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City University of New York, 1991

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Three Economic Essays on Technology and Competition; Applications of John M. Clark's Concepts to the Cement Industry, Transfer Pricing, and Product Pricing

by

Gerald Aranoff

A dissertation submitted to the Graduate Faculty in Economics in partial satisfaction of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1991

This manuscript has been read and accepted for the Graduate Faculty in Economics in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

Three Economic Essays on Technology and Competition; Applications of John M. Clark's Concepts to the Cement Industry, Transfer Pricing, and Product Pricing

by

Gerald Aranoff

Advisor: Professor Michael Grossman

1. **John M. Clark's Concept of Too Strong Competition: The U.S. Cement Industry as a Possible Case.**

The principal hypothesis of this essay is that the U.S. cement industry for the 60's and 70's illustrates Clark's concept of too strong competition. This paper examines the meaning Clark attached to "too strong competition" along with Stigler's objection and Clark's rejoinder. The paper presents a definition of under-capacity for evaluating too strong competition. The paper considers that the mainstream academic view has mischaracterized the cement industry 1909—1946. The paper offers evidence that in the 60's and early 70's cement profit margins were inadequate and were the proximate cause of reduced investment with consequences of severe capacity shortages 1972–1973 and 1978–1979.

2. **Transfer Pricing for Short-Run Profit Maximization in Manufacturing.**

This paper synthesizes the transfer pricing problem for a simple manufacturing model to three theoretical prerequisites or ingredients: quoted price system, durable and specific assets, and demand fluctuations. The writer contends that the transfer price problem in cost accounting literature is in actuality the peak-load problem in utility economics—a short-run problem on how to make optimal use of given fixed assets under demand fluctuations. The major implication is to support marginal-cost, incremental cost plus fixed fee, or dual pricing—methods which imply a low transfer price during periods of idle capacity.

3. **The Economics of Product Pricing.**

The paper explains, with economic diagrams and numerical examples, economic theory for pricing in a simple manufacturing model. Goods are the quoted-price type as opposed to traded on organized commodity exchanges. Cost curves are linear until capacity. Capacity can be of the absolute type or not of the absolute type. The paper demonstrates profit maximization pricing for both types. Other topics discussed: advantages of price discrimination, cost-plus pricing, and behavioral impact of accounting methods on pricing.

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Published in the *Eastern Economic Journal*, January—March 1991, Vol. 17 No. 1 pp. 45–60 and cited as an unpublished manuscript by F. M. Scherer's *Industrial Market Structure...*, 1990, p. 675n. Reprinted with the permission of the publisher.

The writer gratefully acknowledges helpful advice from referees and others. Aaron Sabghir, formerly Director of Construction and Building Products Division in the U.S. Department of Commerce and editor of *Construction Review* from the mid-fifties to 1980 gave helpful editorial suggestions.

1.1 Introduction

The recent crisis involving the savings and loan industry has resulted in renewed attention for the issue of government deregulation. Over the next few years there will be important debates on whether deregulation will lead to the type of competition which benefits bank depositors (consumers). Governmental actions, such as antitrust laws, environmental regulations, and tax laws, influence the quality and the extent of competition, directly or indirectly, upon many industries. Public policy discussions in the future are likely to deal increasingly with the question of how the competitive stances of different industrial sectors affect the health of the nation and U.S. competitiveness in international trade. These discussions may revive a related older question: Is there a possibility of an industry in which there has been

too much competition, from the consumer viewpoint? Many writers would answer no, but John M. Clark (1884–1963) has argued yes.

This paper discusses the cement industry as a case study of John M. Clark's theoretical framework of workable competition, a theory which has been neglected in recent years. It draws on the extensive literature and statistical base of the U.S. cement industry from the Bureau of Mines and Department of Commerce as well as studies by the Federal Trade Commission, and academia. It also refers to the landmark 1948 decision of the Supreme Court which outlawed the cement industry's basing point pricing. The principal hypothesis in the analysis is that the U.S. cement industry's experience for most of the sixties and seventies illustrates Professor Clark's concept of too strong competition.

This paper will examine the meaning Clark attached to "too strong competition" along with Stigler's objection and Clark's rejoinder which is the groundwork for the writer's definition of under-capacity, as a basis for evaluating too strong competition. In discussing the cement industry, the paper reviews the mainstream academic view—notably that of S. M. Loescher and F. M. Scherer—and considers the possibility that they might have mischaracterized the cement industry between 1909 and 1946. It also considers the Federal Trade Commission's "highly antagonistic approach" [Liebeler, 1153] to the cement industry. Finally, this paper offers evidence that during periods of capacity surplus in the sixties and early seventies, periods of high economic activity, cement profit margins were inadequate and were

the proximate cause of reduced investment for cement facilities in the sixties, seventies, and eighties with consequences of severe capacity shortages during 1972–1973 and 1978–1979.

1.2 The U.S. Cement Industry: Role and Structure

Cement is a highly standardized basic construction material. It is used in new construction activity as well as in maintenance and repair activities. Considering that new construction in the U.S. represents about 1/10th of gross national product, it is not difficult to perceive that shortages of supply may well restrict the levels of such construction types as highways, industrial building, and housing.[1] To be sure, there are important competitive materials such as lumber, and competitive construction techniques such as curtain walls construction, which can help alleviate the effects of cement shortages. Furthermore, cement imports can also play a direct role in filling supply gaps. Yet, recurring periods of severe cement shortages may harm society in that they may inhibit economic growth.

The cement industry is regional due to cement's high weight and due to the general widespread dispersion of suitable raw materials for cement manufacturing. Therefore, observations about the cement industry at the national level often do not

[1] E. C. Eckel's observation of 1930 remains true today [Eckel, 287]: "During the last century cement has been associated definitely with, and has indeed in some periods conditioned, the development of the varying stages of industrial and social progress. Neither the growth of large cities nor the spread of modern transportation systems would have been easily possible without the use of a strong construction material cheaply made and easily transported and laid."

apply to all regions.[2]

Cement output is used almost entirely in construction activity and maintains a stable relationship to construction expenditures (see Graph 1, a scatter diagram of cement shipments versus new construction expenditures in constant 1977 dollars 1950–1985 R-squared = 0.93). Thus, forecasting cement usage involves forecasting total construction outlays by type of construction, and assessing the growth rate of cement versus competing construction materials. The fact that cement demand is extremely erratic is well documented by all the statistics on construction.[3]

Cement can be classified as a semi-perishable product because cement customers cannot economically store significant quantities for long periods. Cement customers thus need capacity or a "readiness-to-serve"[4] to meet their needs.

Currently, one state agency and 49 companies operate 131 plants in 39 states. Multiplant operations are being run by 25 companies. The size of individual companies as a percentage of total U.S. production capacity range from 0.2% to 7%. The 5 largest producers provide 28% and the ten largest producers provide 48% of total production [U.S. Bureau of Mines, 1–2].

