or have been)

Magnitude and frequency of change over time

Degree of imperfection of competition

Price relations as indicated by the price differentiation among:

Products (i.e., blast furnace products, tonnage steels)

Producing points

Consuming territories

Marketing agencies

Consumers

Cost and pricing

What are the relations between assembly costs and price differentials among regions and products?

What is the effect of relatively heavy overhead cost upon pricing policies?

How are overhead costs allocated in deciding prices for jointly produced commodities?

How do economies of large scale production influence the price structure?

What is the effect of technological improvements on prices, e.g., the revolutionary reduction of cost accomplished by a continuous strip mill?

What is the effect of distribution cost-price relationships?

How have economies in standardization affected prices?

How are uniform extras related to costs?

Characteristics of the industry structure that affect prices

What effects of integration in production and sales are discernible in prices?

What effects of geographic and corporate concentration of production are evident in prices?

What are the effects upon pricing policy of ease of price-quality comparisons and great importance of material price savings to most buyers?

What is the expected behavior of prices, given assumed conditions of demand and cost, under competitive and monopoly conditions?

What repercussions on the price structure are traceable to concentration of demand both corporate (e.g., large automobile producers) and geographic (e.g., Chicago consumption area)?

What effects has the type of marketing organization upon prices?

What are the price effects of large buyers such as automobile companies who are in a position to impose monopoly conditions?

Procedure in determining pricing policy

What executives within the company are most influential in formulating its pricing policy?

What kinds of investigation are pertinent for setting prices?

What sorts of studies are actually made for price setting purposes:

Demand analyses?

Cost analyses?

Appraisal of competitive situation?

PROBLEMS OF THE INDUSTRY INVOLVING PRICE RELATIONSHIPS CONSIDERED WITH REFERENCE TO THE BUSINESS INTERESTS OF THE INDUSTRY

Relation of price to quantity sold (i.e., the elasticity of demand by products)

What change in the quantity of a steel product sold by a given producer can be expected from a given reduction in its price?

What is the resulting relationship between marginal receipts and rate of output?

To what extent will an increase in quantity sold represent penetration of competitors' markets?

How responsive are buyers to price differences among

sellers (i.e., how great is the incentive to price competition)?

Could the advantage be gained more effectively and kept longer through secret concessions than by announced price cuts?

How long could such a competitive advantage be expected to last?

To what extent will an increase in quantity sold represent encroachment upon the demand for substitutes as a (1) producers' good, (2) consumers' good?

To what extent will the increase in quantity sold represent a net increase in consumer demand?

Is the finished steel product a consumers' or a producers' good?

What is the elasticity of demand for the finished product in the production of which steel is a raw material?

What is the ratio of the cost of steel to the price of those finished products for which steel is a raw material?

What is the degree of price flexibility of cost items other than steel that enter into production of goods for which steel is a raw material?

Relation of price to variations in cost

How does the cost of producing a steel product vary with the rate of output?

Which items of cost are relatively constant and which are relatively variable as a function of output?

What are the effects of relatively large and relatively small changes in output rate upon the degree of variability of the several cost constituents?

What are the differential costs of production at various rates of output?

What is the relation of prices and profits to the rate of output for plants, for companies, and for the industry as a whole?

To what extent do the costs of producing a given product vary among mills?

What is the reported variation in various kinds of cost and cost components?

To what extent are cost differences among mills attributable to differences in accounting procedures?

To what extent do they represent differences in evaluating differential advantages (i.e., ore deposits, plants, managerial skills, etc.)?

To what extent are they caused by variation in technological obsolescence?

To what extent does cost variation correspond to price differences in uniform extras (e.g., quantity, size, width)?

What is the range of differences for each characteristic reported among mills?

Is there a central tendency (average differences) pronounced enough to be significant? Is it related to the corresponding extra?

What factors explain variation from the average differential?

Relation of price structure to production capacity and utilization

What effect will the recent change in price structure have upon the relative competitive advantage of existing mill locations?

Will these effects tend to initiate or preclude changes in installed capacity or cause changes in the rate of utilization?

What repercussions will such changes in capacity or utilization have upon the price structure itself?

Relation of price structure to technological changes

What effect will a given price structure have upon the incentive for technological research and the exploitation of technical advances?

What effects have technological changes upon the levels of steel prices and the price differentials among products, areas, and customers?

Effect of marketing mechanisms on prices

What are the effects upon the price structure of variation in market functions such as:

Credit facilities

Transportation media

Storage (e.g., warehousing vs. non-warehousing middlemen)

What are the effects upon the price structure of variation in

the degree of producer control over distribution (e.g., mill-controlled outlets, consignments, agency relationships)?
What effects have efforts to preserve the existing price structure had upon distribution organization and market practices?

Effect of production organization on prices

What effects has price leadership had upon the competitive methods of smaller independents?

To what extent have they been led to emphasize product differentiation, service, friendship, etc.?

To what extent do they have compensating advantages in flexibility, lower ratio of fixed costs, etc.?

What effects upon the price structure grow out of the complex competitive relationship between non-integrated producers of finished products and their supplier-competitors and between subsidiaries of steel companies and independents in consuming industries such as the construction steel fabricating industry?

**ECONOMIC PROBLEMS OF GENERAL SOCIAL INTEREST ARISING
OUT OF THE PRICE STRUCTURE OF THE IRON AND
STEEL INDUSTRY**

Relation of price stability to cyclical fluctuations in business

What is the elasticity of demand for various steel products under existing marketing and pricing conditions? How does it vary with the phase of the business cycle?

What effect, if any, would an attempt to maintain steel prices during various stages in the cycle be expected to have upon employment, production, wages, and purchasing power in the steel industry and in other industries? (This question involves not only elasticity of demand but also the potential effect of the influence of the steel industry on the price policies of other industries.)

Effect of the interaction of stabilized steel prices and other more variable prices through the medium of composite demand on general price relationships (e.g., possible price dislocation)

To what extent are the prices of goods and services for which the demand, with steel, is joint or composite, cyclically flexible?

What is the effect of the example of cyclically stable prices in a great and basic industry upon the pricing policies of other industries? To what extent does this contribute to cumulative price dislocation?

To what extent are the prices of products for which steel is a raw material flexible over business cycles?

To what extent are the prices of goods and services of joint or derived demand determined competitively?

To what extent are these price fluctuations dependent upon those of the associated steel products?

Effect of discrimination in the steel price structure under the basing point practice, upon relative competitive advantages of consumers and regional economic development

What is the relation of the quoted base price to the mill-net for sales within various markets? (This question involves the difference between transport charges added in the delivered price and transport charges actually paid corrected by inter-basing point price differentials.)

To what extent do variations in the mill-net, under the basing point practice, represent special concessions to given customers or consuming areas?

What has been the extent of market interpenetration through true cross-shipments under a basing point system?

By how much do the transportation charges that are included in the delivered price exceed transport costs for alternative routes or media for the same quantity?

To what extent does access to all sources of steel supply compensate the consumer for any disadvantage arising from price discrimination? Does increased accessibility to alternative sources of supply actually intensify competition among sellers?

To what extent do relative mill-nets under a given basing point system offset or augment the natural relative advantages of location of both steel mills and consumers' plants?

Effect of price structure on preservation and expansion of un-economic capacity for production of steel products

To what extent does the basing point system have the effect of protecting existing investment and obstructing the development of new plant in more economical locations? What changes in location of production equipment were caused by

the price changes of the summer of 1938? To what extent does the concentration of steel production capacity reflect discriminations in the freight-rate structure; e.g., interregional freight discrimination in favor of 'Official Territory' as opposed to southern or western territories? What shifts in location of facilities would result from another pricing system? What would be the costs of these shifts?

Effect of the price structure on efficiency of marketing

To what extent does the basing point system tend to effect: (1) duplication in sales organization; (2) true cross-shipments of identical steel products; (3) rigidity in distribution channels and methods without regard to requirements of consumers and independent distributors and the economics of marketing? What changes occurred in cross-shipments and in marketing channels, methods, and organization as a consequence of the recent changes in basing point differentials?

PART TWO

Report of the
Committee on Price Research
in the Petroleum Industry



Committee on Price Research in the
PETROLEUM INDUSTRY

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I

ORIGIN AND AIM OF THE COMMITTEE'S STUDY

THE Committee on Price Research in the Petroleum Industry was organized in October 1936 in response to invitations extended by the Executive Committee of the Conference on Price Research. Its composition reflects equally the interests of the industry and of professional economic research. Throughout our deliberations, however, we have had the benefit of the experienced counsel of several heads of government statistical bureaus. Perhaps of most continuous and helpful assistance has been the cooperation of the Chief of the Wholesale Price Section of the Bureau of Labor Statistics.

As the Committee understands its terms of reference it was formed (a) to survey the currently available information upon all prices, their component elements, and the mode of their formation, with a view to (b) determining the significant deficiencies in our knowledge of price movements, cost-price relationships and pricing methods and the recommendation of means of overcoming these deficiencies, to the end (c) of indicating adequate bases for a projected program of research in the functioning of the price system in this sphere. The several parts of the report ensuing reflect this interpretation of the general range of our assigned task.

We believe that a wide latitude of choice was deliberately left to the Committee in formulating its objectives and methods of procedure. More specifically, such questions as those relating to the scope of the industry, the purposes price records are designed to serve, and the nature of the price problems for the resolution of which improved data might be sought and research undertaken were left to our decision. In these circumstances we have felt it suitable to

state at the outset some of the limits of our inquiry as we have conceived it. The industrial field covered is indicated in Chapter II. It might be summarily described as the whole sequence of processes from exploration for oil to the delivery of refined petroleum products to consumers.

Within this field we have conceived it to be our responsibility not only to canvass the available statistical data upon current prices and costs (Chapter III), but also to examine critically the meaning, adequacy and reliability of these data and to suggest ways in which they might well be supplemented (Chapter IV). As we understand it, we were not called upon to make detailed investigations or tests of existing price information to verify our judgment of its character. Much less was it within our conception of the assignment to attempt the assembly of any concrete data not now available. Nor were we charged with making new applications of such data as we now have. In Chapter V we confine ourselves simply to outlining certain projects of inquiry which in our judgment should prove fruitful, and the more fruitful so far as the statistics of the industry's operations are made more adequate and reliable by supplementing existing compilations along the lines suggested in Chapter IV.

II

GENERAL CHARACTERISTICS OF THE PETROLEUM INDUSTRY AND ITS PRICE PROBLEMS

A FORMULATION of the economic and industrial problems centering in oil prices, toward the solution of which a research program might properly be directed, involves a preliminary consideration of the technical and economic characteristics of the productive processes by means of which crude oil in the ground is transformed into oil products in the hands of consumers. Such a consideration should be designed to reveal, or focus attention upon, those characteristics of the productive processes which reflect themselves in oil price problems or which give to oil price problems a distinctive quality tending to differentiate them from

price problems in general. A consideration of such special characteristics should be helpful in determining and delimiting the specific problems that afford a proper and feasible objective of price-cost study in the oil industry.

The limited and localized occurrence of crude petroleum, the fortuitous and unpredictable discovery of new deposits, the uncertainty of their extent, the exhaustibility of the resource, its variable and migratory character, the statutes, administrative regulations, and court decisions governing its recovery, the storability of the product, the specialized and fixed character of the investment in productive processes, the joint character of the production cost of its numerous refined products, the widespread distribution of the consumers of its major product, gasoline, the seasonal character of the demand for gasoline, the number of and differences between motor fuels, the lack of satisfactory substitutes—these characteristics or factors have their repercussions upon cost, prices, productive capacity and output and give to the industrial problems centering around price a peculiarity and perplexity that warrant special consideration.

EXPLORATION FOR, PRODUCTION AND STORAGE OF CRUDE PETROLEUM

Since oil in commercial quantities occurs in the voids and crevices of a great variety of geologic structures concealed at varying depths beneath the earth's surface, there is in its discovery a very large element of chance. Because of the elusive character of oil deposits and the fortuitous factors in oil finding, the search for oil has called into operation two types of activities—random and scientific. During the early years of oil exploration discoveries were primarily the result of random effort. As the demand for oil products expanded under the impact of modern methods of transportation, the services of geology and physics in their more recondite ramifications have been commandeered in the search for oil. Stratigraphy, micro-paleontology, seismography, magnetometry—all have been turned to practical

account in an endeavor to find likely oil structures. But as more precise methods have been resorted to, random activities have not been abandoned entirely and only through complementary recourse to two apparently incompatible procedures has oil been brought into the market in amounts adequate to meet a persistently expanding demand. Although with the passing of time scientific methods have been more universally used with increasingly satisfactory results, chance still plays a major role in oil discovery. Only by the drill can the precise location of oil pools be determined, their extent delimited, and their probable productivity ascertained.

The unpredictable character of oil discovery has made oil production historically a highly speculative enterprise. The probabilities of losses have been offset by the possibilities of huge gains. An average rate of earnings seems not to have been the appeal to investors in oil production enterprises, nor predictable economic behavior the result. Risks have been great, rewards in some instances likewise great. These circumstances have led to opposing theories: one, that rate of return on investment is not a good regulator of output in the oil industry; the other, that, from a long term viewpoint, investment in additional wells and, therefore, the output capacity of the industry are very directly affected by the rate of return resulting from the price of crude at the time of such investment.

The migratory character of crude oil, the specialized character of the capital equipment, the preponderance of fixed costs in oil production, and the laws of ownership governing the capture of oil have contributed toward a similar functional irresponsibility. Oil in place, intimately associated with gas and water under pressure, is in a condition of delicate equilibrium. Once the underground reservoir has been tapped, this equilibrium is disturbed and the oil seeks its way to the points of diminished pressure, being pushed or pulled to the earth's surface by the escaping gas or driven by encroaching water. The institution of ownership being ill-adapted to the phenomenon of a mi-

gratory mineral, the courts have developed and applied laws of capture to the subjugation of oil. In most of the oil producing states, the oil belongs *de jure* to the individual under whose property it is found. In all of the states it belongs *de facto* to the individual who reduces it to possession. And possession in this case has become ten-tenths of the law.

The speculative character of oil discoveries and the tendency of oil to flow naturally, together with the property laws governing the capture of oil, have shaped the organization and structure of the production branch of the industry. These factors have thus far prevented any great degree of concentration of control through ownership and have given to oil production a continuously and highly competitive character. Thus, although some twenty integrated concerns account for approximately one-half of total crude oil currently produced in the United States, it is estimated that between 15,000 and 18,000 independent producing units produce the other half.

The competitive character of oil production is not fully reflected in the distribution of ownership. Uncertainty with respect to the amount of oil that may ultimately be recovered from a particular pool, and therefore uncertainty with respect to the profits or losses that intensive exploration may promise, together with the necessity of reducing one's property to possession to retain it once a pool has been tapped, make inevitable a system of protective competitive drilling in newly discovered but not fully developed fields with little regard to the economic conditions prevailing in the industry at any particular time. Once the investment has been made in an oil well, its specialized and fixed character together with the fugacity of crude petroleum and the existing rules governing ownership tend to result, in the absence of state interference or of concerted agreement, in operation at capacity with little regard to the price of oil as long as the well is flowing under natural pressure. Almost any contribution to original investment is preferable to the loss of oil through drainage to adjoining leases.

Once wells have ceased to flow and mechanical means are needed to recover additional oil, obviously the promise of return in relation to anticipated costs will afford a basis for judgment as to whether or not the investment should be made. Once the added facilities are installed, however, the owner tends to operate them as long as any return above out-of-pocket expenses is secured. Here again the question is raised whether interest rates, prices, and costs perform in a normal manner the function of regulating current output in the oil industry.

Do such hypotheses lend themselves to statistical analysis? Discovery has been said to be a "function of the quantity of effort and its caliber." How, if at all, may these be measured? What influence does price exert upon them? Is a satisfactory index of search available? What has been the relation between search and discovery? These questions suggest proper objectives of a statistical analysis of cost-price relationships in oil production.

After oil has been brought to the surface it may be stored readily in steel tanks. The exhaustible nature of the resource and the difficulties of controlling output have encouraged the accumulation of large volumes of crude oil in storage. Between 1920 and 1929 total stocks of all oils more than tripled, increasing from 209,000,000 to 689,000,000 barrels.¹ While consumption increased markedly during this period, stocks accumulated more rapidly. Total stocks at the earlier date represented current requirements for 143 days, at the later date for 228 days.

Exhaustibility has been a factor in accounting for a continued search for additional reserves to make good those which have become depleted. Capital has apparently flowed into the industry in anticipation of liberal rewards at some future date when shortage might be imminent. Oil has been stored awaiting a better market. What influence has

¹ See Department of the Interior, U. S. Geological Survey, *Petroleum in 1919-1921*, and Bureau of Mines Statistical Summary of Refining Products in the United States in 1916 to 1925. Also, Bureau of Mines, *Annual Petroleum Statement Number P 69*, September 29, 1930.

price exerted upon these developments? What influence have these developments exerted upon price?

