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The Emergence of "the" Problem of Industrial Prices

Prices "at wholesale" began to be published on a continuous basis by the Department of Labor in 1902.[1] The index began with approximately 250 commodities, largely concentrated in food and clothing. The prices were collected from trade journals, produce exchanges, and leading manufacturers. Thus began the statistical history of American industrial prices. This history has continued unbroken for almost 800 months and has expanded to where it now includes more than 2,000 commodities.

Certain of the wholesale prices published by the Bureau of Labor Statistics were observed to display a remarkable stability, if not rigidity. The price of steel rails was quoted at $28 per gross ton beginning in 1902, and continued at this level without change until the spring of 1916. Contemporary students attributed the price stability to the United States Steel Corporation, without explaining satisfactorily why this company should wish an unchanging price.[2] Surely such an explanation

[1] See *Bulletin of the Department of Labor,* No. 39 (Washington, D.C., March 1902). The data were collected back to 1890. The famous Aldrich Report of the U.S. Senate Finance Committee had compiled price information from 1840 through 1891.

[2] Abraham Berglund, *The United States Steel Corporation,* New York, 1907, pp. 143, 168, 171–72; Eliot Jones, *The Trust Problem in the United States,* New York, 1924, p. 230. Berglund suggested that the failure of the price to rise in booms discouraged entry of new rivals, which in turn made it easier to avoid cutthroat competition in depressions. The effect of the practice, one would think, would be only to encourage entry in depression rather than in prosperity.

seemed called for: both the generally accepted theory of monopoly price and the theory of competitive price state that market prices will change when demand and cost conditions change—and, of course, over long periods it is inconceivable that demand and cost remain rigid or dance together.

The flow of casual comments on price rigidity continued, but not until 1927 was the first comprehensive examination of the flexibility of industrial prices made, in Frederick Mills' *The Behavior of Prices.*[3] He plotted the frequency distribution of changes in all monthly wholesale prices by seven-year periods from 1890 and found a concentration of prices at the two extremes of frequent and infrequent change, a U-shaped distribution, that persisted throughout the entire period.[4] The "curious concentrations" at the two ends of the distribution were not explicitly associated with the operation of the price system, however, and this aspect of Mills' study received scant attention from contemporary readers.

The behavior of industrial prices entered a new era of study and opinion in 1935 when Gardiner Means' celebrated monograph, *Industrial Prices and Their Relative Inflexibility,* was published.[5] Means tabulated the frequency of change of some 677 monthly prices and found that a large number changed very infrequently. Indeed, in the eight-year period, 1926 through 1933, fourteen prices did not change a single time and seventy-seven prices changed only one to four times. He coined the phrase "administered prices" to describe the rigid prices and offered a definition:

> [An administered price] is a price set by administrative action and held constant for a period of time. We have an administered price when a company maintains a posted price at which it will make sales or simply has its own prices at which buyers may purchase or not as they wish. Thus, when the General Motors management sets its wholesale price for six months or a year, the price is an administered price.[6]

[3] New York, NBER, 1927.

[4] *Ibid.,* pp. 56 ff. Mills also measured the magnitude of the within-year fluctuation of prices by the mean absolute deviation from the yearly average, pp. 39 ff, 489 ff. A corresponding measure of year-to-year variability calculated from link relatives was also presented, pp. 49 ff, 497 ff.

[5] Senate Document 13 (January 17, 1935), 74th Cong., 1st Sess.

[6] *Ibid.,* p. 1.

Such prices were distinguished by Means from a market-determined price, "which is made in the market as the result of the interaction of buyers and sellers".

The administered prices, Means believed, were destroying "the effective functioning of the American economy". In particular, the commodities whose prices were rigid in the Great Depression often experienced great falls in output, whereas those commodities whose prices had fallen greatly (farm products, in particular) experienced only small decreases in output.

These startling statistics of price rigidity—for which neoclassical price theory had no explanation—and the sweeping inferences that were drawn about the role of price rigidity in the economic malaise of the 1930's promptly commanded wide attention. In fact, Means was guilty of understatement when, two years later, he said that discussion of inflexible prices had been "somewhat stimulated by [his] previous articles". He had in fact created a new subject. In the forty-nine years from 1886 to 1935 the *Index of Economic Journals* lists three articles on rigid prices; in the next four years it lists fourteen. If we continue to use the *Index of Economic Journals* as our measure, interest in inflexible prices flagged from 1940 to 1954 (only seven articles) but then revived (twenty-five articles in 1954–65) after administered prices were charged with some of the responsibility for inflation. Although the *Index* crudely measures current writing, it does not measure cumulative effects, and the doctrine of administered prices had achieved an important place in professional thinking on industrial prices after World War II.