[2]The recent U.S. Department of Commerce study on the U.S. cement industry has a 61 page chapter "Regional Analysis Supply/Demand Situations" covering five regions: Florida, Gulf Coast (including Houston), Inland Texas, Southern California, and New England/New York.

[3]Valentine and Dauten, 94, note: "Fluctuations in building cycles are usually several times as great as those in general business. It is to be expected that some individual industries would have fluctuations greater than those in total business activity, but building fluctuations are wider than those in almost any other component of business activity." Clark, 1939, 407 makes a similar point.

[4]This is an interesting term rarely used today but cited frequently by John M. Clark (for example, 1923, 324–327).

1.3 Theory

1.3.1 Clark's Workable Competition Thesis

In an article (1940), "Toward a Concept of Workable Competition," said to have "probably populated more student reading lists than any other piece of journal literature," [Caves, 633] John M. Clark formulated an iconoclastic thesis [Clark, 1940, 243]:

> ... which finds reflection in the apparent confusion of our present policies (trying to raise some prices and lower others)—namely that imperfect competition may be too strong as well as too weak; and that workable competition needs to avoid both extremes.

Clark was arguing against the model of perfect competition as a policy guide. According to the model of perfect competition, competition can never be too strong from a social (that is, consumer) viewpoint. Any practices by business or government to mitigate the severity of competition is deemed undesirable for consumers. This is the presumption behind antitrust policies, as Clark observed [Clark, 1961, 48]:

> Antitrust action, being directed against restraints of competition, may tend to develop an unspoken presumption that competition can be defective only in the direction of being too weak, never too severe. [Clark's footnote 6:] *Nominal exceptions that sustain the rule include predatory competition, the ultimate aim of which is to lessen competition by eliminating competitors: also discriminations of similar effect, under the Robinson-Patman Act. The 'rule of reason' is not necessarily an exception, so long as it relates to the degree of restraint of competitive action, and does not hinge on the reasonableness of resulting prices.*

Clark is opposed to this presumption behind antitrust policies precisely because he is concerned with the "reasonableness of resulting prices" and with competition being defective in the direction of being too severe as well as too weak.

Clark's workable competition supports "informal controls,"[5] such as price leadership and attacks much of government antitrust actions. The theory of too strong competition would justify mergers, possibly price agreements, and certain other restraints of trade that might otherwise be illegal. Too strong competition is alien to modern U.S. antitrust policy because of the U.S.'s per se prohibition of price constraints and related restraints of trade [Scherer, 1990, 335].

1.3.2 What Does Clark Mean by Too Strong Competition?

When Clark asks the question: "Is Competition Ruinous?" he rephrases it as follows: "Does the competition of large business aggregates, with large fixed capitals, tend to force prices below a fair return on capital?" [Clark, 1923, 447] He cites a study by Eliot Jones who gives a careful definition of ruinous competition referencing Richard T. Ely's *Outline of Economics* [Jones, 473]:

> ...that competition...tends to be become 'ruinous,' that is, fails to establish a normal level of rates sufficiently remunerative to attract the additional investments of capital that recurrently become necessary.

The notion that competition can be overly intense and socially undesirable did

[5]Clark wrote two chapters in his classic *Social Control of Business* analyzing "Informal Controls" which he defined on page 201: "Custom, tradition, religion, education, propaganda, public opinion, and the esprit of a class, an organization, or a profession ..."

not originate with Clark, but he wrote about it at length and with considerable insight.[6] Clark cites Alfred Marshall's notion of "a price that spoils the common market for all" [Marshall, 374] as illustrative of too strong competition.[7]

In one of his last published writings, Clark notes that serious economic analysis of excessive competition was more in vogue in the early part of the twentieth century than presently.[8] The fact that the *Encyclopedia of the Social Sciences* (1930) has an entry with references on this subject ("Cut-Throat Competition") while the *International Encyclopedia of the Social Sciences* (1968) has no mention of this concept is probably indicative of this interpretation. A widely cited writer, Richard A. Posner, who may be typical of the current attitude, dismisses excessive competition from serious consideration, for example [Posner, 153]:

> When businessmen complain about excessive competition, what they usually mean is that they would be happier if their prices were higher than their marginal costs.

Some modern writers on this subject, F. M. Scherer in particular, operate with a constricted definition of ruinous competition and consequently they find few cases

[6]Aaron Levine, 120–121, a biblical scholar and a Ph.D. in economics shows that Talmudic rabbis (circa 5th century c.e.) felt that prices could be too low from a social welfare perspective: "The welfare of the business sector was also a vital concern of the Sages. Appreciation of the fact that the viability of the community's economic life hinges heavily upon the prosperity of the business sector finds expression in the following Talmudic passage in Baba Batra 91a: 'Our Rabbis taught: Public prayers are offered for goods (which have become dangerously cheap), even on the Sabbath. R. Yochanan said: For instance: linen garments in Babylon and wine and oil in Palestine. R. Joseph said: This (is only so) when (these have become so) cheap that ten are sold at (the price of) six.'"

[7]See the several references in Clark's (1923) index under "spoiling the market."

[8]Clark (1963, 169): "When the antitrust laws were framed, the evils of 'cutthroat,' 'predatory,' and 'unfair' competition were widely understood."

fit. Scherer considers competition ruinous only if prices fall so low that significant industry exit occurs or if there is significant impairment of the financial health of the firms in the industry. In a section titled "A Digression on Cutthroat Competition" Scherer states [Scherer, 1990, 305]:

> Conduct resembling ruinous competition has been extremely rare in the recessions experienced by the United States since World War II. With the possible exception of the electrical turbogenerator industry, from which Allis-Chalmers exited in 1962, leaving inadequate domestic capacity to serve subsequently booming demands, it is hard to find examples of manufacturing industries not declining secularly whose structural or financial health has been significantly impaired by episodes of sharp price competition.

It may be true that price competition that induces significant industry exit or causes significantly impaired financial health is rare—but price competition that forces prices below levels Ely calls"sufficiently remunerative to attract the additional investments of capital that recurrently become necessary," may not be rare and is thus worthy of more careful consideration.

1.3.3 Clark and The Theory of Second Best

Clark's workable competition is in essence, a "second best" solution. He has been credited [Ferguson, 16] with the first clear statement of what is now known as the theory of second best [Clark, 1940, 242]:

> One central point may be put abstractly. If there are, for example, five conditions, all of which are essential to perfect competition, and the first

> is lacking in a given case, then it no longer follows that we are necessarily better off for the presence of any one of the other four.