During 1926-30, improving technique in oil exploration and oil finding and of random wildcatting culminated in the discovery of reserves at a rate more than double the highest previous annual average. An actual production far in excess of current consumption and the building up of potentials of apparently unmanageable proportions resulted in the development of the current program of output restriction. What effect has this development had upon cost and the price of crude oil? Upon conservation? Controversy centering around these questions suggests the need of unbiased analysis.

TRANSPORTATION AND MARKETING OF CRUDE PETROLEUM

Once oil has been brought to the earth's surface, its liquidity has made possible the development of a unique and singularly efficient system of transportation. Oil from a myriad of scattered wells is collected through a comprehensive network of gathering pipelines. These communicate with an extensive trunk pipeline system through which the oil is driven by pumps located with due regard to the character of the terrain, the viscosity of the oil, and other factors that affect the ease with which the oil may be transmitted through the line. Through such a system crude petroleum is concentrated from widely dispersed pools and delivered to refineries strategically located with respect to markets. Such a system of transportation involves a relatively large capital outlay which, once made, is sharply subject to the principle of decreasing cost in its operation. Operating with capital equipment that is specialized, highly automatic, and fixed, pipeline transportation partakes of the character of a natural monopoly.

This characteristic is reflected in a highly concentrated ownership and control of the existing pipeline facilities. A relatively few large integrated companies control most of the pipeline mileage; some is jointly owned by several companies. Pipelines, although common carriers at law, have

functioned primarily as plant facilities of integrated companies. They have brought to the very mouth of hundreds of thousands of oil wells scattered throughout the United States, owned and operated by thousands of non-integrated oil producers, a market for their product. No adequate analysis has been made of the influence, if any, that pipeline control by the integrated companies exerts upon the price behavior of crude oil or upon cost to refiners. What is the economic significance of 'integrated' and 'joint' ownership of pipelines?

CHARACTER OF PROCESSING

The refining of crude petroleum involves the application of heat and pressure, by means of which the raw material is separated into its components or broken into molecular structures of varying densities and recombined to form the several petroleum derivatives. The mechanical operations utilize the principle of continuous flow and involve the simultaneous production of a variety of petroleum products ranging from heavy residual oils to the volatile naphthas. The process utilizes extensive capital facilities and is automatic in a high degree. In 1937 for each employee engaged in oil refining 12,121 barrels of crude oil were processed and approximately \$13,300 of capital utilized. Of the total capacity of 423 refining establishments in operation on January 1, 1937, 22.9 per cent was represented by plants with a daily capacity of 100,000 barrels or more, 15.6 per cent by plants with a daily capacity of from 50,000 to 99,000 barrels, 15.9 per cent by plants with a daily capacity of from 25,000 to 49,000 barrels, 24.6 per cent by plants with a daily capacity of from 10,000 to 24,000 barrels, and 21 per cent by plants with a daily capacity of less than 10,000 barrels. One hundred and four plants, each with a daily capacity ranging from 10,000 to more than 100,000 barrels, accounted for 79 per cent of the total operating capacity of the country, while 319 plants, each with a daily capacity of less than 10,000 barrels, accounted for 21 per cent of the total operating capacity. These figures reflect the extent to

which the refining branch of the industry runs to mass production.

The larger refineries have tended to concentrate near thickly populated centers or water terminals from which ready access by cheap water transportation to such population centers is assured. The smaller refineries have tended to concentrate near oil pools during periods of flush production where access to crude supplies is more certainly assured. Such refinery capacity appears to have been brought into existence during periods of overproduction. Increasing output and declining prices of crude oil and its products seem to have called into being a surplus of refining capacity. What are the facts and what is their significance for price theory? Many of these smaller refineries are of the incomplete or skimming type, are said to depend upon cheap crude for their survival, and to have introduced an unsettling influence into the industry. Frequently these have been the sources of cut-rate gasoline. Statistical analysis directed toward a determination of relative over-all refining costs and the influence the price of crude and the relative degree of product differentiation exert upon such costs promises to be fruitful.

Since oil refining involves the production of joint or by-products, it becomes difficult or impossible to calculate accurately the cost of producing any single product. The large element of fixed cost in oil refining enhances this difficulty. The existence of unused capacity under these circumstances exerts pressure upon prices which makes for instability. If one producer's estimate of the demand and cost conditions for a particular product differs from those of another, price reduction is likely. Temptation to reduce the price of particular products may be increased by a realization that such price reduction will apply to only a portion of the total output of a plant. (A comparable dissimilarity of calculation by other producers of the cost and demand conditions for other jointly produced products may tend to disturb the entire price structure and to introduce ruinous competition throughout the whole range of products.)

What are the practices of the refining branch of the industry with respect to allocation of costs among the several products jointly produced? What influence have these practices upon price? To what extent has surplus capacity acted as a price depressant? What influence has concentration of production in large plants and concentration of large plants under the control of a few companies upon price competition? Is research directed to the answer of these questions feasible?

CHARACTER OF THE MAJOR PRODUCT AND OF THE
DISTRIBUTION AGENCIES

Quantitatively and by value the most important of the refined petroleum products is gasoline. The explanation is, of course, found in the automobile. The number of motor vehicles registered in the United States increased from 2.4 million in 1915 to 28.2 million in 1936; domestic gasoline consumption increased from 40 million to 482 million barrels.

Prior to the advent of the automobile, the demand for petroleum rested largely upon the demand for kerosene, in the retail distribution of which general retail establishments played an important role. As the automobile came into general use, a new retail distributive system peculiarly suited to the mobile character of the demand for motor fuel developed. Gasoline moves from the refinery by tanker, pipeline, or railway tank car to terminal or bulk stations. The number of bulk stations in the country is said to be approximately 27,000, of which about 20,000 are operated as units of the major integrated oil companies.² From these bulk stations gasoline is delivered by tank wagon to the filling stations and other retail outlets scattered throughout the country. Nearly 180,000 retail establishments, including garages, have installed gasoline pumps as an adjunct to their ordinary retail operation.³ The bulk of gasoline at retail is distributed, however, by approximately

² *U. S. Census of Business, 1935, Wholesale Distribution.*

³ *American Petroleum Institute Quarterly*, July 1937.

200,000 service stations⁴ throughout the length and breadth of the land in every village and hamlet, and on the major highways. They constitute a unique and effective system of retail distribution, but one alleged by some to be costly. They have made available to the motorist his choice of a multiplicity of branded and unbranded gasoline in the sale of which advertising plays an important role.

Only a minority of these service stations, estimated at approximately 15 per cent, are owned or operated directly by the agencies that supply them with gasoline. This does not preclude, however, the possibility that the supplying companies may have influenced considerably the business policies, including price determination, of the stations operated by independent dealers. Through leasing and licensing agreements and other contractual arrangements, the supplying company may have influenced pricing procedures. Moreover, a considerable number of dealers sell unbranded or jobber-branded gasolines secured through independent jobbers, and other dealers handle several brands.

During the last decade or more, the number of retail outlets has increased more rapidly than the total volume of gasoline distributed annually, with a consequent lowering of the average quantity sold annually per outlet. The nominal gross margins of retailers, suggestive of higher merchandising costs, have increased, but the intensifying of competition, characterized at times by price wars, has kept actual margins at a level substantially below nominal margins. The vigorous development of retail outlets for gasoline reflects in part the influence that has led to duplication in retail facilities generally, viz., the lack of heavy demand upon capital, skill, or experience as a prerequisite to entering the business in a modest way. It was also a means of employment for thousands during the depth of the depression who found a livelihood in the tolerably well sustained demand for gasoline. On the other hand, it reflects a competitive drive for retail gasoline service station business

⁴ *U. S. Census of Business, 1935, Retail Distribution.*

among the major integrated oil companies in the face of a rapidly expanding supply of crude petroleum. It has been in part the result of a program designed to assure an appropriate balance among the facilities employed at the several stages in the integrated operations of the major oil companies, each endeavoring thereby to fortify its competitive position in the market. Likewise, it has reflected a desire of the integrated companies doing business over a broad geographic area to reap the full advantage of a national program of radio and periodical advertising. A broader and perhaps more basic influence has been the surplus of crude oil that has been discovered and produced. As this surplus has endeavored to push its way on to the market it has tended to create an excess of facilities from the well to the filling station.

The above brief analysis of the marketing machinery suggests points of attack in a research program on oil prices. Has price afforded an adequate check to overexpansion? Have facilities adjusted themselves to the economic requirements of the situation? How do handling costs vary with variations in gallonage? What has been the course of nominal and actual margins in gasoline distribution at wholesale and retail? What influence have these margins exerted upon price stability? To what extent has marginal handling cost influenced dealer margins?

At prices that have customarily prevailed there is no adequate substitute for gasoline as a fuel for internal combustion engines. Moreover the automobile, dependent upon gasoline for its motor power, has wrought such marked changes in American living habits and in business methods that it is no longer to be classed as a luxury. It is now considered an indispensable asset in the everyday life of the common man. Under these circumstances the consumption of gasoline has shown no such cyclical fluctuations as have goods of the luxury class or durable capital goods. It would seem that the amount of gasoline consumed would be but slightly affected by its price so long as that price remains within the range of customary price fluctuations. As gaso-

line has become a universal source of state revenue derived from taxes placed directly upon it, the question of the influence of price upon consumption has become of greater concern to the several states. For the industry, confronted with a surplus of output and facilities, and for the consumer, interested in economizing his purchasing power, this problem has attained very considerable importance. It requires a more thorough exploration than it has yet been subjected to. Because of the joint character of the production of the whole range of petroleum products, the influence of price upon consumption would seem to be a particularly important field of inquiry.

Excess capacity has been particularly marked in the two end phases of the industry—production and distribution. These have likewise been the points at which competition has been keenest and in which ownership has been most widely disseminated. They have accordingly been the points toward which the stabilization efforts of the industry have been primarily directed. This stabilization program has been largely under the leadership of the major concerns whose integrated activities cover the whole range of productive operations from discovery and production of crude petroleum through transportation, refining, to marketing. For it should be observed that integration and large scale enterprise have been two of the more important characteristics of the business organization under which the oil industry has carried on. These characteristics are reflected in the fact that a group of 22 companies, with a total net domestic investment approximating 5 billion dollars and representing nearly two-thirds of the industry's total domestic investment, account for approximately one-half of the country's production of crude, three-fourths of its refining capacity and about 95 per cent of its pipeline mileage.

The stabilization efforts of the industry in the production branch have taken the form of a program of curtailment and proration, already referred to. In the marketing branch stabilization efforts have been directed primarily toward the standardization of certain practices—price-posting, lend-

ing equipment, granting of premiums, etc. What has been the effect of the curtailment program upon the cost and price of crude oil and upon conservation? What influence have the pricing methods adopted in marketing exerted upon price levels and price stability?

More recently, apparently in an effort to reduce or shift the costs of retail station operation, and to get larger gallonages through the greater price flexibility and sales efforts of individual entrepreneurs, the so-called Iowa Plan has been generally inaugurated in retail marketing. Under this plan the supplying company leases its stations to individual dealers or operators. One result of this change in arrangements seems to be a greater degree of dealer independence in price determination. Under the 'Iowa Plan', gasoline is no longer sold to dealers at a discount from the supplying company's posted retail price, but at a wholesale price to which the independent dealer adds such margin as in his discretion seems expedient. What influence upon price stability, retail prices, margins, station gallonage, etc., will the 'Iowa Plan' have? What effect will it have upon jobbers? Upon the organization of the wholesale and retail structure?

This brief discussion of the structure and organization of the oil industry and the characteristics of its several processes and major products indicates the sort of questions toward the solution of which a price research program might properly be directed. Before setting forth in more specific terms the objectives of such a program, the available statistical materials will be surveyed and their significance and deficiencies appraised.

III

SURVEY OF AVAILABLE STATISTICS

THE survey of available statistics, made in 1937, has not been revised. It may therefore not represent accurately, in every detail, the present situation. Unforeseen obstacles delayed the completion of the Committee's report, and rather than delay it even longer by attempting a revision of this chapter to bring it fully up to date the Committee offers it as originally prepared. We believe however that it is substantially accurate with respect to its main features even today (November 1939).

Abbreviations used in Chapter III:

B. of M.	Bureau of Mines, U. S. Department of the Interior
B. of M., Calif.	Bureau of Mines, California
D. of I. A-949	U. S. Department of the Interior, Report No. A-949
A. P. I.	American Petroleum Institute
I. C. C.	Interstate Commerce Commission
B. F. & D. C.	Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce
B. L. S.	Bureau of Labor Statistics, U. S. Department of Labor
N. P. N.	<i>National Petroleum News</i>
O. & G. J.	<i>Oil and Gas Journal</i>
Oilgram	<i>Platt's Oilgram</i>
O. P. & D.	<i>Oil, Paint and Drug Reporter</i>
T. C. & T. W.	Tank car and Tank wagon
T. P. D.	Procurement Division, U. S. Treasury
R. M.	Rocky Mountains

	REPORT OR COMPILER	TIMING	COVERAGE	REMARKS
A Production				
1 Crude	B. of M.	Monthly	U. S., by states; divisions into major pools and areas	
	A.P.I.	Weekly		
	O. & G.J.	Annual	States and pools	28 days after end of year
	O. & G.J.	Weekly		Does not publish data currently
2 Refined	B. of M.	Monthly	U. S., by refinery districts	
	B. of M., Calif.		Pacific Coast area	
	A.P.I.	Weekly	U. S., by refinery districts	Gasoline produced by cracking. Also indicates daily avg. crude run to stills
B Shipments				
1 Rail				
a Crude	D. of I., A-943	Monthly	U. S., by states: intra- and interstate movements	Receipts by refineries
b Refined	I.C.C. }	Quarterly	U. S., by 10 regions and districts	Quantity and revenue of shipments in district. Does not indicate source or destination
	I.C.C. }			
2 Pipe line				
a Crude	D. of I., A-943	Monthly	U. S., by states: intra- and interstate	Receipts by refineries
b Refined	I.C.C. Pipe Line Report	Annual	Area E. of Calif. Lines reporting to I.C.C.	Does not indicate source or destination
	I.C.C. Pipe Line Report			
	B. of M.	Monthly	Gasoline delivered into and from lines in U. S.	Does not indicate inter-district movements

g Water	a Crude	D. of I., A-943	} Monthly	U. S., by states: intra-, inter-state, and foreign movements	Receipts by refineries
		B. of M.				Shipments from Calif. and Gulf Coast to East Coast refineries
	B. of M., Calif.	Monthly	Shipments by districts to East Coast, Alaska, Hawaii, Canal Zone, and foreign destinations		
	U. S. Engineers	Annual	Movements on all waterways		
b Refined	B. of M.	} Monthly	Shipments from Calif. and Gulf Coast to East Coast refineries and terminals		
	B. of M. Calif.		Shipments by districts to East Coast, Alaska, foreign destinations, etc.		
	U. S. Engineers	Annual	Movements on all waterways		
C Stocks	1 Crude	B. of M.	Monthly	U. S., by states and major producing areas	Includes stocks on tank farms and at refineries, classified by grade
		D. of I. weekly crude oil stocks	Weekly	U. S., by grades of oil	
	2 Refined	B. of M.	Monthly	U. S., by refinery districts	Gasoline series includes stocks at terminals and pipelines as well as at refineries. Other series take account solely of stocks at refineries Gasoline and fuel oils only
		A.P.I.	Weekly	U. S., by refinery districts	
	B. of M. Calif.	Monthly	Pacific Coast area		

	REPORT OR COMPILER	TIMING	COVERAGE	REMARKS
D Imports and exports				
1 Crude				
a Imports	B.F. & D.C. }	Monthly	U. S., by customs districts and sources of supply	
b Exports	B.F. & D.C. }			
c Imports	A.P.I.	Weekly	U. S., by ports of entry	
d Exports	B. of M. Calif.	Monthly	Pacific Coast district	
e Imports and exports	U. S. Engineers	Annual	By Engineers' districts	
2 Refined	(Same as information under '1' above)			
E Prices current				
1 Crude	N.P.N., O. & G.J.	Weekly	Posted prices by fields, gravi- ties, etc.	Prices well covered in these publications; other trade journals publish comparable data.
	B.L.S.	Monthly prices published annu- ally	Calif., Penna., and Okla.- Kansas	Average well prices

a Refined (wholesale) Gasoline	N.P.N. Oilgram	Weekly } Daily }	All grades of motor gasoline by refinery areas and terminal points on East Coast. Export prices by Pacific and Gulf Coast ports, weekly	For bulk shipments only, to domestic destinations. For bulk and cased shipments, to foreign destinations. Gives daily price range, but does not indicate volume of transactions at different prices within the range reported.
	O. & G.J. } O.P. & D. }	Weekly	Fewer areas than N.P.N.	Prices quoted check with N.P.N. Very few variations. A few misc. grades not shown in N.P.N.
	B.L.S.		Wholesale prices: Calif., N. Texas, Okla., and Penna.	Prices approximately in line with those reported in N.P.N., on items inck in both
	(for gov. use)	N.P.N.	Quarterly	Bids occasionally, and awards regularly, reported on T.P.D. advertisements for specific grades by areas and cities	Published annually Furnish some indication of prospective prices, both for T.C. and T.W. deliveries. However, the grades are rigidly fixed by federal specifications with which commercial grades are not strictly comparable
b Kerosene	N.P.N. Oilgram	Weekly } Daily }	Principal grades by refinery areas and terminal points on East Coast; export prices by Pacific and Gulf Coast ports, weekly	For bulk shipments only
	O. & G.J.	Weekly	Fewer prices than N.P.N.	In majority of cases prices lower than N.P.N.
	B.L.S.	Monthly	Wholesale prices, New York	Published annually