The proposition that in many important industrial markets prices do not respond quickly or fully to changing supply and demand conditions in the way a competitive market would had become generally accepted by the late 1930's. It was accepted first by the economists and then increasingly by the general public. Public acceptance is illustrated by the Congressional hearings to which changes in the price of steel products have been subjected since 1948.[7]

[7] For example, "Increases in Steel Prices", Hearings before the Joint Committee on the Economic Report, 80th Cong., 2nd Sess. (March 2, 1948); "December 1949 Steel Price Increases", Report of the Joint Committee on the Economic Report, 81st Cong., 2nd Sess., Report No. 1373 (March 27, 1950); and "1958

This attitude toward the industrial markets—at least those marked by a fair degree of concentration of output in a few large firms—was strengthened in the 1950's. A number of influential economists attributed inflationary price changes in periods of less than full employment precisely to the behavior of "administered prices." Again Gardiner Means was a leader of professional, and public, opinion. In widely publicized testimony before the Senate Subcommittee on Antitrust and Monopoly (the Kefauver Committee) in 1957, Means said,

> As far as I can discover this recent price increase has not been the result of excessive buying power or demand but, at least to a very considerable extent, has been a result of action within the area of discretion in which prices and wage rates are made. This is suggested by the rise of administered prices while market prices were stable or falling. This is a new phenomenon. I do not find it anywhere in our history of prices.[8]

This view was endorsed in substantial measure by economists as eminent as Abba Lerner and J. K. Galbraith, and it led to influential statistical studies such as the monograph by Otto Eckstein and Gary Fromm which attributed a large share of the rise of wholesale prices in the 1950's to the price policy of the steel industry.[9] From this background there was a natural evolution to the "guidelines" of price and wage policy announced by the Council of Economic Advisers in 1962 and applied to steel, copper, aluminum and other products in a series of highly dramatic confrontations of the Presidential office and the industries in question.

We have not and shall not examine in detail these views of the various roles of "administered" prices in depression and inflation. The basic purpose in this sketchy outline is simply to emphasize that generally accepted views on the nature of the functioning of the industrial price system have emerged in the last generation. They have not

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Steel Price Increase", Hearings of the Senate Subcommittee on Antitrust and Monopoly, Part VIII (1959).

[8] "Administered Prices," Hearings before the Senate Subcommittee on Antitrust and Monopoly, 85th Cong., 2nd Sess., 1958, Part I, p. 88; see also Part IX.

[9] "Steel and the Postwar Inflation", Joint Economic Committee, 86th Cong., 1st Sess., Nov. 6, 1959. The analysis was reviewed and seriously challenged by Martin Bailey, "Steel and the Postwar Rise in the Wholesale Price Index", *Journal of Business,* April 1962.

emerged in response to the development of a coherent, widely accepted theory that industrial prices will display downward rigidity in any meaningful sense; on the contrary, no theoretical explanation for price inflexibility has commanded wide and continued acceptance. The existence of inflexible industrial prices is accepted because it is believed to be an implacable empirical fact. One large purpose of our study is to determine whether it is indeed a fact.

THE QUALITY OF THE PRICE INFORMATION

Even if the wholesale price data had not become involved in controversy over the workings of the price system, one would expect the quality of the data to be subjected to periodic review and improvement. Many of the prices are used in the escalation of contract prices, so there are impressive financial stakes upon the movements of prices. The improvements in the quality of retail price data—influenced to a significant degree by controversies over the validity of the Consumer Price Index—would be expected to lead to contagious improvements in wholesale prices.

At the level of literal detail the wholesale prices have no doubt improved substantially since 1902, but the improvements have had two basic limitations. First, all improvements came from within the price collecting agency—there has never been a comprehensive outside review of the data. Second, the improvements have concentrated largely upon increasing precision in the specification of the commodities to be priced, to the neglect of other and possibly more basic questions. We now document this neglect.