Clark gives the reasoning of the theory of second best to support his rejection of so-called perfect competition, but his constraint is not the economy of scale constraint widely used to illustrate the theory of second best which can make short-run marginal cost pricing impossible, that is, leading to industry losses. To Clark, economies of scale, after a certain minimum size, generally don't exist.[9]

Clark does not give arguments involving attitudes towards risk to support his workable competition thesis. Clark's concept is unrelated to risk arguments. Some countries allow cartels if the cartel is expected to lower average prices by reducing risk from price fluctuations. Firms are assumed to be risk averse and thus would be willing to invest more in an industry that has less price fluctuations, all else equal. In England, for example, a cement cartel was ruled to be in the public interest in 1962 for this very reason.[10]

Clark's main constraint is the lack of "freedom of exit"[11] of durable and specific assets during economic downturns. Clark emphasized the importance of freedom of exit long before modern writers who usually don't cite him (notably writers on the

[9]For example, see Clark, 1961, 60, or Clark, 1940, 248.

[10]Heath, 350: "The essence of the case put by the Cement Makers' Federation, and accepted by the Restrictive Practices Court, is that without the price agreement the degree of risk would be greater; if the risk is greater, then the expected return which would be necessary to call forth an expansion of capacity would be higher; since demand is expected to increase, to satisfy this demand from home plants without the price agreement would therefore require a higher price to provide the higher return; and to be charging a lower price is, in this instance, a specific and substantial benefit to the public."

[11]Clark, 1961, 112 and see Clark, 1940, 243.

theory of contestable markets).

1.3.4 Stigler's objection and Clark's Rejoinder

Clark's use of the theory of second best greatly puzzled George J. Stigler in the 1939 roundtable discussion when Clark first presented his workable competition thesis. Stigler stated [Stigler, 1940, 402]:

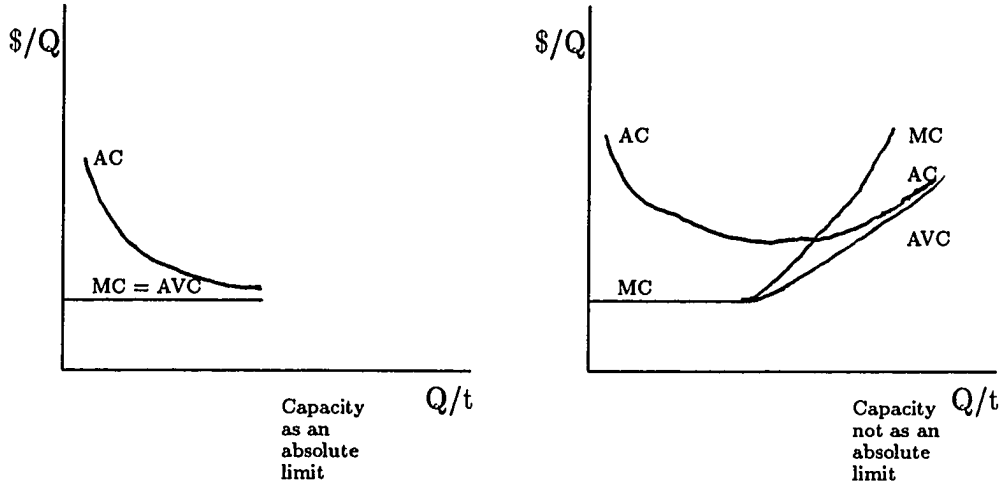
> ...I do not see why flat marginal cost curves (well below average costs throughout a considerable range of outputs) make pricing according to the competitive norm—marginal cost equals price—impossible.

Clark's rejoinder is one of realism and not of possibility. Perhaps this is why Clark is not widely acknowledged for his early formulation of the theory of second best. One must understand that Clark's view of plant cost curves throughout his writings is that cost curves are as shown in Figure 1, modified from a cost accounting text (Aranoff, 589).[12] This is the common cost accounting perspective of which Clark is a leading theoretician.[13] The cost accounting equivalent of marginal cost is variable cost and it is sharply different depending if the firm has idle capacity or not.

[12]J. M. Clark, 1940, 251: "Cost curves for varying output with fixed plant probably fall into two main groups or types. In one, physical capacity has fairly rigid limits, and marginal costs appear to remain approximately uniform, nearly or quite up to the limit of physical capacity. This type may provisionally be taken as characteristic of continuous-process industries, dependent on heat or chemical action, which cannot be substantially speeded up beyond the ordinary economical rates. The other type would include process which can be speeded up or worked overtime. Here it may be possible to produced considerable amounts beyond the point of lowest average cost, with marginal cost above average operating expenses, though possibly not far enough above so that a price equal to marginal cost would yield a fair return on the fixed investment."

[13]Spencer, 221 writes of Clark's 1923 book which focuses on cost theory: "...a book which undoubtedly is one of the most important contributions to economic and business literature in the 20th century."

Figure 1: Two Types of Plant Cost Curves



In his 1961 book Clark elaborated on why short-run marginal cost pricing would be suboptimal with these types of cost curves. With demand fluctuations, durable and specific assets, and pricing of quoted price type[14] leads to the naturalness of surplus capacity for the great majority of time. Clark objected to characterizing such excess capacity as "monopolistic." [Clark, 1961, 120]

Short-run marginal cost pricing, according to Clark, faces two serious problems in a competitive market with cost curves as in Figure 1. The first is a micro-economics problem. The required price when plants are at capacity (which is virtually the only time plants would not be sustaining losses) would be too high to obtain in the real

[14]Clark, 1940, 244 and Clark, 1961, 108 discuss quoted price type markets (such as in most manufacturing) as opposed to supply-and-demand pricing markets (such as in organized commodity exchanges) or negotiated price markets (such as in real estate).

world.[15]

The second is a macro-economics problem. In Clark's view short-run marginal cost pricing implies a volatility of prices that would be destabilizing, that is, likely to accentuate general fluctuations in economic activity.[16] This view is supported by a recent article by De Long and Summers. The majority of economists would argue that increased price flexibility cannot be destabilizing, but De Long and Summers cite impressive theoretical and empirical support for their contention that: "...the sign of the macroeconomic consequences of increased aggregate price flexibility is not a settled issue."[De Long and Summers, 1031]

[15]Williamson, 821, shows that with linear total cost curves, capacity as an absolute limit, and demand fluctuations—the prices that give zero profits over the cycle is P_1 = VC per unit and P_2 = VC per unit + (FC per unit at capacity)/w_2 where P_1 is price in non-peak demand times, P_2 is price in peak demand times, and w_2 is the weighting or probability of high demand. Commonly, since w_2 is a small fraction and FC per unit is not insignificant, P_2 calculates to several multiples of P_1. It would be difficult to raise prices so sharply during high demand times. The greater the relative portion of FC, the greater will be the disparity between P_1 and P_2.

[16]Clark, 1961, 121–122:

> This solution [short-run marginal cost pricing] faces at least two serious difficulties. In view of what has been said about the naturalness of excess capacity as generated by competitive conditions in times of normal demand, the conclusion seems warranted that for most producers a majority of the time short-run marginal cost would be less than average cost, and would equal or exceed it only in considerably shorter periods of extra-strong demand. Only in the latter periods would "pure competition" permit prices to be raised sufficiently to equal or exceed full economic cost. It is decidedly doubtful whether it would be economically feasible to make profits enough in such periods to offset the losses incurred in normal and subnormal periods...
>
> This raises the more general question of the usefulness of short-run flexibility of prices in response to changes in demand as distinct from longer-run flexibility in response to changes in costs. The usefulness of the latter is unquestioned; but as to the former, it seems as likely to accentuate general fluctuations in economic activity as to stabilize them. The price fluctuations called for in the case we have been discussing are so extreme as to go far beyond the amount that could render useful service towards stabilizing the economy.