	REPORT OR COMPILER	TIMING	COVERAGE	REMARKS
2 Refined (whole- sale) (cont.)				
c Gas and fuel oils	N.P.N. Oilgram	Weekly } Daily }	Grades and areas fairly well covered. Export prices by Pacific and Gulf Coast ports, weekly	
	O. & G.J.	Weekly	Some additional grades not shown in N.P.N.	In many cases prices lower than N.P.N.
	B.L.S.	Monthly	Okla. and Penna. wholesale refinery prices	Published annually
d Lubricating oil	N.P.N. Oilgram	Weekly } Daily }	All refinery areas except R. M. and Calif. Export prices by N. Y. and Gulf Coast ports, weekly	Oilgram does not publish all prices regularly. Domestic prices on sundry grades, Neutrals, Bright Stocks, Cylinder Stocks, and Steam Refiners
	O. & G.J.	Weekly	Most areas incl. in N.P.N. and Calif.	In many cases prices lower than N.P.N.
e Wax	N.P.N. Oilgram	Weekly } Daily }	Domestic and export prices, East and Gulf Coast, 2 Appalachian grades and 1 Okla.	
	O. & G.J.	Weekly	Fewer prices than N.P.N.	Prices check with N.P.N.
f Petrolatum	N.P.N. Oilgram	Weekly } Daily }	Penna.	
g Coke	O. & G.J. }	Weekly	Penna.	Prices higher than N.P.N.
h Asphalt	O.P. & D. }		Chicago area only	One price only
			Indefinite	

i	Natural gasoline	N.P.N. Oilgram O. & G.J. }	Weekly Daily }	Mid-continent and Calif. Mid-continent and Calif.	Three grades More grades than N.P.N. Prices check with N.P.N.
	j	Charter rates	N.P.N. }	Weekly	Tanker cargoes from principal Gulf and Caribbean ports to N. Atlantic coast and Europe 11 companies	Asking and last paid charter rates for movements of crude and products by tankers One reporter in each main marketing district
3	Refined (retail)	N.P.N.	Weekly		
F	Sales and deliveries 1 Crude (to refiners)	D. of I., A-943 B. of M. }	Monthly	U. S., by refinery districts	Calculation from changes in crude run to stills and from stocks at refineries Calculation from gasoline deliveries and from changes in stocks at terminals and in pipelines
3	Consumption a Retail by products	B. of M., Calif. A.P.I. }	Monthly	Pacific Coast area U. S., by states	All products Gasoline only, derived from tax data
			Annual	15 states having inspection taxes U. S., by states	Kerosene Gas and fuel oils. Special annual statistical and economic survey
G	Capacity 1 Well potentials	Rr. Commiss. of Texas; Corp. Commiss. of La. and of Kans.; Conserv. Commiss. of Okla. and of N. M; Allocation Comm. of Calif; B. of M., Oil & Gas Div.	Surveys made at irregular intervals	Sample tests; area (to which results are applied) depends on structure, number of horizons, and 'other physical features' of pool	Potential tests not made on each specific well but on selected wells in each local area

	REPORT OR COMPILER	TIMING	COVERAGE	REMARKS
G Capacity (cont.)				
2 Storage	B. of M. Rr. Commiss. of Texas Report on Pipe Lines	May 1, 1931 Special Report	U. S., by states Misc. areas in Texas	All classes of storage facilities
	Planning & Coordination Comm. (NRA Code)	1933	U. S. Capacity of gasoline tankage wherever located	Storage facilities of specific groups of companies Special study made to deter- mine available gasoline stor- age capacity in U. S.
3 Transportation				
a Pipelines				
1) Crude	I.C.C. }			
2) Gasoline	I.C.C. }	Annual	Lines reporting to I.C.C. Class I Rr.	Mileage Does not segregate tank cars used for various purposes
b Tank cars	I.C.C. }			
c Tankers	U. S. Maritime Commiss., Div. of Shipping	End of each quarter	Am. steam and motor mer- chant vessels of 1000 gross tons +	Tonnage
4 Refineries	B. of Navigation } B. of M. }	Annual	Tankers and barges regis- tered in U. S. U. S., by states and companies	Tonnage Size, by 'daily run' capacity. Classified also by type of op- eration: 'skimming,' 'crack- ing,' etc.
5 Bulk stations	Petroleum Investi- gation, Report on Marketing Facilities	January 1930 to July 1934	U. S., by states	Also gives no. of service sta- tions, but not their storage capacity

Comments on Reports or 'Compilers' referred to in preceding Tabulation

REPORT OR COMPILER	AVAILABLE AFTER END OF PERIOD	COMPILATION	REMARKS
B. of M., Monthly Petroleum Statement	42 days	Individual company reports	Covers principal operations in producing, refining, and transportation divisions of industry Summarizes data from the Monthly Statements; also indicates average well value of crude by states Crude stocks Covers industry in Calif.
B. of M., Annual Petroleum Statement	8 to 9 months		
D. of I. (weekly stocks) B. of M., Calif.	18 days 30 days		
District Engineers ¹	12 months	Water movements compiled by Engineers	Rivers, harbors, and canals
I.C.C. Pipe Line Report	10 months	Reports of interstate common-carrier companies	Crude and products
I.C.C. Rr. Report	4 months	Reports of rail movements by Class I Rr.	By districts
Report on Pipe Lines	Special	Investigation by Cong. Comm., H. Res. 59, 70th Cong. (1931), known as Splawn Report (1933)	Gives capitalization, investment, organization, barrels handled, revenue, costs, and earnings of all oil pipe line companies, both intra- and interstate
Bureau of the Census (Census of Manufactures)	10 months	Individual company reports	Avg. refinery realization for specific products; products divided into major grades of each product Avg. realization is composite of many grades of materials

¹ Statistics on water-borne commerce by Engineers' districts indicate movements of crude and products by rivers, streams, and canals by areas within major areas, Annual Report of the U. S. Engineers.

Comments on Reports or 'Compilers' referred to in preceding Tabulation (concluded)

REPORT OR COMPILER	AVAILABLE AFTER END OF PERIOD	COMPILATION	REMARKS
B. of F. & D. C.	30 days	Imports by customs districts and origin Exports by customs districts and destination	Avg. export value of products (bulk and package); avg. value is a composite of prices for specific grades classified into major groups
A.P.I. <i>Petroleum Investigation, Report on Marketing Facilities</i>	7 days regular 4 days preliminary Special	Individual company reports Investigation by Cong. Comm., known as Cole Comm., pursuant to H. Res. 441, 75th Cong., Recess (1935)	Prepared for Comm. by Petroleum Adm. Bd.
Oilgram	1 day	Information solicited from individual companies and brokers by publisher's representatives (reporters) resident in principal market centers. Number and identity of sources of information not revealed	Daily publication of prices except export prices (pub. weekly); does not show Calif. prices, or all grades reported in N.P.N. Weekly publication; prices as of Monday and available following Thursday Weekly publication; prices as of Tuesday and available following Friday
N.P.N.	3 days		
O. & G.J.	3 days		
B.L.S.	6 months	Information assembled from trade journals, and checked by occasional inquiries addressed to individual companies	Prices labeled refinery prices but commodities insufficiently identified by grade, and markets in which f.o.b. quotations are applicable are not invariably designated

IV

ANALYSIS AND APPRAISAL OF PRICE AND OTHER DATA

THE foregoing survey of statistical information bearing upon price formation and price movements in the oil industry discloses numerous shortcomings and gaps. It does not indicate, however, (1) whether any useful purpose would be served by meeting the deficiencies, or, if so, (2) in what particular directions the need is most urgent for supplementing or improving the statistical record, or (3) the best method of making such improvements. Manifestly, these questions may be most appropriately considered in particular reference to specific types of information now inadequate or lacking.

Before proceeding to a detailed examination of the deficiencies in the current record, however, it may not be out of place to note the basic criteria used in appraising statistical 'adequacy'. What constitutes a shortcoming or a gap in the record, the degree, and the relative urgency of its removal alike depend upon the standards of judgment employed. Standards may, of course, be legion. For our present purpose it will suffice to distinguish two types: qualitative and functional. By the former is meant the degree of original authenticity (correspondence between source figures and facts), the measure of reliability of computation and transcription, the known extent of coverage, and similar criteria of the trustworthiness of statistical records. By the latter is meant the utility of the information, assuming its trustworthiness, for some definite purpose.

The qualitative standard used in general is of practical expediency, not one that might be termed technically ideal. For example, if a responsible enterprise in the industry voluntarily consents to report a given type of data respecting its operations we take for granted the authenticity of its report. For the purposes in hand, sworn statements, legally imposed sanctions to assure accuracy, even outside and disinterested

checking, are considered superfluous. Again, if the compiling agency for a particular series of price data happens to be a reputable trade journal it is assumed, in the absence of evidence of a biased interest, that there is no deliberate suppression of data from acknowledged sources and that reasonable care is taken to exclude errors of computation. In short, our general qualitative objective in making the criticisms and recommendations aims to provide a body of data upon price-making forces and price movements that will be reasonably dependable.

The functional standard employed comports with this qualitative standard. In this respect, the test of the adequacy of the statistical record, as a whole no less than for any particular class of information, is the measure in which it fulfills the requirements, primarily, of two groups of interests: (1) those directly engaged in the industry, including investors and employees and especially business executives; (2) a wider and more heterogeneous group, including consumers, professional economists, government officials, representing collectively what may be termed the public interest. It is recognized that the interests of these two primary groups may not in all respects be identical or even compatible, that there may well be divergences of interest on particular points within each group. Furthermore, the interests of the second group are probably more nebulous than those of the first. Hence the standard of the adequacy of the statistical record from this standpoint is not susceptible of clear and unexceptionable definition.

Notwithstanding all these recognized difficulties the Committee is convinced that at least up to a certain point it is possible to reconcile the standards of appropriate and useful price information for each of these basic groups of interests. There is, we believe, a certain area of common ground for all the different interests, and from this we have sought to survey the functional adequacy of the statistical record. In sum, our functional standard aims to provide a body of data upon price-making forces and price movements that will better meet the needs of business executives

in the discharge of their responsibilities and at the same time enable outside observers and students better to trace the causes and effects of the actual course of affairs within the industry and of its relations with the whole economy. The following analysis is predicated upon subscription to this standard. So vital do we consider this desideratum that we have felt obliged in recommending each particular improvement or supplementation of currently available data to suggest how and in what measure the project is designed to fulfill a definite, useful purpose from both standpoints.

PHYSICAL DATA

Information upon production, consumption, stocks, deliveries, and capacities is essential to both an understanding and intelligent treatment of price phenomena. This is true no less for the investor and business executive than for the student and investigator. Because petroleum is a mineral resource, because technically and commercially the industry is closely integrated in its various phases, and because its members have long been conscious of their vital interdependence and mutual obligations, physical data upon the facilities and operations of the industry are, upon the whole, singularly well and fully provided. Few branches of either extractive or manufacturing industry furnish or secure as prompt and complete returns upon the current course of their operations as the oil industry.

The Monthly Petroleum Statement of the federal Bureau of Mines, though issued from 35 to 45 (average 42) days after the end of the month reported, is probably as prompt as is consistent with its wide and diversified coverage. The production of crude petroleum is so widely scattered and in such numerous hands that some delay in the assembly of the data is necessarily entailed if the compilation is not to rely to an intolerable degree upon estimates. The number of small independent refineries often inadequately staffed for record keeping, let alone record reporting, is also a factor preventing greater promptness in the release of the monthly statements. It is a tribute to the efficiency of the

work of the Bureau of Mines in this field that the revisions of its current figures in subsequent (month later) releases and in the annual summaries published 7 to 10 months after the close of the year are insignificant.

While the crude production report in the Monthly Statement does not segregate different grades of oil, it does divide the output by states. A basis for an approximate estimate of the production of various grades is thereby furnished and there seems to be no appreciable demand for more detailed reporting in this sphere. The data upon refined products cover all the major varieties. They do not, however, differentiate grades of gasoline, gas and fuel oils, or lubricants in the same degree as is done in the reports of the Census of Manufactures, or to an extent comparable with the differentiation of grades in market price reporting. Grade differentiation to the latter extent is not practicable. It may be suggested, however, that, at least as an eventual prospect, it would be desirable to 'refine' the data in the Monthly Statement upon output of refined products to conform with the detail in the Census of Manufactures. In this way a biennial check-up would be facilitated and the current usefulness of the data on refinery output enhanced. This applies perhaps more especially to gas and fuel oils than to the other major refined product, gasoline, since the grade of the former ordinarily remains unchanged after leaving the refinery while blending operations upon motor fuel are customarily carried on to a not inconsiderable extent outside the refineries.

The official reporting service of the Bureau of Mines is supplemented by the weekly reports of the American Petroleum Institute upon crude production, crude run to stills and gasoline and fuel oil production. While the coverage of this service does not approach the completeness of that represented by the Monthly Petroleum Statement, its timing allows it to serve the function for which it is primarily designed, despite its incompleteness. It enables the business executive to follow trends and detect changes in the rate of operation of the industry more promptly than he would

otherwise be in position to do. It indicates, as it were, the pulse beat of current productive operations, and for this purpose the tolerable margin of error is somewhat wider than in the case of a reporting service designed primarily to measure what might be described as the season-to-season ebb and flow of industrial activity.

Data upon stocks have recently been greatly improved, though there is still room for further improvement in some directions as will be noted. The Department of the Interior issues monthly and weekly reports upon crude oil stocks. The former, included in the Monthly Petroleum Statement, have a more exhaustive coverage and divide the total according to both geographical location and states of origin. They show as well the amounts in the field, in pipelines and tank farms, and at refineries. There seems to be no good reason to seek greater detail or wider coverage in these crude oil stock reports.

Stocks of refined products held at refineries and, in the case of gasoline, those held also at large marine and pipeline terminals are reported in the Monthly Petroleum Statement. For products other than fuel oils these statistics are doubtless adequate. The industry should be better able to adjust inventories to the levels economically required, however, if stocks of fuel oils held at terminals were reported as well as those held at refineries. Although the American Petroleum Institute supplements the Bureau of Mines service by a weekly report of somewhat more limited industrial coverage upon gasoline and fuel oil stocks, it also omits terminal stocks of fuel oil.

Perhaps the most marked deficiencies in the currently available physical data on the industry's operations are in traffic movements (other than those of crude oil). For crude oil the Petroleum Administrative Board, in cooperation with the Planning and Coordination Committee, sponsored in 1934 a monthly reporting service of receipts by refineries. This information now compiled by the Bureau of Mines and issued by the Department of the Interior as Report Number A-943, shows deliveries to refineries (wher-

ever located) from every producing state and receipts by refineries (classified by state of origin, or foreign, and by method of transportation). This report on crude movements not only supplements, in practical effect it supersedes, the annual report of the Interstate Commerce Commission on pipeline traffic, that of the United States Engineers Corps on water-borne traffic, and the quarterly reports of the Interstate Commerce Commission on rail traffic. It is far more timely; it encompasses truck transportation; it reveals source and destination of movements. The third feature preeminently, by showing interdistrict circulation of crude petroleum supplies, enables both producers and refiners to adjust more economically their output, storage, and market policies.

It is precisely this same feature which, by its absence, distinguishes current statistical information upon the movements of refined products. It is true that, supplementing the belated data from the Interstate Commerce Commission and the United States Engineers, the Bureau of Mines reports monthly the volume of gasoline delivered into gasoline pipelines and shipments of refined products (as well as crude, of course) by tankers from California and Gulf Coast ports to East Coast destinations. These data are of prime significance; the compilation of similar data, covering other interdistrict movements, is desirable. Essentially, such information is no less indispensable than that on crude oil movements to the formation of sound marketing policies by the business interests concerned or to the determination by research students of such issues as the responsiveness of the industry to variations in price stimuli among various marketing regions.

At the minimum, it is suggested, such a reporting service should embrace the movements of both gasoline and fuel oils. As an initial step, this coverage might well be sufficient. The Committee recognizes that transactions in gasoline and fuel oils are much more numerous and individual shipments smaller than those of crude petroleum. This has doubtless been a major deterrent to the collection of such

information hitherto. It makes the original assembly of the data by the reporting companies, if the same procedure were followed as in the compilation of the data for Report Number A-943, correspondingly more expensive. The Committee is also aware that if the effort were made to obtain the data from the various transport agencies through public supervisory bodies the practical obstacles to an expeditious assembly and issuance of the data would be formidable, to say the least, and in the case of truck transportation perhaps insuperable.