When the continuous reporting of prices began in 1902, monthly prices were reported retroactively for twelve complete years. It was therefore possible for a price change to occur eleven times in January (January 1890 began the series and December 1901 terminated it) and twelve times in each other month. For most of the nonfood commodities initially included in the Wholesale Price Index, one would expect price changes to occur equally often in each month—or, perhaps better put, price changes should come when market conditions change, and these changes come throughout the year even for sea-

sonal goods. Yet when the frequency of price changes of 19 commodities reported by companies in "metals and implements" is analyzed, it is found that 32 of 190 price changes (or 16.8 per cent) came in January, although only 7.6 per cent of price changes were expected in that month.[10]

Such a concentration in January could not arise by chance (the odds against it are a million to one). (For the 20 metals whose prices were reported by trade publications or governmental bureaus, January price changes were only 7.7 per cent of 2,081 price changes.) An even more striking result holds for cloth and clothing, where 272 of 1,839 price changes, or 14.8 per cent, occurred in January. The conclusion is statistically irresistible that many manufacturers reported prices on a calendar-year basis so the within-year price rigidity was due only to the method of reporting prices. Although this kind of test could have been made in 1902, it was not made then or afterward.

It should perhaps occasion little surprise that the quality of the wholesale prices was not examined with any care in the long period preceding Means' celebrated monograph.[11] It is more surprising that the importance of Means' findings attracted little attention to the question of validity after 1935. Means himself wrote as follows:

> Do the Bureau of Labor Statistics figures accurately reflect actual prices? It has been held that the Bureau's price series have to do with list price, not with actual price. However, the Bureau of Labor Statistics asks for and usually gets net prices. Where there are list prices this means the list prices less all regular discounts. Presumably the resulting price quotations do not reflect unusual special discounts. In some cases, errors undoubtedly creep in. In examining a number of the Bureau's price series involving inflexible prices, I have become convinced the bulk of their quotations represented net prices. The exceptions seemed unlikely to falsify seriously the picture which I presented. Consultation with the technical staff of the Bureau of Labor Statistics supports this view. So far as this question is concerned, I am confident that the statistical picture is not seriously faulty.[12]

[10] That is, 11 out of 143 possible changes for each series (adjusted for the incompleteness of 4 of the 19 series).

[11] Even Wesley Clair Mitchell's justly famous monograph, *The Making and Using of Index Numbers,* Bulletin No. 173, Bureau of Labor Statistics, Washington, 1915, gives only passing attention to the quality of the price data.

[12] "Notes on Inflexible Prices", *American Economic Review,* March 1936, p. 28.

But this passage does not present the evidence which would lead the reader to share Means' confidence in the data.

In 1939 Saul Nelson made the first substantial study of the accuracy of the wholesale price data.[13] The variety of discounts, terms of trade, and secret concessions used by secretive price cutters was described by Nelson, and the failure of the BLS to capture all price movements was illustrated by fertilizer and salt. Receipts per unit of output, calculated from Census of Manufactures data, were also compared with prices for twenty-eight commodities. The sample was not felicitous: it contained three agricultural implements, and uninteresting commodities such as canned peaches and dried peaches. The agreement between Census unit values and BLS prices was good in perhaps half the cases and in the remainder varied from fair to very bad (men's shirts, sulfuric acid, bone black, asphalt). Nelson drew the conclusion:

> These observations make the use of caution in dealing with individual price series imperative. However, they do not preclude the use of Bureau of Labor Statistics wholesale price data as statistical bases for broad economic investigations. In analyses of price rigidity and amplitude of price movement, it becomes necessary to place emphasis upon broad and consistent relationships and to avoid relying upon small differences in absolute figures. Yet, after all due allowance is made for the factors demanding caution, very marked and significant differences still remain between the behavior of rigid and flexible prices. For the statement and interpretation of such different types of price behavior, Bureau of Labor Statistics series can be regarded as furnishing an acceptable basis.[14]

This conclusion appears to go well beyond the assurance provided by Nelson's tests.

The second large test of quoted prices was made in 1943 by the Bureau of Labor Statistics under a contract with the Office of Price Administration.[15] The BLS collected more than 2,200 price series from 629 firms which bought steel products directly from steel mills in carload lots. Prices paid were compared with quoted prices (after adjust-

[13] "A Consideration of the Validity of the Bureau of Labor Statistics Price Indexes", Appendix 1 in the National Resources Committee report (of which Gardiner Means was the director), *The Structure of the American Economy*, Washington, 1939.

[14] *Ibid.*, p. 185.

[15] "Labor Dept. Examines Consumers' Prices of Steel Products", *Iron Age*, April 25, 1946, pp. 118 ff.