1.4 A Proposed Definition of Under-Capacity

This writer's formulation of a definition of industry under-capacity is as follows:

Industry under-capacity exists if persistently, over considerable periods, there are acutely raised prices, product shortages, costs and inconveniences of waiting lines and higher costs of substitutes at times of high level or peak demand.

The above definition of under-capacity is developed as a converse to Bain's definition of chronic excess capacity. Bain (384) writes: "By chronic excess capacity we refer to an adjustment of capacity to demand where persistently, over considerable periods of time, there is redundancy of nonobsolete capacity at times of high-level or peak demands." The above definition of under-capacity is in agreement with Bain's description of optimal capacity, which he calls "most efficient" capacity (Bain, 382):

> ... Suppose that an industry experiences periodic fluctuations in demand in connection with general business cycles or otherwise. Is the most 'efficient' adaptation of capacity to demand one that gives the lowest unit costs for the aggregate output over all stages of the demand fluctuations, and that thus involves some shortage of capacity and either rationing or acutely raised prices at times of peak demand? Or is it the adaptation that permits the high levels of demand to be met without price-elevating shortages, so that capacity is fully adequate for 'boom' periods? ...
>
> "We are inclined to support the latter definition of 'most efficient' capacity—thus justifying somewhat larger capacities in the case of most industries. The provision of capacity in such amounts in many industries will generally permit high-demand or boom periods to be sustained for much longer periods in the economy as a whole, and the resulting gain in the total employment and output of the economy should outweigh any nominal increase in unit cost that is due to a poorer cyclical load factor on plant capacity...

In Bain's statement under-capacity is a situation where persistently, over considerable periods, during high demand times, rationing or price elevating shortages develop. The social cost is a less sustained boom period and a reduction in total employment and output. Bain offers only persuasive argument and not a "proof" that such under-capacity can exist.

This writer's definition of under-capacity is also in agreement with economists of a previous generation who wrote on adequacy of capacity, such as George Terborgh and Edwin G. Nourse. They used the criterion that general under-capacity exists if there is full capacity and not full employment. For example, it may surprise some that using this standard, George Terborgh decried the general inadequacy of industrial capacity at the end of the 1939.[17] Edwin Nourse, before Terborgh, stressed the need to compare capacity with labor employment.[18]

One can relatively easily prove chronic excess capacity, vis-a-vis under-capacity, because the main requirement is to show low capacity utilization data during several economic upturns. Chronic excess capacity is a physical fact—it is idle nonobsolete plant and equipment during high-demand times.

[17]Terborgh, 639: "The last quarter of 1939 saw a level of industrial activity roughly comparable with the peak of 1929, but accompanied by a large surplus of unemployed labor, estimated by the conventional methods at eight or nine million workers. During this period a considerable number of manufacturing industries appear to have operated at or near 'capacity.' This situation suggests a present deficiency of capacity in many lines relative to the amounts that would be needed if productive activity as a whole were to rise high enough to provide reasonably full employment for our labor force."

[18]Nourse, 174: "It becomes extremely important for our present inquiry that we scrutinize the data with which we are working with great care to bring about practical criterion as to how large a plant would be available under actual operative conditions if our existing labor force were given the opportunity for full employment in the satisfaction of their wants."

It is far more difficult to prove industry under-capacity. The reason is that the social cost of under-capacity is by nature conjectural and difficult to measure. At best one can argue that if capacity were higher—a reasonable case can be made that cycle output would be higher and cycle costs to buyers would be lower. To suggest a case of industry under-capacity one has to show high capacity utilization data and evidence of acutely raised prices, product shortages, and waiting lines, and use of less satisfactory substitutes during several economic upturns. Infrequent cases of product shortages or apparently minor social costs of shortages would not be evidence of under-capacity, but rather would be evidence of occasional or minor short-run disequilibria. Frequent or major short-run disequilibria suggests a long-run disequilibrium which is what under-capacity is.

1.5 Cement 1909–1946: Possible Mischaracterization

1.5.1 The Loescher-Scherer Hypothesis

Samuel M. Loescher contends that there has been historic over-investment and chronic excess capacity in the cement industry.

The principal hypothesis or conclusion of Loescher's widely cited study, *Imperfect Collusion in the Cement Industry*, is that there has been "long-run excess capacity" in the U.S. cement industry and that this has been due to collusive pricing practices, notably basing point pricing.[19] Loescher concluded: "Stabilization of the price level

[19]Basing point pricing refers to charging a base point price plus freight, as Fritz Machlup, writes (page 7): "The basing- point technique of pricing makes it possible for any number of sellers, no

through the use of a delivered price formula has operated to induce and maintain long-run excess capacity ..." [Loescher, 191]

F. M. Scherer, in his popular text *Industrial Market Structure and Economic Performance*, cites the U.S. cement industry on several occasions and each time gives Loescher's book as a reference as an industry suffering "the sick industry problem" which Scherer includes among the "...chief prerequisites: capacity substantially in excess of current and probable future demands ..." [Scherer, 1990, 294] To demonstrate the hypothesis that cement can be characterized as having chronic excess capacity and apparently accepting Loescher's claim that this was due to basing point pricing in effect until declared illegal in 1948, Scherer states, with a footnote reference to a table in Loescher's book, graphed as Graphs 3A and 3B [Scherer, 1990, 674]:

> Similarly, cement producers using the basing point pricing system as a collusive device were apparently unable to control the tendency toward excess investment stimulated by their high prices. Between 1909 and 1946, the fraction of practical production capacity utilized by the U.S. industry averaged 68 percent, and in only three years out of thirty-eight did the level of capacity utilization climb above 90 percent.

Loescher may have incorrectly cited cement pricing behavior before 1948 as non-competitive. It may be that a more reasonable hypothesis would consider all the

---

matter where they are located and without any communication with each other, to quote identical delivered prices for any quantity of the product in standardized qualities and specifications, going to any of the 60,000 or possible destinations in the United States. It is only necessary that one or a few 'base prices' governing the entire industry be announced. All competitors can then use the formula 'applicable base price *plus* specified extra charge *plus* applicable railroad freight.'"

incidents that Loescher and the courts uncovered of illegal price collusion as desperate attempts by industry members to reduce strong competitive pricing pressures only to avoid large losses. Contrary to the Loescher and FTC and Liebeler characterizations, some business analysts portray the U.S. cement industry of the 30's as fragmented, highly competitive, and suffering from high losses.[20]

Loescher-Scherer are implicitly treating all years 1909–1946 equally. In Bain's definition of excess capacity cited earlier, the focus should be "at times of high-level or peak demands." The years of World Wars I and II should be excluded because during these years there was an extreme drop in cement demand because of the general halt in civilian construction.