In these circumstances, notwithstanding the recognized burden, the Committee feels justified in recommending that the industry co-operate in furnishing the necessary data to the Bureau of Mines for a report parallel to Report Number A-943. Such a report would show monthly the aggregate outward shipments of gasoline and fuel oils from the refineries of each state classified by states of destination and by mode of transportation.¹ No individual reporter would be called upon to disclose the amount of any individual shipment or delivery. Each reporting company would simply furnish information to the compiler (the Bureau of Mines) concerning the aggregate of its deliveries of gasoline and of fuel oils during the month into each defined territory (state or district). The Director of the Bureau of Mines has indicated to us his approval of a project along these lines and the readiness of the Bureau to co-operate in providing the service if the requisite additional funds, estimated at \$12,000 per year, can be found. We believe that the benefits to be gained on all sides by such an extension of the reporting service of the Bureau of Mines warrant general co-operation in making it a reality.

¹ It is recognized, of course, that reports derived from refining companies could not in the nature of things, so far as the deliveries reported consisted of shipments to purchasers, assure complete accuracy with respect to the eventual destination of the products shipped. Resales of the products either in transit or after they reached original destination might mean their final delivery into other districts. It is believed, however, that the margin of error such re-transfers would involve would not, in this industry, be substantial.

Data upon the volume of consumption, so far as current or month-to-month figures are concerned, are in every case of a derivative nature. In other words, the item misleadingly termed 'demand' in the Monthly Petroleum Statement is deduced from data upon production and changes in stocks. Doubtless there is no feasible alternative to this procedure for other petroleum products, but in the case of the major product, gasoline, consumption data can be obtained directly from motor fuel tax figures, which are available both nationally and for the several states upon a monthly basis.²

Besides the basic types of physical data concerning current operations of the industry discussed above, certain other types of physical data relating to its structural features, particularly capacity, deserve brief attention. There is no regular and dependable reporting service covering the number of wells currently drilling, producing or abandoned, or the potentials of wells producing. All these data are of vital significance to the business executive in planning capital commitments and in framing market policy in the light of potential supply, as well as to students concerned with the responsiveness of capital inflow and outflow to price considerations. It is true that well-drillings and completions for major fields are reported weekly by the *Oil and Gas Journal* and the American Petroleum Institute and, from these sources, summarized monthly by the Bureau of Mines. But this record is neither authentic nor complete, and contains no data whatever upon well shut-ins (temporary) or abandonments (permanent). Upon a matter so important from every aspect it would seem desirable that the primary source of information should have a greater measure of responsibility, and should cover the

² The motor fuel tax figures do not cover the entire consumption. Some gasoline is used, along with naphthas, as a cleaning agent; and some is used also, along with kerosene, as tractor fuel on farms. In certain states gasoline used for one or the other of or both these purposes is tax-exempt. Slight qualifications on this account would be required in estimating total consumption solely from the tax data.

whole field exhaustively. It is clearly a task appropriate to the Bureau of Mines.

Upon the capacity of producing wells, or so-called well potentials, adequate current data are likewise lacking. The state regulatory bodies in Texas, Oklahoma, Kansas, Louisiana, and New Mexico, and the California Bureau of Mines do from time to time make 'samples' by testing the potential of selected wells in important fields. Because these tests are made by various methods and under different conditions and because there are numerous producing fields outside the jurisdictions mentioned above (in which, in the main, potentials are gauged by the producers themselves) it is questionable whether current data upon the potential capacity of producing wells are not more misleading than informing. The Committee strongly urges the early inauguration of a movement, looking to the eventual standardization of conditions, methods, and periods for the authentic testing of well potentials in every field. It recognizes the thorny obstacles in the way of an early achievement of this goal, particularly those arising from the circumstance that diverse stipulations in statutes, administrative orders, and judicial decisions hedge about the testing procedure in states in which proration is operative. Nevertheless, the Committee believes that a forthright attack upon the problem and earnest solicitation of the co-operation of oil producing states would not prove futile. Whatever advance was made would be a definite contribution toward a wiser and more orderly exploitation of the oil resources of the country.

Since storage capacity may at times have special significance for pricing problems, it is worthy of remark that the latest comprehensive survey of storage facilities was made by the Bureau of Mines in 1931, though a special study of gasoline storage capacity was made by the Planning and Coordination Committee in 1934. It is suggested that surveys of this character covering all classes and locations of storage would be most serviceable if made at regular, say three-year, intervals.

Refining capacity by size, class of equipment, and location is reported annually by the Bureau of Mines. These data presumably are complete and authentic. Figures upon transportation capacity are not so satisfactory. For pipelines the Interstate Commerce Commission reports only length, classified upon the basis of crude and gasoline facilities. Tank cars available for rail transport of crude petroleum and petroleum products are not separately classified. The capacity of trucking facilities is unknown. The Bureau of Navigation reports annually the number of registered tankers and barges. While regular reporting of these capacities does not seem urgent, studies at infrequent intervals, such as those suggested above with respect to storage, would probably find useful application.

Perhaps in no other division of the industry, not even in crude production, is the deficiency of data bearing upon capacity so marked as in marketing. Until the Petroleum Administrative Board made its special survey for the Congressional (Cole) Committee undertaking the Petroleum Investigation, even the number of bulk stations and retail outlets in the United States was unknown.³ This report, covering the period January 1930 to July 1934, shows bulk-station capacity, classified by states, and estimates the number of service stations and other retail outlets. Less comprehensive data of this character are also reported by the Bureau of the Census in the *Census of Business*. The Committee recommends that hereafter in the *Census of Business* provision be made not only for the separate reporting of all 'filling station' operations, with some classification by type and gallonage, but also for the segregation of the gasoline and oil business reported by garages, repair shops, hotels, and all other classes of retail establishments. The exceptional diffusion of, peculiar diversity in, and frequency of ingress to and egress from, the retail trade in gasoline and

³ This report was separately published in March, 1935, its completion being too late for inclusion in the 5-volume Report of the Petroleum Investigation by the special sub-committee of the (H. of R.) Committee of Interstate and Foreign Commerce pursuant to H. R. 441 (Washington, 1934).

oil make its statistical survey almost a unique problem. It does seem desirable, however, in view of the importance of facilities and operations in this field, alike to the consuming public and to business managers in the industry, to have at least biennial information sufficiently comprehensive and detailed to reveal the general outlines of its development.

PRICE DATA

The indispensable elements for a fruitful study of price formation and price movements in any industry are costs and sales revenue, outlays and receipts. Whether these are expressed in unit-product terms or gross sums expended and realized is often a significant matter for the analyst. In whichever form expressed, moreover, the completeness or the representative character of the data for the operations covered, whether those are of a company, of a single phase or division of a given industry, or of the industry in its entirety is always a vital desideratum. But some information in one form or another, of one quality or another, upon both financial outgo and income is essential, if price analysis is to avoid sterility. This is true whether the analysis is that of the business manager primarily concerned with the adequacy of prices and the opportunities they afford or withhold for new commitments and expanded operations, or that of the economist primarily concerned with the functional interrelationships of prices and their efficacy as guides to economic behavior, particularly in directing the distribution of productive resources. And it is true in both cases for the same reason. Neither financial outgo nor income, neither costs nor prices, has any meaning or significance economically, save in relation to the other. As the 'weight' of an object is conditioned by, and in turn conditions, the density of the surrounding medium so the 'adequacy' or the 'efficacy' of prices is conditioned by, and in turn conditions, the costs they envelop.

To restate the matter, no business man is greatly concerned with prices as such. His interest is in prices in relation

to costs and to other prices. Nor does the level, or movement, of a particular price, by itself, invite much inquiry by the economist; only its level, or movement, in relation to the levels, or movements, of its components and of other co-ordinate elements in the price system. Thus stated, in their elementary nakedness, there would seem to be little ground for exception to these propositions. It is when one brings them down from the sphere of abstraction to the domain of concrete application that doubts, reservations and objections arise. These spring in substantial part, we believe, from the inherent impossibility under modern industrial conditions of attaining that complete and accurate knowledge of the pecuniary terms upon which industrial processes proceed which would constitute the ideal, both for the business man and the research worker.

There are innumerable technical obstacles to the attainment of that ideal, but of fundamental importance in our judgment are the problems of apportioning costs and sampling prices. The commitment of productive resources in durable forms for use over long periods entails the apportionment of costs in time. The multiplicity of products made by refining petroleum likewise presents the problem of the apportionment of (their joint) costs among the various products. Apportionment of costs upon both bases and the selection of what are deemed representative transactions for the measurement of product-price yields are bound under these conditions to be in some degree arbitrary. In these circumstances, which are certainly not less characteristic of the oil industry than of most other branches of modern industry, there is an understandable reluctance to divulge information compounded of such large elements of discretion and judgment. For in the absence of clearly defined and generally accepted standards for the apportionment of costs and the sampling of price transactions, the information reported can disclose little more than the business judgment of the individual reporter with respect to internal management and external policy. These being the essential factors upon which business success hinges in a competitive private

enterprise system (in which full knowledge of the market is precluded), there is the more reason for jealously guarding the limited knowledge each enterpriser has of his own operations.

Nevertheless no business in the modern economy can be sufficient unto itself. However extensive the scope of its integration, at certain points it must come into trading relations with the market, both as buyer and as seller. In these transactions prices emerge, some of which, for better or worse, well or ill selected, are bound to be recorded. Part of the costs represented by capital investment, labor employed, materials purchased and part of the prices realized upon sales will become matters of general information available to all engaged in the industry and to the public. Whether these cost-price data are representative or misleading will depend in no small part upon the readiness or hesitancy of the business units in co-operating in the erection of definite standards and furnishing direct and continuously comparable information within the standardized categories. Favorable to the assumption of a responsible attitude toward this essentially co-operative function is the circumstance that in its absence the conduct of business is rendered needlessly speculative, hazardous, and erratic. Lending collateral support to the assumption of this responsibility is the further circumstance that thereby the circulation of misleading information and the attendant growth of suspicion and illwill among the public with which the industry must perforce deal may be in a measure mitigated, if not abated.

Moreover, there is what this Committee considers a still more positive reason for the collection and wide dissemination of comprehensive, accurate price information, namely, its salutary effect upon the extent and character of competition among the units of an industry. If a competitive economy is a sound economy, then any procedure that increases the intensity and, thereby, the usefulness of competition also increases the tempo of economic progress. Frequent, accurate, and comprehensive price reports imple-

ment such procedure. On the one hand, they make more difficult the exploitation of any class of buyers, especially those otherwise ill informed price-wise, and, on the other hand, continuously provide backward suppliers with a spur to initiate cost reducing improvements in their own businesses in order to remain in the competitive ranks.

The oil industry has not been oblivious to these considerations, as will be shown by the analysis of available cost and price data. Nevertheless, here as elsewhere, prodigious opportunity remains for the improvement of statistical records. The price item most completely and reliably reported is unquestionably raw material. In the oil industry the prices paid by leading purchasers have for many decades been publicly posted. Almost invariably purchases are made at such posted prices. However, in periods of rapidly rising demand premiums are sometimes given and in periods of overproduction discounts likewise are irregularly made. These posted prices are quoted daily and weekly in the trade press, and averages of representative samples have been included in the wholesale price reporting service of the Bureau of Labor Statistics since its inception.

Nevertheless two features of current operations in the industry detract from the adequacy of these data upon crude petroleum prices. The first is that there is a wide range of grades of crude oil marketed; the second, that posted prices apply to purchased portions of crude only. As to the first factor, variations at any one time in the purchase price depend principally upon the presence or absence of certain foreign elements, partly upon other characteristics affecting the results of its processing,⁴ and partly upon location.

It is presumed that the schedules of posted prices integrate the influences of all these various factors but the prices reported in trade journals are usually not accompanied by information concerning any properties, except specific

⁴ The ordinary water and sediment deduction is generally standardized, but variations in the chemical composition of oil from different levels even of the same area and from adjacent pools are often reflected in the net prices paid.

gravity, of the different crudes purchased. In numerous cases, not even specific gravity is specified. This is, of course, not in any way a reflection on the reporting service of the trade journals but merely an indication of the limitations of the price data for research purposes. Furthermore as a gauge of the weighted average prices actually being paid for all crude petroleum, a price record drawn from the postings for a single grade is not dependable, however representative that grade may be as an indicator of price changes. But as a measure of price fluctuations over fairly long periods, which is doubtless the primary function of the Bureau of Labor Statistics index, no more than this sampling method is reasonably required. What is required is only that the samples chosen be representative in respect of both grades and fields covered. Seeking fulfillment of this need, the Committee has made suggestions to the Bureau, looking to an extension of the field-coverage of its crude petroleum price series designed to make it nationally more representative.

In addition to ambiguity in respect of quality differences, we have noted that the posted prices apply only to the purchased portion of raw material supply. The exact proportion of crude petroleum purchases to total crude run to stills is not definitely known; it has been estimated at approximately one-half. When such a large proportion of the raw material processed consists of crude that has not 'gone to market', serious question arises concerning the reliability of the posted prices as an indicator of what the price would be if all crude had to go to market.

Wholesale transactions in the principal refined products of petroleum comprise three separate categories of business. We may consider briefly, first, those sales, chiefly of gasoline, by one refiner to another, or to a large marketing company. Such sales are ordinarily in large volume and at prices negotiated privately with each customer. In the second place, there are sales, usually in tanker, tank car or transport-truck lots, by both integrated and non-integrated refiners to brokers and jobbers. In the Middle West many of these sales are on an f.o.b. mid-continent refinery basis, or a modi-

fication thereof, but probably in most instances today delivered prices prevail. Finally, there are sales by both classes of refiners, as well as by jobbers, to retail dealers. Individual transactions in this category ordinarily involve less than tank car lots; indeed they customarily involve simply day-to-day replenishment of supplies in service station tanks from the suppliers' delivery trucks. The term 'wholesale prices' as used in the oil trade refers solely to prices in transactions of the first two types distinguished. Prices in wholesale transactions of the third type are usually denoted as 'dealer prices' or 'dealer tank-wagon prices.'

The price record for sales within these three distinct categories of transactions is not of uniform quality or dependability. Prices in transactions between refiners are not currently reported and never have been regularly disclosed to outsiders. As these transactions probably do not bulk proportionately large, the Committee does not consider that such statistical value as they might have would be commensurate with the difficulties that would be encountered in trying to secure their separate reporting.

What are usually denominated 'tank car prices' (involving principally transactions of the second category above distinguished) for the various refined products are now reported daily or weekly, as the case may be, in the trade press; e.g., in the *National Petroleum News, Oil and Gas Journal*, and the *Chicago Journal of Commerce*. Weighted monthly averages of certain of these items are compiled by the Bureau of Labor Statistics and published monthly in mimeographed form and semi-annually in its *Wholesale Price Bulletin*. These tank car prices are derived in the main from systematic inquiries by field representatives of the trade journals in the important market centers.

Substantially all prices are reported on an f.o.b. refinery basis. Historically, these f.o.b. refinery prices had a very real significance because delivered prices to jobbers, up to a relatively few years ago, were typically the f.o.b. refinery prices as described above plus the tank car rail freight to the jobber's destination. Today, however, this has ceased to be

the real basis for the delivered prices to jobbers in many, if not most, parts of the country because of the great changes in transportation, in refinery locations, and in marketing practices. Relatively little of the gasoline reaching jobbers today has come all the way from the old refinery centers by tank car: most of it has had the benefit of some lower cost method of transportation such as pipeline, water transportation, or transport trucks. Furthermore, as new refinery centers have appeared in many parts of the country, there is no longer one predominating refining center that supplies the jobbers in a given area; e.g., in the Middle West, jobbers are supplied by refineries in Oklahoma and Kansas, in the St. Louis area, in the Chicago area, and at other points. This development, together with the diversity in methods of delivery to the jobber, has tended to modify the earlier tendency of determining jobber prices on the basis of some predominating refinery center and adding rail freight from that center to the jobber's location. The result is that the f.o.b. refinery prices referred to above do not now constitute a very satisfactory means of determining what delivered prices to jobbers actually may be at any given point.

Moreover, most jobbers or distributors handling recognized brands buy from their supplier under a contract which in many if not in most cases provides that the price to the jobber will be a certain amount per gallon below the price to dealers in that area and, up to a few years ago, prior to the initiation of the Iowa Plan, such jobber price was not infrequently determined as a certain amount per gallon below the retail price in the same area. In these circumstances, the prices paid by jobbers in a particular locality at any given time depend far more upon the dealer and retail prices current in that area than upon the f.o.b. refinery prices in some distant refining center plus the rail freight to the destination in question. This is particularly true, of course, with respect to the larger marketing centers where usually competition is especially keen and where there is access to the market by several methods of transportation from several sources of supply.

