This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Price Research in the Steel and Petroleum Industries

Volume Author/Editor: Committee on Price Research

Volume Publisher: NBER

Volume ISBN: 0-87014-189-9

Volume URL: http://www.nber.org/books/unkn39-3

Publication Date: 1939

Chapter Title: Analysis of Two Important Research Projects

Chapter Author: Committee on Price Research

Chapter URL: http://www.nber.org/chapters/c5800

Chapter pages in book: (p. 56 - 69)

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—inevitable 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 (thereafter 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.