The years of over 90% capacity utilization cited by Loescher-Scherer were in fact years of widespread severe regional cement shortages. Also, the looseness of the reported capacity utilization data was dealt with by Loescher making a flat 10% adjustment from the survey data reported by the Bureau of Mines, a seemingly arbitrary adjustment. The Federal Reserve Board's approach for many years is to add cautionary notes to their releases of capacity utilization data to avoid unwarranted implications of excess capacity that the numbers might indicate.[21] Not to

[20]For example: Standard & Poors, *Industry Surveys 1956*, B 80: "The overcapacity during the construction lag of the 1930's and the ruinous trade conditions of that period made most cement companies unduly cautious about expanding their facilities."

[21]Zoltan E. Kenessey in his work on capacity and capacity utilization at the U.S. Federal Reserve Board coined the term "the optical problem" [Kenessey, 246] referring to the misleading appearance of chronic excess capacity in virtually every industry including labor employment in that capacity utilization rates peak at much less than 100 percent even during periods of reported tight supplies and shortages. Zoltan E. Kenessey, 245, observes: "Less informed users of the material on capacity utilization sometimes believe that a measure showing 85 percent utilization implies that output could readily be increased an additional 15 percent to a total capacity of 100 percent. More

be overlooked is the fact that during the twenties, other than its years of over 90% capacity utilization rates, the cement industry had about the same rates of capacity utilization as that of the general economy.[22]

To judge the adequacy of technical productive capacity one needs an estimate of a *preferred* rate of capacity utilization, that is, an optimal rate over a business cycle considering the cost of maintaining unused capacity versus the cost of product shortages. This is similar to Bain's concept of most efficient capacity cited earlier. A preferred rate of average capacity utilization over a business cycle for the cement industry should be significantly less than conditions of relatively tight supply and even below that of the preferred rate for the average of the economy since cement is a semi-perishable product and a small essential ingredient to a large and widely fluctuating demand industry. Economists of the U.S. Federal Reserve have pointed out that material shortages reduce economic activity in the short-run.[23] The most prominent economist to argue against the cement industry prior to the 1948 Supreme Court decision was Frank A. Fetter of Princeton University, as Clark noted when asserting that Fetter's concept of competition was flawed in that it ignores freight absorption as a competitive action, that is, competitors absorbing

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sophisticated users know that if the peak rates usually occur at 86 or 87 percent, the 85 percent rate implies only a small margin for output expansion."

[22]For example, Nourse, 416: "In a word, the conclusions arrived at in the analysis of the several branches of industry mean that our productive system as a whole was operating at about 80 per cent capacity in 1929 and slightly less than that if we take the average of the five years 1925–29."

[23]For example: Raddock and Forest, 8: "...shortages of industrial materials—caused to some extent by hoarding—probably impeded production further downstream, so that peak utilization rates for primary materials were much higher than those for advanced products. In 1973, capacity utilization in primary processing (and materials) industries reached a quarterly peak of about 93 per cent. In contrast, capacity utilization in advanced processing reached only 85 per cent ..."

incremental transportation costs as they invade more distant markets.[24]

Henry Parker Willis and John M. Clark were both professors of economics at Columbia University and both were among the few outstanding academic economists to write in defense of the cement industry's basing point price system which was outlawed by the FTC in 1924 and by the U. S. Supreme Court in 1948.[25] The focus of Willis' study was to make a determination "Are Portland Cement Prices 'Reasonable'?"[26] This puts Willis in the camp with Clark. As in Clark's writings, to Willis competitive prices "...are prices which result from the effort of producers to get business from consumers ..." [Willis, 40] Interestingly, Willis argued for three operational tests of reasonableness.[27] Using these tests of reasonableness, Willis' conclusion was that cement prices are reasonable. [Willis, 67]

Fetter condemned and ridiculed Willis' book.[28] Loescher and Scherer made no

[24]Clark, 1961, 330: "At that time [1924] it [the FTC] held that competition would bring about F.O.B. mill pricing. It was under the ideological influence of F. A. Fetter, whose theory of competition for industries of this type ...hinged on uniform mill pricing, under which a producer's marketing area would depend on its mill price, relative to those of the surrounding mills, and it could enlarge its area only by a relative reduction of its own mill price. ...Fetter's claim that genuine competition between spatially separated producers would lead them to refrain from freight absorption disregarded the incentive arising from this kind of competition ..."

[25]Another example is Nicols, 309, who notes: "The Federal Trade Commission's and Supreme Court's finding of monopoly in the Cement cases is the result of an unduly narrow definition of competition. Competition in the sense of 'individualistic action' which ignores mutual dependence is rarely found. It follows as a consequence that most markets are monopolistic. Such a result is due to our definition and not any 'concerted action' by producers."

[26]Title of chapter 6, 59. This was the central issue in the U.K. cement case cited earlier.

[27]Willis, 58: "If cement prices on the whole (1) change as frequently as those of other commodities of a similar sort, (2) are no higher than the average of all other commodities or of other representative commodities, and (3) afford to producers no more than an average rate of return on investment, the prices must be considered reasonable. If on the other hand they fail in these tests, they must be considered unreasonable."

[28]For example: Fetter, 656: "Under a veneer of loose economic phraseology and a camouflage of graphic diagrams of prices relating almost entirely to products other than cement, and having little if any pertinence to the central theoretical question, the views of the cement manufacturers and of their lawyers as set forth in the brief of the case, are faithfully reiterated by the authors."

reference to the Willis study. Graph 5A presents Loescher's data on the cement industry's return on investment. Loescher did not relate these numbers to returns for commodities of a similar sort, to representative commodities, to general fiscal conditions, or to values obtained by the consumer which, as Willis says, is needed to determine if returns are reasonable.

Thus, the Loescher-Scherer hypothesis of over-investment 1909–1946 may be open to question by the light of 1) the widespread and severe shortages 1922–1925, 2) during the period of the cement industry's major expansion, the latter twenties, its capacity utilization rate was about that of general industrial averages, and 3) the methodology and evidence of Willis' 1924 cement study were not incorporated in Loescher and Scherer's work.

1.6 Cement in 60's and Early 70's

The U.S. cement industry has had widespread and severe regional product shortages and rationing during the construction seasons of the high economic growth years 1922–1925, 1947–1956, 1972–1973, and 1978–1979. This is reflected by:

1. Relatively high capacity utilization rates for these years (see Graphs 2–4).

2. Failure of construction unemployment to fall further during the construction season April through November for these years (see Graph 7).

3. Extensive press coverage for these years (A summary appendix is available on request).

The cement shortages created noticeable problems for the construction industry because of the disruptive effects of delayed and canceled construction projects. The press coverage shows that entrepreneurial interest, labor, financing and other building materials were available—but prospects of cement shortages caused many projects to be canceled or deferred. The concomitant rising of cement prices was only a small factor in construction deferrals since many projects, notably industrial plants and new highways are often let on a cost plus basis. There are other sources such as the National Purchasing Managers Association which report on material shortages.