Presumably it remains true, of course, that delivered prices to jobbers in areas contiguous to and supplied mainly from a basic refining center such as the Oklahoma 'Group 3' region would usually conform to the f.o.b. refinery tank car prices in such refining center plus the transportation cost to destination. This is axiomatic so far as the actual course of business in these areas conforms to the pattern indicated, as it still does in considerable measure. The significant point is that the areas around such refining centers within which these conditions apply with any great degree of rigor or consistency tend to become smaller and smaller, and if the refiner desires to sell to jobbers at points beyond such areas he must do so on the basis of whatever delivered price levels may have resulted at such points from the interplay of competitive forces represented by various alternative sources of supply and methods of transportation available to such markets. It is also true that changes in the general level of delivered prices to jobbers throughout the country continue to follow closely fluctuations in f.o.b. prices in the basic refinery markets. In other words, while there may be many independent variations in prices in response to local market conditions in different areas, and while the spread between the average delivered prices to jobbers throughout the country and the concurrent basic refinery prices doubtless tends to diminish on account of the savings accomplished in transportation, nevertheless all these prices are sufficiently interrelated to fluctuate pretty much together. So far as measuring changes in jobber or tank car price levels is concerned, therefore, the f.o.b. refinery basis, which prevails for tank car price reporting in the trade journal sources referred to above, probably continues to be reasonably satisfactory, although the difficulties of getting satisfactory price data for such sales obviously increase as the f.o.b. refinery basis for making tank car sales to jobbers becomes less prevalent and the relative number of transactions on that basis declines.

There would seem, on the whole, to be two main shortcomings in the tank car price data now available. In the first

place, if the f.o.b. refinery 'spot' price is of diminishing importance as a basis for actual jobber sales, the question arises whether it furnishes a satisfactory index of the average 'net back' (i.e., the net realization to the refinery) obtained on all sales of the product in question made by refiners in the given area to jobbers, including those made under contracts and for delivery at destinations where no single refinery-center-price-plus-rail-freight basis obtains. It seems probable that the practice of extending so-called 'local protection' (i.e., granting lower prices) to jobbers or distributors in cut-price areas, together with the general tendency of most refiners to make at least a part of their sales in more or less distant markets, has the effect of 'grading down' the average over-all realizations to a level somewhat below that represented by the f.o.b. refinery prices in 'spot market' sales, as quoted in the trade journals. This is not a criticism of the accuracy or dependability, as such, of the prices reported but merely introduces a question with respect to how large an area of the whole jobber market they represent.

The other limitation is the absence of a published record of the delivered prices at which jobbers are being supplied in the principal consuming areas. Nor is it possible, under the conditions above described, to deduce or compute such delivered prices, with any assurance of accuracy, by adding to the f.o.b. refinery tank car price quotations for a particular refinery market the rail freight rate to given destinations. So long, of course, as there are two radically different bases of pricing (i.e., f.o.b. refinery and delivered) being followed in the same area with respect to different transactions in this same wholesale class, an adequate price reporting service must include quotations upon both bases. There is no alternative. The two pricing methods are not interconvertible. The prices resulting from, or determined in, each way of transacting business influence the prices negotiated upon the other basis, of course. But in view of what has already been said it should be clear that a representative index of prevailing prices in many of the larger marketing

districts cannot be predicated solely on the assumption of a simple 'regular course of trade'.

The chief deficiency in the present reporting service is that it does not attempt to supply information on delivered prices to jobbers in important distribution centers. For example, if in a given state most jobbers buy upon a delivered or destination price basis, it should be of advantage to the trade to have a record showing at least approximately what these prices are for deliveries from a representative cross section of suppliers selling to jobbers in that territory. And for the purpose of determining the course of wholesale prices (changes from time to time) such a price record would afford a needed supplement to f.o.b. refinery prices. Yet at present not even in the large consuming area along the eastern seaboard, in which jobbers certainly buy mainly upon a destination basis, is there available a continuous record of what jobbers pay for their gasoline.

It is the opinion of this Committee that such a record of delivered prices is desirable and it hopes that one of the trade journals, which we believe are in the best position to assemble this type of information, will undertake the task. We suggest the collection of data representing the actual delivered prices charged to jobbers in various representative markets; such data should include sales on both spot and contract bases. Actually, there may not be as much difference as might be assumed between 'spot' and contract prices, since it is understood that where competitive conditions indicate prices below those that could be charged under such contracts, the suppliers quite frequently grant lower prices in order to protect the interests of their customers and thereby their own interests as suppliers. In the collection of such data there should, of course, be an attempt to establish such grade and other classification as would seem necessary in order to make the data representative.

It need hardly be added that we are not suggesting that this service should displace the practice of reporting tank car prices on an f.o.b. refinery basis for the leading refinery markets. Rather, the new information on delivered prices

would supplement the old information. It seems hardly probable that all sales will ever be on a strictly delivered basis; in fact, there is today a counter-trend in a few cases where jobbers, having their own transport trucks, are going to the supplier's refinery or terminal and getting their supplies directly. Usually, however, in such cases we believe the sale is on the basis of an independent delivered price at the jobber's destination, with a separate allowance for the transportation service performed by the buyer. Under these conditions, the physical delivery arrangement should not seriously interfere with the collection of delivered price data or impair their significance.

COMMERCIAL CONSUMER CONTRACT PRICES

In certain petroleum products, chiefly gasoline, fuel oils, lubricating oils and greases, a special class of business is in one sense wholesale and in another sense retail. In the industry this is known as commercial consumer contract business, and its price record is notably meager. The designation does not accurately indicate the class of business encompassed in this category, because among these transactions are sales to governmental agencies and co-operative associations. In the main, however, commercial consumer contract business consists of deliveries under contract to industrial and commercial consumers for use in their own operations, often at several scattered points. This class of business is retail in the sense that the products are sold directly to the ultimate consumer and not for resale. It is wholesale in the sense that these contracts ordinarily call for bulk deliveries, sometimes, as in the case of certain government contracts, in a volume exceeding that involved in any single wholesale, i.e., dealer, transaction.

For many years prices in the commercial consumer contract category were reported only sporadically even with respect to usual terms. Latterly, there have been issued in the price quotation columns of certain trade journals, notably the *National Petroleum News*, the posted prices of certain refiners for gasoline for delivery to commercial

accounts by tank car and, in some instances, by tank wagon. The news columns of the trade press occasionally carry information on governmental contracts recently let. Public fiscal documents also may contain information of this sort. Even so, there is a paucity of price information on this class of business. The geographical coverage is small even when all classes of postings are considered collectively, and there is no continuity of coverage with respect to any specific item.

The difficulties of securing an accurate record of transactions in the 'commercial consumer contract' category are numerous and in some instances seem insurmountable. Even under the administration of the Robinson-Patman Act there may be many bona fide classifications of accounts. The consideration accorded one class of accounts may differ in one or more particulars from that shown accounts in other classes. For example, certain accounts require as little as 100 gallons per month; others, upwards of 10,000 gallons per month. If an average were computed by weighting the volumes of deliveries at various prices, the result would probably convey little information of the actual price structure of the reporting company with respect to different classes of business. Nor would such an average yield a very reliable index of price changes unless it were supplemented with exhaustive information of a similar character for every grade of the product in question marketed.

However, there is nothing very extraordinary about the existence of such conditions in the petroleum industry. They have existed in many other industries in which manufacturers deal directly with large industrial consumers. Under these circumstances, the Committee is disposed to favor, for the present, only an attempt to extend the reporting service now available for commercial consumer rates rather than to develop an elaborate record of prices throughout the industry for this class of business. Obviously, a truly comprehensive system of reporting commercial consumer contract business would be expensive to operate and would yield results incomprehensible to the layman, confusing to

the price expert, and of questionable value to any and all concerned.

Accordingly, the Committee recommends that the members of the industry, particularly in the refining and jobbing branches, co-operate with an established trade journal, which has had broad and extensive price reporting experience, in furnishing currently, perhaps weekly, information upon average, current or 'going' rates at which new or renewal business of this type is being contracted. Such reports might, probably should be, in the nature of schedules which relate price to other essential terms of the offerings and with such classifications of customers as exist.

Under these circumstances, while it would be impossible for a student of price to ascertain actual realizations for deliveries made to commercial consumer contract trade as a whole, it would be possible and practicable to study the differences between the terms accorded the various classes of trade with special emphasis on their economic appropriateness. If these current price schedules were reported to the price collecting agency by several sellers in each important marketing area, and if the agency dexterously classified and compiled the data, it would also be possible for interested persons to gain information respecting the minimum and the maximum prices for specific categories, the arithmetic averages, and this without disclosing the specific terms of any particular company, which, no doubt, should be left to discovery in the ordinary channels of trade negotiation.

At the same time, the compiled average of current prices in each 'volume' bracket, together with their respective minimal and maximal limits, would furnish for the benefit alike of buyers and sellers what is now lacking, namely, a reasonably reliable gauge of the general situation in the market whereby to form a judgment upon the merits of any specific bid or offer. Moreover, this procedure would retain the advantage of a geographical differentiation of prices such as is now shown in the reporting services of certain trade journals. From a statistical and economic standpoint the recommended procedure would provide a record of

price variations and price changes having more than a questionable pretense of representing the actual course of the market. For all these reasons, therefore, the Committee urges an earnest effort forthwith to secure the furnishing, assembly, and publication of the data suggested.

RETAIL PRICES

No official record of retail prices of petroleum products, or even of gasoline alone, exists. The most commonly cited index of retail gasoline prices in the country as a whole has been the 50-city average, long published by the *Oil and Gas Journal*. Since the widespread adoption of the so-called 'Iowa Plan', whereby service stations formerly 'owned and operated' by major-company suppliers are leased to individual operators, the publication of the 50-city average has been discontinued. This index was derived from the postings for regular grade motor fuel in service stations owned or operated by 11 companies, collectively covering the national market. Prices reported for 50 representative cities were combined in a simple average to give a country-wide picture of the retail gasoline market. The actual quotations from which these indices were made up are no longer published but apparently somewhat comparable data are now being collected by the trade magazine, *Super Service Station*.⁵

The shortcomings of this retail price reporting service, even when it was more than the skeleton that now remains, may be briefly summarized: (1) It was unofficial and therefore unauthentic, though the index seems to have been com-

⁵ Formerly the *National Petroleum News* published a complete record of the changes in service station posted prices in some 150 to 175 towns, including all the principal cities in the country, in its annual *Oil Price Handbook*. This Handbook now gives only the dealer tank wagon prices in these towns and cities. However, occasionally during the last two or three years this journal has published a 50 Cities Retail Price Index, apparently compiled on the same basis as the index formerly published regularly. It is understood that the *National Petroleum News* is now preparing to publish monthly an average of the posted retail prices in 50 cities. While this new index may not be on exactly the same basis as the old, it presumably will be on a basis roughly comparable.

piled with reasonable care and exactitude upon the basis of the original data available. (2) The basic data represented solely the service station prices of a group of companies, each operating in more or less distinct market territories. They may perhaps constitute, each in its respective sphere, the market leaders, but none is the marketer at retail, nor was it even prior to the adoption of the Iowa Plan, of more than a minor fraction of the gasoline actually distributed through service stations in any section of the country. Furthermore, the very position in the industry of these 11 companies that constituted the source of the retail price data used in the index tended to bias their service station postings somewhat toward stability. In our judgment it would not misrepresent the facts to state that the prices included in the 50-city average index have always reflected, in the main, 'top' prices in the retail market.

It would be clearly advantageous from every standpoint to have an index of retail prices of this major product that reflected more accurately the actual prices charged and was based upon information from wider sources. In particular, an adequate index would have to encompass transactions in several types of retail distribution, including so-called 'cut price' outlets. The most appropriate medium for the development of such a service would be, in our judgment, the Retail Price Division of the Bureau of Labor Statistics. This Division has developed a trustworthy technique and has established useful contacts in the 51 representative cities included in its retail food price index. It has for some time contemplated an extension of its service in this particular direction in view of the mounting significance of gasoline prices in the cost of living, changes in which it is one of its special functions to measure. With respect to the Bureau's plan the Commissioner of Labor Statistics has made the following statement: "The reporting service will depend upon the cooperation of a selected list of service-station operators in each city (the 51 cities included in the retail food price index), who will return to the Bureau, by mail, schedules showing prices as of a specified date. If the coop-

eration of a number of the large refiners who operate or control service stations on a sectional or national scale can be secured, this work will be simplified by having master schedules filled out at the home office for as many of the cities as are included in each company's sales territory. These master schedules will be supplemented in each city, however, by reports from several independent service stations."

The Committee endorses this general outline of the plan and especially recommends, in view of the considerations already advanced affecting the value of what remains of the 50-city average index, that the major integrated suppliers co-operate in developing and maintaining this essential service. The resultant index, published monthly, while it would not disclose every isolated instance of price unsettlement, would furnish a much more complete and authentic record of retail price movements for gasoline than we now have. The Commissioner of Labor Statistics estimates that the annual cost of such a reporting service would be about \$11,000. As the lack of funds to this extent is the only present known obstacle to the institution of the service, and as the Bureau is authorized to accept funds from private sources for the support of such a service, this Committee recommends to the representative trade organizations of the industry earnest consideration of the advantages that might accrue from their support of the project, pending Congressional appropriations for the purpose.

Retail prices of fuel oil are now reported weekly in the *National Petroleum News* for about 40 cities in the middle and eastern parts of the country. This service suffers from the limitations pointed out in connection with consideration of the retail gasoline price index. It is now being supplemented by the Retail Price Division of the Bureau of Labor Statistics which has recently included in its survey of retail fuel prices in 51 cities a schedule showing delivered retail prices of range oil and four grades of fuel oil. This should furnish an adequate record of retail prices for the second major product of the industry. Because of the additional

expense occasioned by this and other revisions in the retail fuel price reporting service, in conjunction with the limited appropriations for the Bureau's work, it has shifted the reports from a monthly to a quarterly basis.

Of refined products of petroleum other than gasoline and the various fuel oils, in general, the economic importance is relatively so slight and the channels of distribution so varied that the Committee does not consider an attempt to develop a current retail price reporting service practicable, with a possible exception. Lubricating oils are sold very largely through service stations and garages. Eventually it might well be found that the additional burden entailed by simultaneous reporting of lubricant prices with the service station prices of gasoline, under the plan recommended, would be so slight as to warrant such an extension of that service. For the present, however, and until an adequate system of reporting gasoline retail prices has been introduced and proven dependable, it seems inadvisable to embark upon this auxiliary project.

In the foregoing analysis and appraisal of the available statistical data bearing upon price formation and price movements in this industry, we have endeavored to restrict ourselves, as indicated at the outset, to practicable standards and reasonably attainable objectives. While we recognize, for example, the advantages to be obtained from continuous and authentic price records of many cost elements such as investment, payrolls, and taxes, we have not deemed it expedient to extend our recommendations beyond the modest range of filling the more obvious gaps and improving the procedure in price reporting as now practiced. Moreover, we have addressed ourselves only incidentally and collaterally ⁶ to the technical problem of refin-

⁶ Within the last twelve years the octane rating of regular grade gasoline, for example, has been increased some 16 points, or 30 per cent, and there are other improvements in quality not reflected in octane numbers. Moreover, no inconsiderable portion of the price of gasoline at retail, omitting the tax element, consists of a charge for services rendered the average patron. No serious effort has been made to compute in quantitative terms, so far as we are aware, the extent to which this service element in the price

ing price data to assure validity of time comparisons of prices, or accuracy in measurement of price movements. Changes in commodity composition or product standards present a special difficulty in this connection. Our recommendations relative to increasing the precision and extending the scope of refined product classification in price reporting do, in our judgment, lay the indispensable groundwork for an eventual attack upon this vital problem. For the rest, we may conclude this part of our study with the observation that, particularly in a co-operative enterprise such as the development of adequate trade statistics unquestionably requires, to attempt relatively little initially does not foreclose the prospects of a fuller measure of ultimate accomplishment.

V

OBJECTIVES OF A PROGRAM OF PRICE-COST RESEARCH IN THE PETROLEUM INDUSTRY

RELATION OF PRICE, COST, AND EARNINGS MOVEMENTS TO SUPPLY AND TO THE COURSE OF INVESTMENT IN THE INDUSTRY

A PROGRAM of price research in the industry might appropriately be directed toward three broad objectives. Determination of (1) the forces upon which price and price movements depend; (2) price relationships among the several products of the industry; (3) the functions prices perform and their effectiveness.

of gasoline has varied with the passage of time. But it should be clear that this has an important bearing upon the comparability of retail gasoline prices, at least over extended periods and possibly over wide areas.

Because, however, of the relatively high degree of standardization of the products and raw materials of this industry at any given time, and particularly of its major product, motor fuel, it affords a promising field for analysis of the significance of product changes in the measurement of price movements. Moreover, on account of the complex relationship of various petroleum products, in some part as joint products, in some part as alternative products, and in some part as complementary products, and of the effects that quality changes may have upon these relationships, and *vice versa*, research in this direction should prove exceptionally fruitful. It will call for both economic perspicuity and statistical acumen and should have both theoretical and practical implications.