TABLE 2-1

Purchases at Invoice and Quoted Prices of Hot Rolled Sheets

Period	Number of Purchases	Percentage of Purchases at Invoice Price		
		Below Published Price	At Published Price	Above Published Price
2nd Qtr., 1939	137	79	9	12
3rd Qtr., 1939	178	96	4	0
2nd Qtr., 1940	210	78	22	0
2nd Qtr., 1941	253	15	85	Less than 1
4th Qtr., 1941	259	7	90	3
2nd Qtr., 1942	251	2	96	2

SOURCE: "Labor Department Examines Consumers' Prices of Steel Products", *Iron Age*, April 25, 1946, p. 134.

ing for charges for "extras" and transportation) in six quarters falling in the period 1939 to 1942. In 1939 and 1940, before industry operations reached high rates relative to capacity and before price ceilings were imposed, price cutting was extensive (a sample summary is given in Table 2-1).[16] This study certainly served to reduce confidence in the reliability of quoted prices in the period before World War II. The elaborate test (which cost several hundred thousand dollars) was never repeated.

The Price Statistics Review Committee, of which one of the present writers was chairman, devoted more attention to the problem of wholesale prices. One staff paper in particular, that of Professor Harry McAllister, subjected the price reports of the Bureau of Labor Statistics to intensive analysis, to reach disquieting results. The Bureau's prices are based upon one, two, three, or more reporters (companies, in our context) and McAllister tabulated the frequency of price change by the number of reporters, on the basis of a sample of one-third of the BLS prices. His analysis (see Table 2-2) demonstrated that the number of

[16] The average ratio of invoice to quoted price for hot rolled sheets was 92 per cent in the second quarter of 1939 and 85 per cent in the third quarter, 94 per cent in the second quarter of 1940, and essentially 100 per cent thereafter (*ibid.*, p. 134).

TABLE 2-2

Frequency of Price Changes per Month, December 1953 to December 1956
(average number of price changes per item)

Commodity Class and Type of Reporter	Number of Price Reporters				
	1	2	3	4	5 or More
Company Data					
Crude Materials	.474	.470	.526	.500	.480
Intermediate Materials	.096	.143	.212	.207	.392
Finished Materials	.106	.112	.196	.215	.276
Nonfood Materials					
Company Data	.103	.143	.206	.207	.392
Publications Data	.239			.444	
Consumer-Goods Other than Food					
Company Data	.056	.101	.170	.200	.287
Publications Data	.258			.444	

SOURCE: "Government Price Statistics", Hearings before the Subcommittee on Economic Statistics of the Joint Economic Committee, 87th Cong., 1st Sess., 1961, pp. 388, 390.

reporters was a major determinant of the number of reported price changes. In fact, for certain classes of commodities the data permit one to assert that the probability that any one company will change its prices for a given commodity in a given month is independent of such change by other companies in the same industry in that month. To an economist such an implication seems absolutely unacceptable and casts grave doubts on the underlying data.

A possible explanation for this peculiar price behavior is that the industries with only one price reporter differ substantially from those with two or more reporters—in fact, the former industries are more concentrated. This explanation, however, was shown by McAllister to be insufficient.[17] No other plausible explanation is at hand.

[17] He took random samples of the prices reported by one, two, three, etc., sellers of commodities for which there were numerous reporters to obtain again the patterns of price change by number of reporters already observed. See "Government Price Statistics", Hearings before the Subcommittee on Economic Statistics of the Joint Economic Committee, 87th Cong., 1st Sess., 1961, p. 391.

Means once described his work as applying "a new kind of analysis to the best available supply of wholesale price data"—the new approach consisting of "taking a series of price data for an individual commodity and counting the number of price changes in a given time period".[18] So far as his original work is concerned, this description was largely true. The McAllister analysis effectively destroys the entire body of work resting upon frequency of price change. But even if Means' original work rested heavily upon frequency of price change, and made so dramatic an impact because of the startling findings on frequency, the importance of administered prices never rested upon this negligible basis. Its essential thrust was with respect to *amplitude* of price changes: few economists would have taken so seriously the infrequency of price changes if the prices had changed by large amounts.[19] Our own work, to which we now turn, confirms the view that frequency of changes in monthly prices is of little economic importance.

[18] "Notes on Inflexible Prices", *American Economic Review Supplement*, March 1936, p. 23.

[19] Indeed T. Scitovsky had shown that the U-shaped distribution of prices by frequency of price change arose because all prices which changed once or more per month were grouped together, and if price changes per day or hour were allowed, there would be no modal group of commodities with frequently changing prices. See "Prices under Monopoly and Competition", *Journal of Political Economy*, October 1941.