As shown in Graphs 5B and 5C, since 1963 according to Citibank data and since 1962 according to Standard & Poors data, the cement industry has had below average profit rate returns which persisted until 1978. The intense competitiveness of the industry during the periods of significant surplus capacity coupled with the long life, immobility, single purpose nature of cement manufacturing equipment, the wide and erratic fluctuating nature of cement demand, and the long time required between initial planning and actualization of plant expansions (four to six years) can explain the low returns since the early sixties and their historically low and cautious configuration of expansions.

By the time the cement industry had a chance to get over the unsettling effects of the 1948 Supreme Court ruling barring basing point pricing, the shortages and high profits of the late forties and fifties encouraged major industry expansion. Nevertheless, the industry's long periods of low returns and recurring shortages gave it a reputation for technological backwardness and poor economic performance.[29] A recent U.S. Department of Commerce study confirms the cement industry's inability to pass forward cost increases in the form of higher prices.[30] Johnson and Parkman's study on the cement industry also refers to "... the general record of aggressive price competition..." [752]

The major expansions of the latter twenties and fifties came only after the sustained high prices and shortages of the earlier twenties and fifties. In the fifties, the impact of cement demand from the then new federal interstate highway program was an important factor and essentially unexpected from a long-term planning view.

The low levels of net plant expansions (new additions less plant closings) has been persisting throughout the sixties, seventies, and eighties, despite the possibility based on past performance that construction upturns comparable to the upturns of

[29]For example, Scherer, 1975, 394 comments on the cement industry's "...technological backwardness compared to counterparts abroad ..." Also, there was uniform agreement that U.S. cement industry performance is low in a questionnaire survey (Cox) taken of 42 economists, marketing professors, and business writers on the quality of performance of 14 major industries which included cement.

[30]In many places, for example p. ix: "The ability to pass on cost increases through higher prices is a significant determinant of financial performance in this industry. Weak demand in the early 1980's through 1982, coupled with import competition have adversely affected performance in much of the industry, although some firms improve performance in 1985 and 1986. Due to overall poor financial performance in this industry and increasing pressure from imports, many companies have left the cement business..."

1972–1973 and 1978–1979 would lead to a repeat of the cement shortages. Reliance upon cement imports has soared. If not for the anti-pollution laws passed in the late sixties considerable capacity would have remained open and not have closed, because generally prices cover variable production costs however old and inefficient the plant is. These laws forced firms either to invest heavily in pollution control equipment or to shutdown.

1.6.1 Unemployment Data Suggests Under-capacity

Graph 6 shows employment rates (1 – unemployment rates) and capacity utilization rates for the cement industry and for manufacturing and for materials. Graph 7 compares unemployment rates for total workers and for construction workers April through November, the main construction season, for the economic upturn years 1952, 1953, 1968, 1969, 1972, 1973, 1978, and 1979. The war time years of the Korean and Vietnam wars showed the lowest unemployment rates. Construction unemployment was at its all time low in September 1967 (3.4%) while total workers unemployment was at its all time low October 1953 (2.6%). It is reasonable to assume that the reported cement shortages in the fifties and the seventies was one of the factors which lead to construction workers unemployment rates failing to fall lower than they did in the fifties and in the seventies during periods of high construction activity. This suggests industry under-capacity.

1.6.2 Conclusions on Adequacy of Cement Capacity Post WWII

The expansion of the fifties was socially beneficial in that it permitted construction unemployment rates during the construction seasons of the latter sixties to fall to general averages. The low profit returns of the sixties and early seventies (see Graphs 5B and 5C) were socially damaging because they contributed to a general lack of needed net plant additions of the seventies and eighties and to the severe cement shortages of 1972–1973 and 1978–1979. The antagonistic attitude of the FTC and writings in support of the FTC is unjustified in the face of the long periods of low profits and of the consumer need for greater capacity. Existing cement companies, especially those with large modern facilities located near waterways or good growth areas, should benefit in the years ahead with above average returns. However, cement users which include ready-mix and concrete product industries and virtually all construction activity will likely suffer if they experience repeat cement shortages. As Graph 4A indicates, capacity is about the same as the mid-sixties. New additions approximate closings. This is a common situation in many so-called smokestack industries explainable by many factors—the large expansion of the fifties, the depressed returns in the sixties and seventies for these industries traceable to such factors as price wars and strict pollution laws forcing massive expenditures. Especially painful were the few years of price controls in the seventies for industries which experienced low returns in the base year period of the later sixties. Furthermore, the soaring price of energy in the seventies, which impacted

considerably on energy intensive industries such as cement, was accompanied by sluggish capital markets because of the generally poor investor and stock market climate in the seventies and early eighties. If the intensity of competition were weaker, cement companies might have been able to pass forward, in the form of higher prices, the soaring cost of energy and pollution control equipment.

Cement in the sixties and seventies illustrates Clark's concept of too strong competition because throughout this period the industry earned low returns as shown in Graphs 5B and 5C yet evidence is compelling on the need for investment for new capacity. We thus have a condition which Clark spoke of [Clark, 1940, 249]: "The most serious problems of imperfect competition seem, as already noted, to center in the fact that the immediate short-run pressures are out of harmony with the conditions of long-run equilibrium."

1.7 Research and Policy Implications

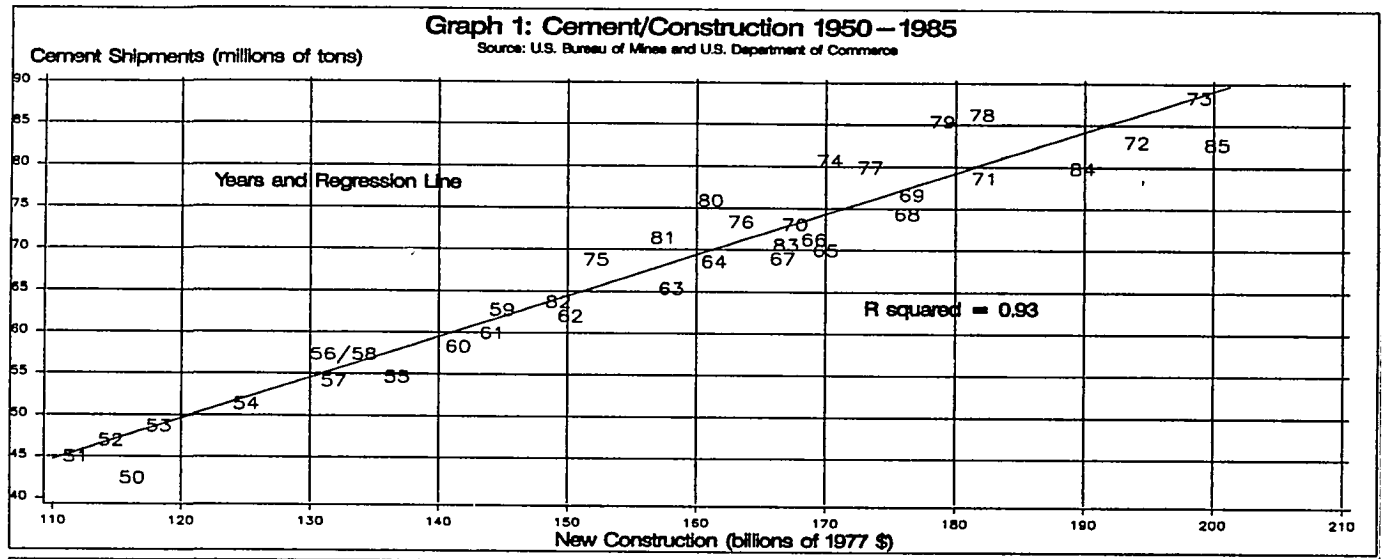
Too strong competition similar to the cement industry may be far from rare and so deserves serious consideration. Further research is needed to determine if steel, paper, or other major industries may also be classified as instances of too strong competition with significance for government industrial policy. The essential ingredients are capital intensive operations, widely fluctuating demand, and low returns during periods of surplus capacity, with the result that industry under-capacity exists, that is, persistently, over considerable periods, there are acutely raised prices,