We direct immediate attention to the third objective. Prices in a competitive economy are presumed to be the devices by means of which equilibrium is maintained within an industry and a proper balance between an industry and the whole economy secured. This equilibrium both within the industry and between the industry and the whole economy is presumed to be established by the influence of prices in accelerating or retarding changes in supply and demand. The influence that price exerts upon each element in the supply-demand equation must therefore be analyzed to determine the role that prices and price movements play in establishing equilibrium. At this juncture we examine the problems involved in determining the influence of price on supply, leaving for a later section consideration of the problems involved in determining the influence of price on demand.

In general, the influence of price upon supply is first manifested by the withholding from or the offering on the market of the available stocks of the commodity in question. Sooner or later supply is presumed to be brought into equilibrium with demand by the influence that price exerts upon investment and production activity. Other influences remaining constant, high prices serve as an impelling force attracting capital into an industry and thereby increasing its productive capacity and ultimately its output. Low prices serve as a repelling force to the inflow of capital and afford a mechanism by means of which output may ultimately be brought into equilibrium with demand.

Crude Oil Production

In Chapter II the technical and economic characteristics of the several branches of the oil industry and of oil and its major products are analyzed briefly. There it is suggested that the speculative character of oil production, the migratory nature of the resource, the property laws governing its capture, the specialized and fixed character of the investment may serve to obstruct the force that price tends to exert in establishing an equilibrium between demand and

supply. Some students of the industry contend that these characteristics constitute such a serious obstacle to economy in the movement of capital into or out of the industry as to rob price of its effectiveness in establishing with reasonable dispatch equilibrium within the industry and between the industry and the whole economy while maintaining technical efficiency in recovery. It is upon such reasoning that the proration program rests. The thesis that unrestricted competition in oil production makes for waste and inefficiency has been frequently expounded in analyses and discussions of the economics of oil production.¹ In these analyses, however, the role that price plays as a regulator of demand and supply has not been scrutinized exhaustively. A thorough-going statistical and economic analysis of the relation between prices and costs on the one hand and production, stocks, and investments in productive capacity on the other seems to promise fruitful results. Such a research program is of major importance to the industry, concerned with the problem of profitably producing and marketing petroleum and its products; to the public, interested in a continuing supply of petroleum and its products at reasonable prices; and to economists, interested in testing price theory in its applicability to petroleum and its products.

An appropriate point of departure would seem to be an analysis of the changes in the current supply of crude oil and of their relation to changes in oil prices, and to changes in oil prices relative to general price levels. How promptly and consistently have changes in price been accompanied by changes in a similar direction in the amount of oil offered in the market? Over short periods has the 'elasticity' of

¹ The term 'unrestricted competition' is used here, not to denote a kind of *bellum omnia contra omnes*, with no quarter given, but only to indicate the absence of any special restrictions peculiar to the oil industry, i.e., of any restrictions upon competitive methods not generally enforced upon enterprisers in other fields. The thesis mentioned, as usually expounded, takes into consideration only the direct effects of competition upon, or within, the petroleum industry. For criticism of this thesis, from a viewpoint giving a broader perspective, see J. D. Gill, *The Economics of Overdevelopment*, a paper read at the annual meeting of the American Institute of Mining and Metallurgical Engineers, New York, February 16, 1939.

supply been equal to or greater than unity? If supply has been 'elastic', such 'elasticity' must have reflected itself in changes in the amount of either oil currently produced or crude oil in storage. Under unrestricted competitive operations with surface holdings in small blocks, the element of drainage limits the feasibility of 'closing in' individual wells in fields of flush production. How does this influence the efficacy of price as a regulator of current output? It apparently leaves the production from wells on artificial lift as the most flexible element in current output. However, in view both of the uncertain effect upon future production that the closing of a 'pumper' well is claimed to have and of the relatively small production of stripper wells under mechanical lift, it may be asked whether this source contributes any considerable 'elasticity' to current supply. To show the responsiveness of current output to price changes the Committee recommends an analysis of the relationship between price and well abandonments and the reopening of temporarily abandoned wells.

An analysis of the movement of inventories, other than purely seasonal variations, in their relation to price changes will further illuminate the general problem of the flexibility of supply in relation to price. Inventories, as we have said, presumably act somewhat as a 'governor' over demand-supply relationships in the short run. What influence do price changes have upon inventories and *vice versa*? Continued expansion of inventories obviously may involve an inflow of capital in relatively large amounts in the form of additions to storage and storage facilities. Here we may find an unexpected but, in an industry of this type especially, a perfectly 'normal' relation between price and the inflow of investment. Low prices may serve to expand rather than contract or check investments and they are the more likely to do so if, as in the case of petroleum, supply in the proximate future is highly problematical and in the long run certainly exhaustible. A further study of the relation between price changes and changes in oil inventories and capacity for storage seems indicated. Since excess refinery

capacity and the desire to keep refinery costs at a minimum by operating at full capacity may cause changes in inventories and storage facilities at the finished product stage of the industry, a study of the influence of price upon current supply should be extended to this stage. The analyst must be on his guard not to overlook the influence that prospective conditions may exert on movements of inventories, for example, the labor situation in the industry or expectations as to future prices. Nor should he misinterpret the significance of changes in stocks as reported because of failure to appraise the influence of stocks that are unreported.

Adjustments in the supply of crude oil in the short run will, then, be reflected in changes in either current output or in crude oil or refined product inventories, or in both. Underlying supply, in the long run, however, are the undeveloped and undiscovered oil reserves. In what manner and to what extent are their discovery and development influenced by price factors? Is the rate of the inflow of capital into oil 'production' governed by price (in relation to cost), and what relationship does the discovery of reserves bear to the rate of inflow of capital?

Where property holdings are small and competition unrestrained, operators have been under great pressure to complete a contemplated drilling program as rapidly as possible once an oil pool has been discovered and development begun. In truth, the very character of any particular program may have been shaped by that of competitors on adjoining tracts. The migratory character of oil and the property system governing its extraction necessitates a system of offset drilling as a protective measure. A multiplicity of factors may work toward the rapid development of a discovered reserve under competitive exploitation. Furthermore, under such standards of proration as are sometimes employed, the influence of a declining price upon drilling activity may be obscured, if not checkmated. These matters are well known, of course, to those familiar with oil. Their significance to the economist has never been adequately

appreciated. Indeed, the influence the price of crude oil exerts in encouraging or checking this tendency has not been adequately explored. Exploratory research in this direction has indicated, contrary to what some might have expected in the light of the geological and legal characteristics of oil production, that the number of producing oil wells completed annually bears a direct relation to the price of oil. Data on aggregate producing wells drilled do not distinguish between those drilled in wild-cat and in proven territory. It has been assumed, therefore, that producing wells constitute developmental rather than exploratory drilling. This assumption is probably not far from the facts. However, since such analyses as have been made of this relationship have not involved a breakdown of the data by producing regions, further analysis along these lines should be fruitful.

The drilling of dry holes may be taken as a rough measure of the intensity of search for new reserves. Exploratory economic research seems to indicate in general that rising prices tend to increase the number of dry holes drilled and falling prices to decrease the number. Such movements would presumably be influenced also by the state of the capital market and changes in the general price level. However, speculation, the hope of extraordinary gains, often seems to play a more important role than rational economic behavior (that is, calculation) in bringing undiscovered reserves into development. Although in the last decade and a half great progress has been made in the application of scientific methods to oil finding, the chance element in oil discovery has not been eliminated. If price is to be relied upon as a long-time regulator of supply, there should be not only a positive correlation between the number of dry holes drilled (since these reflect intensity of search) and the price of oil, but also a correlation between expenditures in search for oil and new fields discovered as well as expenditures on fields discovered and the potential production from them. What are the facts? Is there any measurable relationship between discovery response to wild-cattling

effort and the price of oil? The rate of discovery is the most important element in maintaining equilibrium. Does it lend itself to price control?

Has price resulted in the early development of readily 'accessible' and hence cheap supplies and have less 'accessible' and hence more costly supplies been tapped only in response to the price factor? Have improvements in technology reduced the proportion of dry holes to producing wells? Does average initial production and ultimate recovery of wells bear any measurable relationship to price? How does price influence the application of new recovery techniques, for example, water flooding?

Price is, of course, merely the immediate factor influencing supply. The relation between price and costs (upon which earnings depend) is presumably the determining factor in establishing equilibrium between supply and demand in the long run. The inquiry should therefore, be pushed into this realm. While continuous cost data are not available and would be difficult to secure, the cost studies of the Tariff Commission and the Petroleum Administrative Board contain data covering six years, 1927-33, which should be sufficient to warrant tentative conclusions with respect to the relation between cost and price and its influence upon supply. Although it is recognized that these six years were rather, abnormal, these data should be analyzed in detail for what they reveal concerning the questions raised in the foregoing discussion. Other data are available from public, and private but published, sources, on the course of earnings. It is not necessary for the purpose of such studies as are here suggested that authentic, complete and meticulously accurate data upon earnings in the industry should be available; representative figures, disclosing variation in earnings from period to period, are adequate. These too should be analyzed for the light they may shed upon elasticity of supply.

As the foregoing discussion indicates, there are those who believe that price has manifested a certain functional irresponsibility in the production branch of the oil industry.

This thesis needs further investigation, and affords an appropriate point of departure for further research. If the belief is well founded, then presumably the phenomenon is to be explained in terms of certain peculiarities of oil production to which attention has been called—the uncertain and localized occurrence of oil in place, the geological and physical circumstances under which it occurs, its migratory character, the nature of property rights in oil. Do these factors in reality serve to make price an unsatisfactory equilibrant of crude oil supply and demand? A research program directed toward a more convincing answer to this question is recommended.

Refinery Division

The refinery division of the industry is a manufacturing enterprise and as such is commonly supposed to be more responsive than the extractive division to those price influences which govern economic activity in general. Nevertheless, further inquiry into the extent to which equilibrium has been maintained in this branch of the industry, and between this and the other branches, into the factors that may have made for instability and into the role price has played, seems warranted. It is alleged that a more or less continuous excess of refinery capacity has existed in the industry and that at times this excess has been of large proportions. For example, in 1929, when a new peak in crude oil output was attained, the rated capacity of refineries in operation at the end of the year is reported to have been 32 per cent in excess of the rate of crude oil production during the year. Moreover, the rate of production of crude oil seems to have been considerably in excess of the demand for all oils during that year as evidenced by an increase in crude oil and products in storage. On the basis of the figures reported by the Bureau of Mines, overcapacity seems to have been more or less chronic. But an uncritical acceptance of such data may lead to unwarranted conclusions. Excess capacity in a dynamic industry and in a dynamic economy is not incompatible with economic progress. Moreover an

apparent excess capacity may be a reflection of obsolescence in either the physical equipment of refineries or their geographical location. In the absence of proration, the small scale non-cracking and incomplete type of plant apparently tends to locate in new fields where, temporarily at least, there is access to relatively cheap supplies of crude. By curtailing the available supply of flush-production crude eagerly seeking a market at whatever price it may bring has the introduction of proration resulted in any significant shifts in character or location of operating refinery facilities? Has it led to any withdrawal of capital from small refineries and an increase in the investment in larger scale units? If so, have these developments resulted in advancing the average efficiency of refining operations and been reflected in the prices of refined products? If overcapacity is established, how has it and construction of new refinery capacity varied with the prices of crude oil and of refined products, or with the difference between them, that is, the refiners' margin? Is it possible to measure the influence of changes in refining technique upon this margin?

While oil production, refinery throughput of crude oil, and refinery capacity have all tended sharply upward during the last three decades, the output of gasoline has increased much more rapidly chiefly because of the widespread introduction of the cracking process. Is there any discernible relation between changes in the margin between the prices of crude oil and refined products and the rate of introduction of the cracking process? What is the relation between the installation of cracking and reforming processes and funds available within the industry for capital expansion or replacement? How have the more recently adopted polymerization and catalytic processes in commercial use influenced prices and margins, and *vice versa*? A consideration of these several questions may afford at least a partial answer to the broader question: To what extent has refinery capacity been responsive to price and price margins?

Marketing Division

As capital has continued to flow into oil production, as stocks have mounted, as refining capacity has increased, facilities for the retail marketing of gasoline have expanded persistently during certain periods, more rapidly than sales. This expansion was accompanied by a marked decline in the retail price of gasoline during 1920-35, and by a slight but rather persistent downward trend in the margin between the wholesale price of regular grade gasoline in Oklahoma and the average retail price in 50 representative cities of the United States. It has likewise been accompanied by a decrease in average sales per retail outlet and presumably by an increase in the average marketing cost per gallon of gasoline marketed. While available data on costs, prices, margins, and gallonage are far from what might be desired, even they have not been analyzed as systematically and thoroughly as the importance of the problem warrants. Supplemented and improved in the directions indicated in Chapter IV, their analysis should lead to more positive conclusions concerning the influence prices and margins have had on the growth of retail marketing facilities in this industry. The opinion is widespread in the industry and among its students that prices and marketing margins have not effectively performed their basic function in the retail distribution branch of the industry. But this view has been challenged by responsible analysts who have explored the field. The issues raised certainly merit further and more painstaking study.

To operate a retail station apparently requires no special type of business or technical training. Likewise one filling station makes relatively slight demand upon a community's capital resources. Gasoline retailing is essentially and characteristically a field of small scale enterprise as judged by capital investment. Consequently, entrance to the business has been relatively easy. Exit of a 'plant' once established is not so simple. The plant structure, such as it is, represents a highly specialized type of investment. Once a 'plant'

is in operation the only cost items, other than the cost of goods sold, directly limiting price competition are such operating expenses as wages and interest on borrowed capital. When the enterpriser is at once operator and proprietor even the latter items may be foregone over considerable periods.

Under these conditions have retail price adjustments followed cost differences and variations closely? Have inward and outward movements of investment in this branch of the industry been steadily responsive to price inducements and price warnings? These questions are manifestly of prime significance not only to a host of actual and potential small enterprisers and an even larger host of motorist customers, but also to those with more substantial and extensive business interests in the industry. For in no small measure the 'temper', or plane, of the competitive process in the industry at large is set by the degree to which price performs its basic function in this terminal phase of the industry. Here are focused the accumulated forces of supply and the ultimate forces of demand and upon the mode of their adjustment at this point depends, to a considerable extent, for better or for worse, the fortunes of a far-flung industry and of the vast public it serves.

In periods of sustained 'overproduction' of crude oil, such as occurred in the late 'twenties and early years of the present decade, pressure was thereby brought to bear upon integrated and partly integrated companies to expand marketing facilities, either directly or indirectly. In this manner an assured outlet for their refined products might be provided and their strategic position in the market fortified or strengthened. So far as the impetus to this expansion of marketing facilities had its roots in an overabundance of crude oil under a regime of unregulated production the influence of an uneconomic element in the increasing scale of service station investment might be considered to have waned latterly; for the spread of proration, with its proven efficacy, at least for the time being, to hold back a large potential production of crude oil has reduced the direct

and immediate pressure of surplus supplies seeking a market outlet.

On the other hand, the suggestion has been made that proration, though removing the immediate pressure of crude oil surplus, has indirectly exerted much the same influence upon the scale and organization of the market structure. Proration has done this, it is contended, through accentuating the advantage to an integrated unit of a slight increase in *its* crude output, pipeline runs, refinery throughput, and distributed gallonage. In the first three of these four successive processes of the industry especially, the incremental costs associated with a given marginal increase in the operating scale are relatively small. In production areas still under natural flow the costs of producing oil are largely either 'sunk' costs or costs of superintendence, which do not vary greatly in aggregate amount with fluctuations in the rate of production. The situation is similar in pipeline transportation wherever unutilized capacity exists, and, within limits, holds true even when the addition to 'runs' involves an increase in pipe-line capacity, since right of way, maintenance, superintendence, communication facilities and in some part even pumping facilities do not require expansion in proportion to increase in capacity. In the refinery branch of the industry, likewise, in view of a substantial margin of capacity beyond peak load requirements, an increase in throughput is usually possible without a proportionate increase in total costs. Since, then, incremental costs are likely to be much less than average costs all along the line, their cumulative force makes extra gasoline gallonage in the retail markets seem unusually attractive to the management of a fully integrated concern.

Under proration, it has been suggested, this expansive pressure may be appreciably greater even than it would otherwise have been, and in particular that the pressure from the production branch of the business tends to be enhanced since the discrepancy there between incremental costs and average costs is bound to be magnified. The contention has been advanced that this expansive force makes

itself felt through a circuit of enlarged market facilities, of mounting gallage and finally of bids for additional crude oil allowable. And since prorating agencies usually canvass the field in determining allowables, these possibly inflated 'nominations' may result in 'letting down the bars' of curtailment somewhat at least in particular fields, with temporary advantage to certain interested concerns. This increased allowable thereupon may become the signal for another cycle of expansion of market facilities, added gallage, and so on.