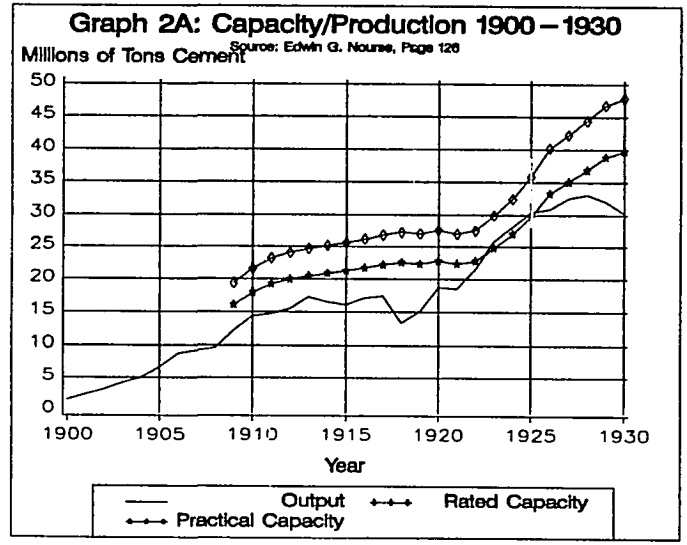
product shortages, delayed deliveries, and higher costs of substitutes at times of high level or peak demand.

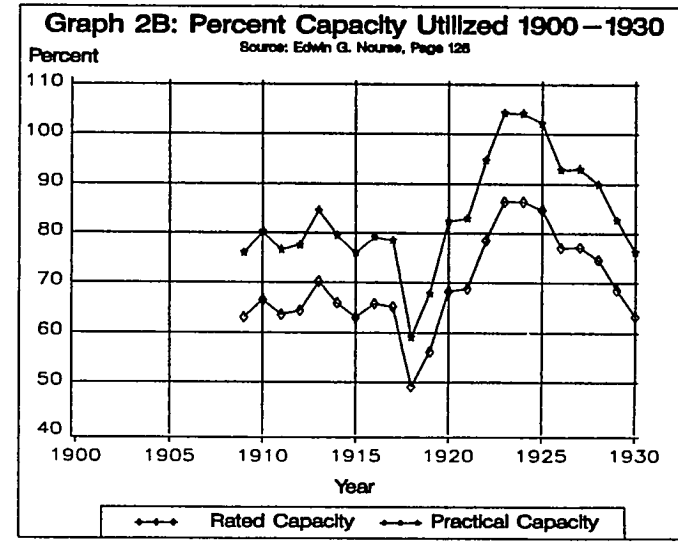
If the condition of too strong competition is not a rarity, the policy implications might be in the direction of easing of antitrust laws especially allowing more mergers, and possibly the adoption of a "rule of reason" approach, which admittedly has considerable complications (see Scherer, 1990, 335–339). If such approaches are not enough to give adequate returns to industries where long-run investment is needed, then, perhaps, more direct government stimulation through government policy might be recommended, especially in the tax policy area.

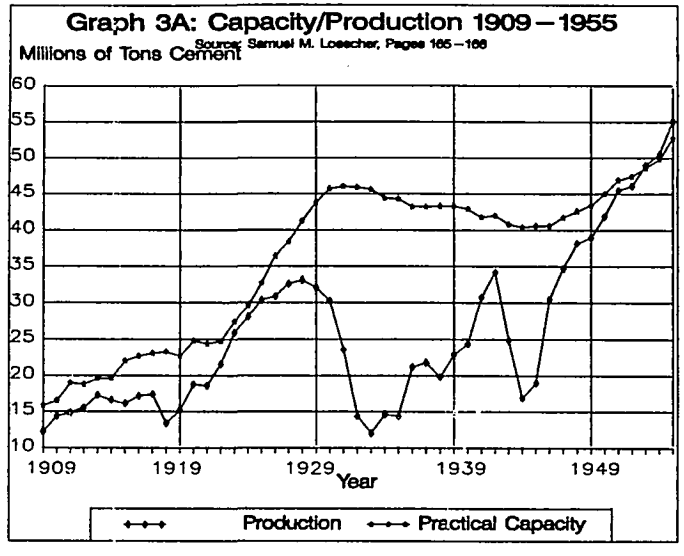
Perhaps another approach might be increased vertical integration of cement factories with other construction establishments, or else a greater use of "long-term supply contracts" so that investors can expand capacity without losing funds.

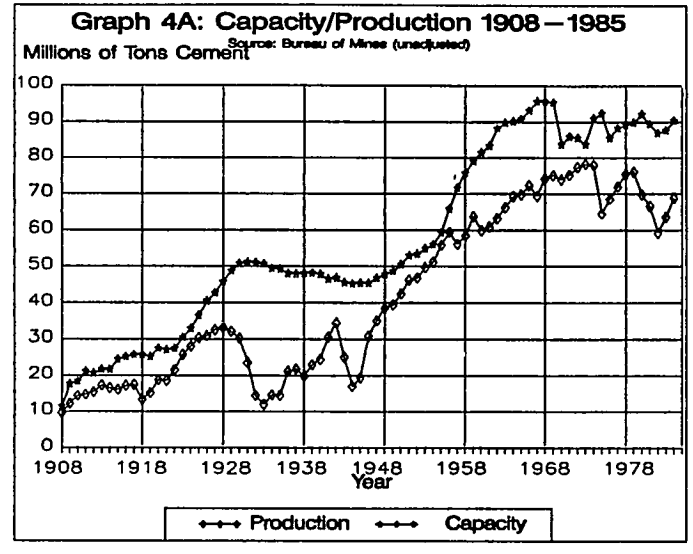
The macroeconomic policy implication is that by avoiding too strong competition in many industries, and thus avoiding under-capacity, the ability to achieve expanding employment and a rising GNP (without adding to inflation) is increased. Understanding the phenomenon of too strong competition may allow the development of an industrial policy that facilitates the achievement of full employment and simultaneously helps maintain the competitiveness of domestic industry vis-a-vis its foreign competition.