Whether, under proration, the expansion of market facilities has continued to be, even if it were assumed theretofore to have been, 'stimulated' by forces generated in the initial, or raw material, branch of the industry is by no means certain. Only an intensive study of all aspects of the movement of capital into the retailing branch of the industry can supply a convincing answer. Other factors besides those discussed above may well have had an important bearing upon the outcome, that is, concretely and primarily, upon the trend of service station investment; e.g., certain types of tax legislation, particularly chain store taxes. Whether the net outcome of developments, during the past decade especially, in the direction of expanding service station facilities represented a prudent and farsighted adjustment in the sense of providing a superior accommodation for motorists which they would in the long run stand ready to support, through their demand for petroleum products, or instead, an imprudent and shortsighted response (in part) to the dictates of competitive strategy, is uncertain ² and needs further study.

Whatever may be the outcome of a thorough investigation of this major issue, however, two things seem clear. First, expansion of the scale of retail marketing facilities has made no genuine contribution toward solution of the basic problem of surplus capacity in the crude production branch of the industry. It has served primarily simply to

² As indeed, also, it is uncertain whether the actual course of development may not have represented neither of these extremes, but rather some intermediate adjustment, with perhaps oscillations alternately first in one direction, then the other.

transfer the pressure of overproduction, or threatened overproduction (mounting potentials), of crude oil to a later stage in the integrated operations of the industry. Second, so far as the expansion of marketing facilities has been spurred by advancing integration, in one form or another, it has impaired rather than improved the situation of those refiners having no direct ties with the expanding market facilities. For such refiners the problem of finding a steady and dependable outlet for their products has become increasingly acute, despite the growth in both aggregate retail sales volume and in number of retail outlets. The spot market for gasoline in tank car lots has become steadily 'thinner,' but in the circumstances this seems not to have retarded the expansion of investment in the retailing branch of the industry.

Closely connected with the major question whether the expansion of marketing facilities has surpassed the limits that sound economic considerations³ would indicate is the matter of sales promotion activities. How far, if at all, do the intensified national advertising campaigns conducted by integrated companies in recent years represent an effort to find relief from the pressure of a possible overinvestment in marketing facilities induced by other factors? On the other hand, how far, if at all, may these sales promotion efforts have actually increased, both absolutely and relatively, the demand for the types of products (branded) they publicize, thereby at once making expedient an increase in the number of retail outlets where they are conveniently available and offsetting in some degree the burden of overcapacity in the production and refining branches of the industry? It may not be possible to answer these questions with certainty, but it should be evident that inquiry along

³ We use this phrase here in the conventional sense. It imports simply such an allocation of resources among various alternative uses that, at the margin, the rate of pecuniary returns yielded by each of the several categories thereof in each of its several uses is as much as, and no more than, these factors might yield if elsewhere employed. There are, of course, other possible standards of 'sound economy', but for the purposes of this report we put them aside.

this line will bring out important considerations bearing upon the main question.

Whether price has afforded an adequate check upon the capital devoted to the retailing of gasoline should be examined further. The fragmentary character of available statistical data may prevent definitive conclusions, but adequate analysis of existing data will undoubtedly remove some of the existing obscurity. Distribution census reports provide information regarding changes in the number of service stations and in unit costs of retail marketing, as do also reports of the Petroleum Administrative Board. The problem is complicated by the fact that retail outlets frequently (in truth, usually) handle other commodities than petroleum products. Because of the tremendous importance of this subject to the oil companies themselves, co-operation in the assembly of representative data on investment, costs, gallonage, and margins might well be secured. The rewards promise to justify the efforts.

The foregoing discussion is designed to indicate some of the ways in which the efficacy of prices as guides to business commitments in the oil industry may at some points have fallen below a tolerable standard. Indeed, as has been suggested, price may have manifested a degree of functional irresponsibility in this sphere, considered as a whole. This is an hypothesis to be tested, not a settled conclusion. It affords a point of departure for inquiry and suggests the essential character of price research in the oil industry designed to determine the role price has played in maintaining equilibrium and the effectiveness with which this function has been performed. The interests of the professional economist, the business man and the public in this problem are so vital and of such magnitude that comprehensive research in this field seems justified.

ELASTICITY OF DEMAND FOR PRINCIPAL REFINED PRODUCTS

One of the crucial questions concerning price is its relation to consumption. As many interests are concerned with the consumption of petroleum products, research that may

illuminate the subject can be of great value. The relationship of price variations to the consumption of petroleum products is not to be determined easily. Numerous important factors influence changes in the amount of gasoline used that are not directly related to price changes or price differences; for example, from season to season or in one district relative to other areas. A simple illustration is the effect upon gasoline consumption of the dating of automobile license fee collection. Up to a few years ago in most states the calendar year was the period covered by automobile licenses. Various observers noted, however, that gasoline consumption in the first month or two of the year seemed to decrease as compared with the preceding December to a degree greater than could reasonably be explained by weather changes. A study of automobile registration data showed that many car owners were not buying licenses until the second quarter, thereby saving themselves both the operating cost of the car and a part of the annual license fee. Eventually a few states experimented in postponing the registration date until March 1 or April 1. Now a large number of states have adopted this policy and gasoline consumption has increased noticeably in the early months of any calendar year relative to the preceding December—a fact of importance to the petroleum, automotive, and other industries, as well as to the states.

Among other non-price or indirect factors having a similar incidence upon motor fuel consumption and thereby upon demand for gasoline and lubricants are the (a) efficiency of automotive power plants; (b) condition of highways; (c) relative cost and facility of alternative forms of transportation; (d) national income. Similar factors manifestly affect the demand for fuel oil and kerosene. But the vital question in connection with the bearing of all these conditioning factors upon the demand for petroleum products is the degree or measure of their influence. Is it quantitatively determinable? The Committee believes that studies thus far made in these directions have not conclusively demonstrated the possibility of precise quantitative meas-

urement but it suggests that there is reasonable prospect of obtaining significant results from intensive efforts to segregate and measure these various indirect factors affecting demand elasticity.

For instance, certain automotive authorities have contended that progress in automobile engine and vehicle design has outrun improvement in roads, so that the latter has become the more important limiting factor upon the growth of automotive transportation. This contention suggests several questions susceptible of fruitful research. Given a certain standard of technical performance in automotive vehicles, do road improvements tend to have their most marked effect in augmenting the number of vehicles used or in increasing the use of equipment already operating? Given, on the other hand, a certain standard of road improvement, do advances in the technical efficiency of automotive vehicles tend to reduce gasoline demand by curtailing the requirements of motor fuel for a given volume of automotive transportation or to expand gasoline demand by inducing more people to become motorists and most motorists to drive more, that is, to operate equipment more intensively? By comparing standards of road improvement, motor vehicle registrations, gasoline sales, and types of automotive design for registered vehicles in various state jurisdictions during carefully selected periods it should be possible to disentangle, to some extent, these several indirect factors that influence gasoline demand and weigh their relative importance. The collateral significance of such studies should not be overlooked. For example, they should furnish a useful index of the relative advantages of highway improvement outlays upon various classes of roads, such as hard-surfacing of secondary roads as against widening, straightening, and leveling arterial highways.

Much of the gasoline sold today is used by commercial vehicles competing with other forms of transportation, especially railroads. The relative cost and facility of alternative forms of transportation has an indirect effect upon elasticity of demand for gasoline and lubricants. Study of this effect

should contribute significantly to the resolution of important issues of public policy. To what extent is automotive transportation, and therewith the demand for gasoline, affected by the relative levels of railroad rates or changes therein?

Taxes may be regarded, according partly to the point of view and partly to the nature of the tax, as either an indirect or a direct factor affecting demand. So far as the tax is incorporated in the price of a product, its effect upon demand is indistinguishable from any other element, such as the cost of a direct factor of production. On the other hand, from the business standpoint in the formulation of price policy an excise tax, like the ordinary motor fuel impost, represents a rigid, predetermined, and extraneous element limiting the discretionary factor in price adjustment. In whichever light regarded the elasticity of demand is indubitably an important consideration in determining tax policy, since the revenue-yielding power of the gasoline sales tax is conditioned by it. It is equally incontestable that the levying of such a tax imposes limits upon the pricing policy of business, since the degree of elasticity of demand at the tax-included price level is almost certainly not the same as a tax-free price level. From the public standpoint as well as from the business standpoint, therefore, the determination of elasticity of demand for gasoline is among the extremely significant, if not one of the most urgent, problems of price research in this branch of the industry.

Considerable study has already been devoted to gasoline taxes in this connection. A review of the material available on the subject was recently published by the American Petroleum Industries Committee.⁴ The studies hitherto

⁴ See memorandum, *The Effect of Gasoline Tax Increase on Motor Fuel Consumption and Revenues*. Studies mentioned include one made in 1930 by R. G. Blakey; a joint study by J. W. Martin and Marshall Harris covering tax increases from 1925 through 1929; a study entitled *Gasoline Taxation and Its Effect on Consumption* by S. A. Swensrud (American Petroleum Institute, Proceedings, May 1933); a study by C. F. Roos of the effect of tax increase in Virginia in 1926, published in *Dynamic Economics* (Bloomington, Indiana, 1934), pp. 24-44.

made are concededly exploratory; they suggest, however, that there is a measurable inverse relation between the tax rate and consumption. The whole mass of data on the relation of changes in rates of consumption to changes in tax rates in various state and local jurisdictions should be assembled and analyzed.

There remains for consideration the main question of the elasticity of demand for gasoline and other petroleum products relative to the prices at which suppliers offer them for retail sale. In the case of motor fuel there is much discussion among motorists of 'mileage per gallon'. Does this indicate a degree of concern about the cost of gasoline that would mean sharp elasticity of demand relative to price? Very little published material seems to be available on this question.⁵ The subject is intricate because of the difficulty of isolating the influence of price among all the various factors operating upon demand.

The numerous and wide variations in price, both in place and in time, of this widely sold commodity should facilitate the study of its demand elasticity. On the other hand, the long range problem of determining to what extent the growth of automobile use has been fostered by declining gasoline prices is especially difficult. It is true that since the War there has been a secular downward trend in gasoline prices, especially marked after 1929, although up to 1920 gasoline prices had been rising. Is there any evidence that the sharply advancing price in the first period, that is up to 1920, which coincided with the shift of gasoline from a byproduct to a major product status retarded the growth in the use of automobiles? Conversely, has the sharp decline, coincident with outstanding improvements in the geophysical technique of oil discovery and the introduction of the cracking process in oil refining, appreciably accelerated the expansion of demand since 1920?

⁵ See, however, the pioneer studies of A. J. Nichol, *Partial Monopoly and Price Leadership* (Philadelphia, 1930), and C. F. Roos, *Dynamic Economics*. The latter study in particular evinces some ingenuity in the elaboration of mathematical formulae upon a rather narrow statistical base in attempting a solution of the problem.

It might appear that investigation of depressed prices in particular areas resulting from so-called price wars might provide material for studying the short-run elasticity of demand. By comparing gasoline sales data for such areas with similar data for adjacent areas where prices had remained steady, at higher levels, some indication might be afforded of consumer response to price inducements. Two qualifying factors would have to be considered, however. First, the shift of gasoline purchases from other areas into the low price area would have to be taken into account in assessing the significance of the gallonage increase accompanying the price decline. This probably occurs on a larger scale than might commonly be supposed. The effect of a severe price depression in Detroit some years ago was plainly discernible on the gasoline sales at service stations in Toledo, some fifty miles distant on the through routes to Michigan. It would be necessary, therefore, to try to determine quantitatively the extent of this diversion of demand from the territory surrounding the 'low price zone', in order to arrive at the increase in gallonage sold to customers normally buying within the low price zone, attributable to the reduced prices. A second qualifying factor is the tendency of dealers to 'stock-up' during short periods of cut prices and the published gasoline tax data are usually based on shipments to resellers rather than on actual consumption.

The significance of these qualifications upon the apparent effect of price reductions upon consumer demand would be relatively less, however, as the area of cut prices was larger and the duration of the price cut longer. It may well be that some of the acute and prolonged periods of severe price competition in southern California would afford a sufficient basis for fruitful study of the elasticity of gasoline consumption relative to price. It seems probable, too, that the price and consumption data for some foreign countries should prove helpful, for owing to various causes—scarcity, taxes, government or private monopolies—much higher prices and much greater variation in prices from time to time have prevailed abroad.

Such studies of the relation between consumption demand and price, whether in the domestic field or abroad, should, of course, have among their objectives the determination of the relative effect of price changes upon different classes of consumers. It is reasonable to suppose, for example, that the response to variations in price would be much greater on the part of passenger car owners in lower income brackets than of those in the higher income brackets or as compared with the response of industrial or commercial operators of trucks. Analysis of available data on sales to consumers taking delivery by different methods and under different contractual forms would be helpful. Further information might be obtained by an intensive survey of family budgets in representative local areas.

For petroleum products other than gasoline the relation between price and demand seems susceptible of more definite determination. In the case, particularly, of fuel oils used for commercial, domestic and industrial heating, the factor of substitution is much more conspicuous, exerting a powerful and unremitting influence upon fuel oil demand. Petroleum fuels come directly into competition with other sources of heat and power, including coal, coke, natural and manufactured gas, wood, and water power, and the extent of their use, still more the extent of their adoption, is to a substantial degree contingent, plainly, upon close cost reckoning. Factors other than price are, of course, influential in determining the kind and amount of fuel used. One is the portability and weight of both the fuel and the equipment required to use it, as in the case of vehicles, boats, and trains. The cost of equipment and other items involved in changing from one fuel to another and the technical characteristics of the fuel are other factors. For certain special industrial processes these technical features may be decisive. Significant conclusions as to the importance of these various factors could be reached, we believe, through a study of changes in the consumption of petroleum fuels in various uses in relation to their prices, the prices of their substitutes, and the rate of business

activity. The United States Bureau of Mines has published for several years a breakdown of the consumption of fuel oils by uses which should provide useful data for studies of this type.

In considering the heavy industrial fuel oils the by-product aspect would have to be weighed. Many refiners probably consider heavy fuel oils as a byproduct to be sold for what it will bring. Under this conception, its price would seem to depend more upon variations in the demand than upon the cost factors. This suggests the probability that in times of industrial depression prices of such oils would tend to fall drastically with declining demand, since the supply, based primarily upon running crude oil for gasoline, for which demand is relatively steady, would not be greatly decreased. The case is also complicated by the possibility of converting some of the residual parts of the crude, such as heavy fuel oils, into other products, such as coke, asphalt, and road oil. For the latter products, in their fuel and road building and maintenance uses, there are again, in turn, various substitutes—for asphalt and road oil, cement, coal tar, and other materials. In these circumstances, the determination of demand elasticity has obvious practical significance for the shaping of business policy.

From the standpoint of the interrelation of price and demand these byproduct aspects of certain petroleum products raise interesting questions, because to the extent that products are truly byproducts their supply is primarily determined not by the cost-price relationship but by the production of other, the primary, products. As has been indicated, however, almost no petroleum product is strictly a byproduct. In most cases there is a considerable range within which various product assortments may be made from the crude being run to stills.⁶ Indeed, the hydro-

⁶ Cf. A. J. Kraemer, A Report on the Effect of Technologic Factors on Supply of and Demand for Petroleum Products (Petroleum Investigation, Hearings on House Resolution 441, before the Interstate and Foreign Commerce Committee, House of Representatives, 75th Cong. recess, Washington, 1934), Part II, pp. 1310-90.

generation process makes it possible to convert the entire barrel of crude into gasoline. The relation between price, cost, supply, and demand in respect of these products are, therefore, very intricate, to say the least. Nevertheless, large investments are made from time to time, by both the petroleum industry and the users of these various products, on certain assumptions of price and availability. If, however, crude oil over the years rises in price as a result of declining production, or for any other reason, it presumably would mean that prices for the so-called byproducts would rise rather sharply. In view of the large capital investment by the users of such products, as well as by the manufacturers of the equipment in which they are used, it should be of distinct value to learn more about the price relationships between crude oil, gasoline, and the semi-byproducts of petroleum refining, and in particular about the factors that regulate demand for the semi-byproducts.

The consumption of petroleum distillates in agricultural uses, primarily for tractors, provides data of unusual interest for the study of price-making factors. Many tractors can burn either gasoline or heavier fuels, and since even the tractor farmer usually retains some horses the extent of tractor use as well as the kind of fuel used may be varied considerably. In contrast to the passenger car, for the tractor the cost of fuel is a relatively important item. Here then are a host of factors affecting the consumption of tractor fuels—the cost or price of gasoline, of other tractor distillates, of tractors, of horses and horse feed, of farm labor, and the price of farm products.

A thorough study of elasticity of demand for gasoline and other petroleum products should consider certain closely related problems. One is seasonal elasticity, that is, the variation in demand that may result from different weather conditions at different times of the year and in different geographic regions. The mere measurement of such seasonal variations is one problem. It should include consideration of the changes in seasonal variations. This is not a new field of research, but new studies need to be made frequently in

order to ascertain what changes, if any, are taking place. The other problem is to determine what lies behind the seasonal or geographical variations as such. Is it merely the weather per se? Or is it rather the effect of the weather upon driving conditions? Of course, it is a matter of common observation that it is largely the latter and that closed cars, heaters, easier starting, better roads, and better clearing of roads have increased winter consumption of gasoline relative to that of summer, but more knowledge about the relative importance of these different factors would be useful. Ways in which demand could in some measure be further stabilized might be revealed. Another and even more significant objective of such a study would be to determine to what extent supply is economically adjusted to variations in demand, not only from season to season and from region to region, but also among different classes of consumers and different types and modes of use.

EFFECT OF PRORATION OR CONCERTED CURTAILMENT UPON THE COST AND PRICE OF CRUDE PETROLEUM

Since 1927 the method of crude oil production has been altered fundamentally. Prior to 1927 the owner of a producing well, generally speaking, was at liberty to operate it as he saw fit, so long as he carried out his contractual obligations to the lessor on whose land the well was sunk. As a result, when new wells were brought in, production, as a rule, was very large at the outset, because the great pressure on the oil underground tended to force it to the surface. When in a few months, however, this pressure, through the open flowing of the well, had largely exhausted itself, production declined rapidly; and then, under pumping conditions, tapered off gradually over a period of years. This condition still prevails in greater or less degree in certain areas where no state control over production exists, as in Kentucky, Michigan, and Illinois. In California there is no state control, but a certain amount of self-imposed restriction by the industry itself has existed in recent years. In the mid-continent area, however, especially in Texas,

Oklahoma and Kansas, state control is thoroughgoing. Production in all oil pools of any consequence is limited by regulation and total production from each pool is 'prorated' among the participating wells. As a result, new wells in new pools are often limited in output to a small fraction, in some cases less than 1 per cent, of their 'potential', that is, of the quantity they could produce at that time if unrestrained.⁷ Under these conditions of restricted production the period which must elapse between the bringing in of the well and the time when enough crude oil is produced from it to pay for the cost of the well, is greatly prolonged, assuming the price to be the same in either case.

A great many questions stem from this new type of production control and about them there is today much speculation and controversy but little that is finally conclusive. What effect, for example, does this process of delayed recovery have on the cost per barrel of crude oil produced over a long period, or over the life of the well? Are there gains in the way of greater ultimate recovery through the more deliberate extraction of the oil likely to result under proration? Is a larger proportion of the recovered oil brought to the surface by natural pressure, rather than by pumping, under these conditions? If these advantages accrue, what is their magnitude in terms of cost per barrel? How far are these gains offset by added carrying costs on the capital investment resulting from the longer period required to retrieve the original investment?

There is also the question of the effect of proration upon the average price over a long period. Would such average price be higher or lower were production unregulated? And whichever is the case, will it be because costs are greater or less or because of modification in the impact of the supply factor upon the market? Some believe that the restriction of production per well results initially in a

⁷ The 'capacity' established for a well by a 'potential' test is often misleading, however. Such tests are commonly of short duration, especially if they be 'open-flow' tests; and it is very doubtful that the rate shown during the test could be sustained for any considerable period under conditions of unregulated production.

higher price but that this tends to stimulate the drilling of many more wells than are necessary, or than would be drilled were production not restricted, thus having the two-fold effect of tending to keep down the price (because of the constantly overhanging potential supply) and increase the per barrel cost. Under free conditions, it is claimed, prices would tend to decline or remain low until production from existing wells had begun to decline; then, as prices mounted, exploratory drilling would begin to increase again, new production would be brought in, and the cycle recommence. It is pointed out that, contrary to belief in some quarters, the number of wells drilled from time to time shows a remarkable correlation with the price of crude oil.⁸

Is there, then, a vicious spiral in the proposition that with restricted allowables prices must be kept higher in order to cover the added costs of operating surplus wells? This seems to be implicit in the contention of many producers from time to time that higher prices are needed.⁹ If, however, these higher prices attract still more wells, necessitating still further reductions in allowables, again requiring higher prices which induce still more wells, with a repetition of the cycle of smaller allowables, higher prices, more wells, *ad infinitum*, the device of proration would seem to have fallen somewhat short of effecting an economical adjustment of the supply of oil to demand. It has been suggested that as a consequence of the curtailment of flowing wells and the stimulus to drilling, an ever mounting potential of immediately produceable oil tends to be brought about below ground which has somewhat the same

⁸ See the Report of the Petroleum Code Survey Committee to the Honorable Harold L. Ickes, Petroleum Administrator, March 28, 1935 (reprinted in *National Petroleum News*, March 27, 1935, p. 23); also our discussion in the first section of this Chapter.

⁹ See e.g., statement by President Moran of Continental Oil Company, in announcing an increase in crude oil prices, that the situation required "either an increase in the allowables or an increase in the price" (*Oil and Gas Journal*, December 10, 1936).

effect upon prices as though the oil were on hand in above-ground storage tanks.¹⁰

A contrasting view of the significance of proration is that the extra capital cost of partly idle wells caused by delayed recovery is a small loss compared with the great physical waste of oil when it is allowed to come to the surface under unrestricted flow and with the losses attending chaotic marketing conditions prices are made on a catch-as-catch-can basis. The adherents of this view maintain that proration is well justified, from an economic standpoint, by the greater physical recovery and the more stable relation between supply and demand which, it is their contention, it tends to promote. The large reserves of potential production developed as a result of the stimulus to drilling can be kept under control by proration, they assert, and the oil allowed to flow to market only in proportion to current requirements. In short, the argument runs to the effect that proration tends to minimize the difference between the conditions of production of petroleum and those of the production of solid minerals, simply invoking administrative discretion as a lieutenant of ordinary business prudence in a field in which otherwise the latter is largely inhibited.

The discovered reserves of oil held in their natural reservoir are considered a highly desirable stabilizing factor, assuring supply for a long period and thus safeguarding heavy investments of capital in the oil, automotive, and other industries depending on petroleum, as well as constituting a valuable element of national defense.

The novelty and administrative imperfections of proration, the lack of uniformity in its exercise among the various oil producing states, the extraordinary influence of the East Texas pool, and the disruptive tendencies generated by the long continued depression have all combined to make it difficult to reach convincing conclusions concerning the questions and problems outlined above. The

¹⁰ See study by J. E. Pogue, *Economics of Crude Oil Potentials in the United States*, Transactions of American Institute of Mining and Metallurgical Engineers, Petroleum Development and Technology, 1931, p. 633.

issues raised by proration are of such profound and pervasive concern to the public interest, however, as well as of such vital importance to the petroleum industry that in the Committee's view thorough, objective, and comprehensive analyses of the economic effects of proration, both potential and actual, are highly desirable. Consumers wish to be assured that proration is not a device that might result in high or monopolistic prices. The government is interested in the maximum ultimate recovery, within economic limits, of a natural resource vital not only to national defense but also to the general welfare and to the stability of numerous peace time industries. The oil states are concerned from the standpoint not only of the effects of proration upon tax revenues but also of the equitable determination of proper allowables for various pools and producers. Different groups within the industry or affected by it have diverse interests in the questions at issue. Producers, of course, want higher crude oil prices; independent refiners are opposed to higher crude oil prices unless they can be certain of getting correspondingly higher refined product prices. Consumers are interested in continuing low prices. Finally, there is the fundamental question whether the proration authorities, in setting allowables based upon some estimate of demand or consumption requirements, may not, through their determination of the supply factor, be in fact actually regulating demand and prices.

In recent years, since the advent of proration, considerable controversy has arisen within the industry as to whether the division of the industry's total revenue among the several branches, to wit, production, pipeline transportation, refining and marketing, is not frequently distorted as a result of proration and various political and other factors. Some believe these to have made the posted price of crude oil unresponsive to the normal forces of supply and demand while the latter continue, nevertheless, to operate in the market for the refined products. Thus it is claimed that the refining branch of the industry, and particularly independent refiners not having their own crude

production, frequently suffer a severe squeeze between artificially high posted crude oil prices and realistically low refined product prices. The independent marketers, on the other hand, maintain that the integrated oil companies despoil marketing as a profitable field of enterprise by utilizing it not as a means of making marketing profits as such, but merely as a means of enlarging the volume of business on which production, pipeline, and refinery profits can be made. Unbiased analyses should be made of the relative proportions of the industry's total revenue that have gone to the various branches from time to time and under varying conditions and degrees of production control or proration, and of the forces making for this distribution.

Probably of no aspect of the oil business, therefore, can impartial study of price and cost relationships be productive of more valuable results than with respect to these questions concerning crude oil production and its regulation. With the experience already at hand an adequate factual basis for such studies is, we believe, available.

PRODUCTION COSTS AND COST-PRICE RELATIONS

The possible influence of various production control procedures on petroleum costs has been mentioned. In view of the prevalent tendency toward efforts to rationalize prices in one way or another, especially the proposals made from time to time to fix crude oil prices on the basis of production costs, research into the production costs of petroleum is in itself important. But what is the cost of crude oil production? What, indeed, is cost; what should be included in it? And if prices were to be fixed on the basis of costs, what would be the influence, if any, of the prices themselves upon the 'costs' as computed?

As previously indicated, some governmental studies have already been made of the costs of crude oil production. The first, by the Tariff Commission covering 1927-31, were extended through 1933 by the Petroleum Administrative Board of the Department of the Interior during the NRA

code period. In these governmental studies, as outlined in the description of methods used, the share of oil or other compensation going to the land or royalty owner or to previous lessees in the form of 'overrides' was treated as a cost of production and so also, through the mechanism of amortization charges, was the price paid for oil in the ground (that is, the amount paid over and above the value of wells and other equipment) by one producer to another for a developed production property. From the standpoint of the producer such items clearly would seem to be properly included in cost, because for any individual producer they are very real costs indeed. From the overall standpoint, however, some question may exist as to whether amounts representing payments for oil rights or profits on the sale of oil properties should be treated as costs in the economic sense. If, for example, the land owner gets one-eighth of the oil produced, what is *his* cost of production? In most cases, of course, it is nothing (except the possible reduction in revenue from the surface uses of the land on which the wells, tanks, etc., are located). Should overall costs, therefore, include this free or practically free royalty oil? Or again, if an oil right is sold by a lessee who gets a bonus or an 'override' equal to a certain share of oil subsequently produced, what is the cost of that operation?

Some suggest that if royalty oil and bonuses or overrides paid for leases or producing properties are treated as costs, then the price of oil itself tends to influence cost in the same direction in which the price has been tending. Furthermore, when the price of crude oil increases more wells tend to be drilled, as already shown, and under production it is suggested that this means a diminution in the allowable production per well and higher costs per barrel. Thus, it is claimed, an increase in the price tends to bring about an increase in cost in both these ways.

It is suggested, too, that the maintenance of a high crude oil price tends also to promote drilling in areas of high cost production, where, at lower prices, drilling would not be likely to take place—at least to any material extent—until

a greater scarcity of oil developed. Once wells in such high cost areas have come into existence, however, their high costs become a part of the average costs for the industry as a whole and this, it is contended, is another illustration of the way in which a high price tends to result in increased costs.

An even more direct example of the influence of price upon costs is in connection with the payments for mineral rights. Under ordinary conditions where land is leased ahead of development the producer pays the surface land owner (who originally owns the mineral rights also) merely a nominal amount in cash and agrees to give him one-eighth of the oil when and if produced. Under such conditions the producer would regard his unit cost as being the total cost of the operation divided by seven-eighths of the oil. Thus the value of the mineral rights as such creeps into ordinary cost figures to a limited extent, although many economic authorities would contend that the value of the mineral rights or the amount paid for them, whether in cash or in royalty oil, is not a production cost in the proper sense of that term; it is merely a measure of the market value of the oil that presumably can be produced, less the estimated cost of getting the oil to the surface. If the fee owner who originally possessed the mineral rights drilled his own wells, his accounting records would not normally include among costs any amount representing the price paid for, or the market value of, the mineral rights;¹¹ his cost would be merely the actual costs of production divided by all the oil produced. In any oil producing area, however, especially after various properties have been traded with the passage of time, many of the producers are almost certain to have paid substantial amounts for mineral rights. A farmer may not sell his mineral rights until after development has proceeded to a point where oil is known with reasonable cer-

¹¹ On this point, reference being solely to accounting records of persons presumably not ordinarily highly skilled in the arts of business management, almost everyone would probably agree. The following clause is more debatable. Its acceptance depends on one's view of the validity and scope of the 'alternative cost' doctrine.

tainty to underlie his land; he then sometimes gets a very high price for his mineral rights; or the original lessor, who may have paid only a nominal amount for the oil rights prior to development, may later resell his lease to a producer at a substantial price; or one producer may sell his producing properties (that is, his mineral rights and his wells) to another producer at a price that reflects a large profit for the oil underground or, in other words, for the location value of the lease. Such profit, not a part of the original producer's cost—either actual or accounting-wise—nevertheless becomes a part of the new producer's investment cost to be charged up to his future production, usually under the heading of depletion or amortization.

The amounts paid for mineral rights fluctuate, of course, directly with the price of oil. A lease which, if oil were selling at 50 cents a barrel, might have a very low market value, might sell at many thousands or even hundreds of thousands of dollars if the price of crude oil were \$1.25 or \$1.50 a barrel, because obviously the value of the lease depends directly upon the expected realization for the oil that can be produced over and above the cost of getting it to the surface and into marketable condition. There is always a strong tendency to assume the continuation of current prices in valuing production even though the total oil can be got out only over a period of years. As already suggested, the cost of such mineral rights to the producer who buys them are often a substantial part of his total outlays, even though, as some economists contend, they may not be price-determining 'costs' of crude oil production.

The problem of determining crude oil production costs is, therefore, more complicated than may appear on the surface or than may be indicated by the experience of an individual producer according to his particular set of books. Some suggest that a vicious spiral would be involved in any program that undertook to fix crude oil prices on the basis of production costs which were themselves influenced by price. Inquiry into what constitutes a sound definition of cost in this case and into the influence, if any, of price upon

costs would seem, therefore, to be of considerable interest and possible significance.

SUPPLEMENTARY OBJECTIVES

Amplifying somewhat the introductory statement to the basic research project recommended, the Committee believes that a comprehensive program of study of the operation of the price system in a particular sphere, such as the oil industry, should have three major objectives. For clarity, these may be schematically presented as follows:

- 1) How do prices move and how do price relationships change?
- 2) What makes prices move as they do and price relationships alter?
- 3) What effects do price movements and price relationships have?

Illustrative of the appropriate questions arising under (1) are: (a) movements from year to year, month to month, or day to day; (b) movements in one geographic region relative to another; (c) movements in the given industry relative to movements of prices generally. With respect to the manner in which price relationships change, appropriate questions arising in the oil industry would be the relations of: (a) crude, wholesale, and retail price changes; (b) gasoline, fuel oil, kerosene, and other refined product price movements.

In connection with the second line of inquiry, research might well be concerned with the role in price determination of (a) costs; (b) demand; (c) administrative policy. But an exhaustive analysis could hardly fail to take account of: (a) the influence of technological advance; (b) the factors of competitive rivalry and business emulation; (c) the whole range of inhibitory forces stemming from traditional public policy and crystalized legal precedents.

A wide range of questions suggest themselves under the third heading, of which the following are representative. At the prices realized, what are the rates of return upon investment, and how is the flow of investment funds affected not only in the industry as a whole but also in (a) its four

vertical divisions, (b) the principal geographical areas, (c) enterprise units of various size and scope of integration? Does the rate of utilization of capacity in the several branches of the industry consistently vary directly with price changes and is there evidence from which could be deduced what constitute cost-indemnifying prices at various levels of curtailed operations? How are the returns to labor engaged in the industry affected by the course of prices? Do the prices realized and price relationships in any degree promote or hinder the conservation of petroleum or have repercussions upon the conservation of other natural resources and if so, in what measure? What are the effects upon consumption, and upon the social and economic interests of consumers, of the course of prices for each of the principal refined products?

From the foregoing survey it may be seen that this Committee has chosen to recommend as the initial and basic project for an articulated research program an inquiry falling within the broad bounds of the third basic objective. Supplementary to this basic project we have outlined two additional lines of inquiry relating more especially to the second major objective as above distinguished. In placing special emphasis upon the first of these projects and in limiting our recommendations to the three research problems outlined, the Committee does not thereby reject either as impracticable of execution or as wanting in vital significance research projects bearing upon other issues and having other objectives. But we are convinced that the basic project set out above, dealing with the efficacy of prices as regulators of the flow of investment and the rate of operations, is a suitable one upon which to concentrate for immediate development. This judgment rests upon three grounds: (1) that the project first above recommended is of fundamental and general significance; (2) that it is of paramount urgency; (3) that it is entirely feasible. To a large and, we believe, a sufficient extent, though by no means exhaustively, the factors that have in our minds given weight to these grounds have already been indicated. We shall not repeat them.

In submitting this limited research program, the Committee on Price Research in the Petroleum Industry would like to emphasize that it conceives of it as in the nature of a report *ad interim*. It represents simply what we have been able, in the time available, to agree upon in substance and in form for unanimous recommendation. Upon the basis of what may be accomplished by concentration upon these limited objectives, through the experience thereby gained, and from the exchange of opinion, criticism and suggestion, the Committee hopes and expects that a basis will be laid for eventual recommendation of additional research projects worthy of the support and encouragement of the Conference on Price Research.

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