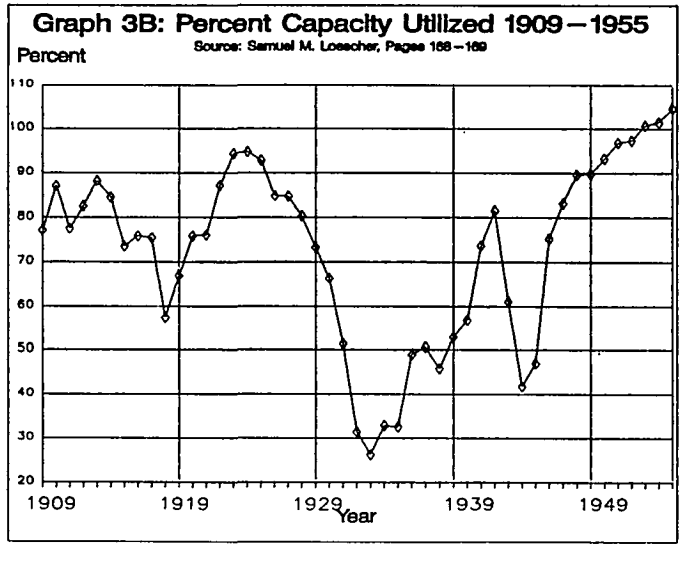


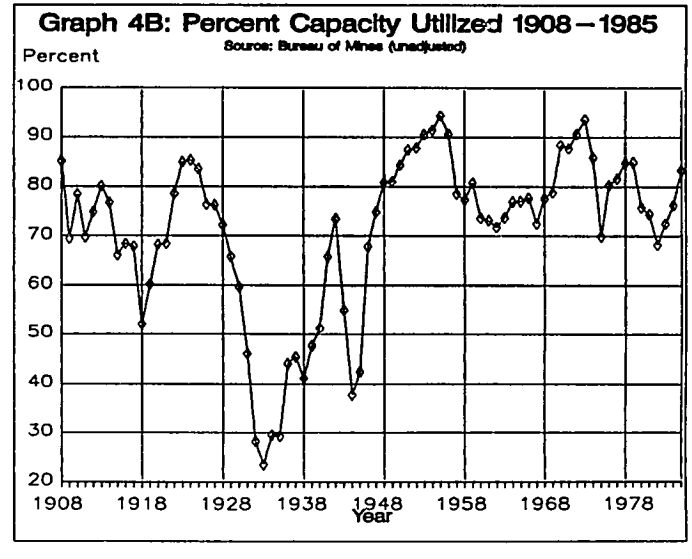


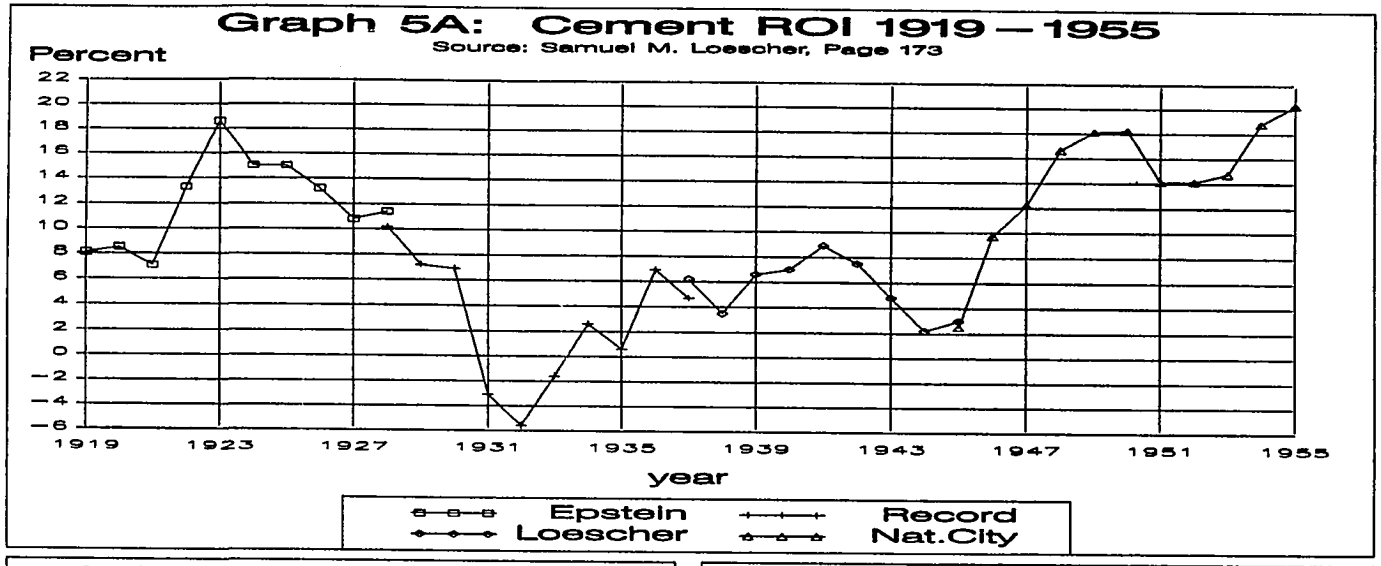


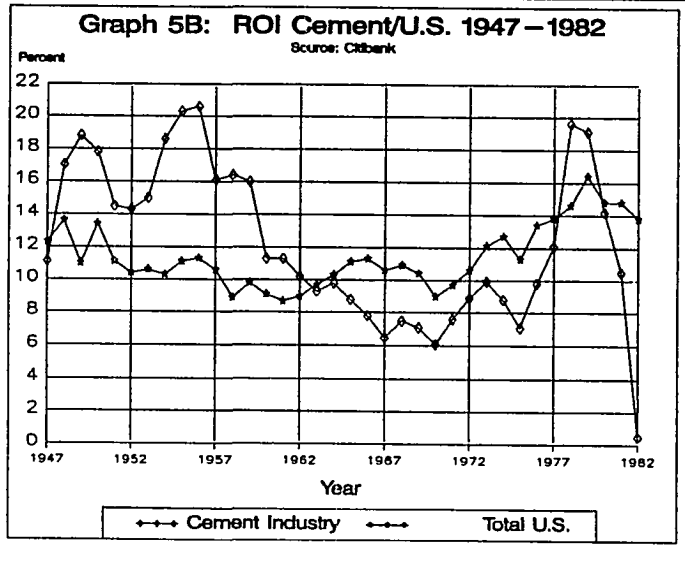


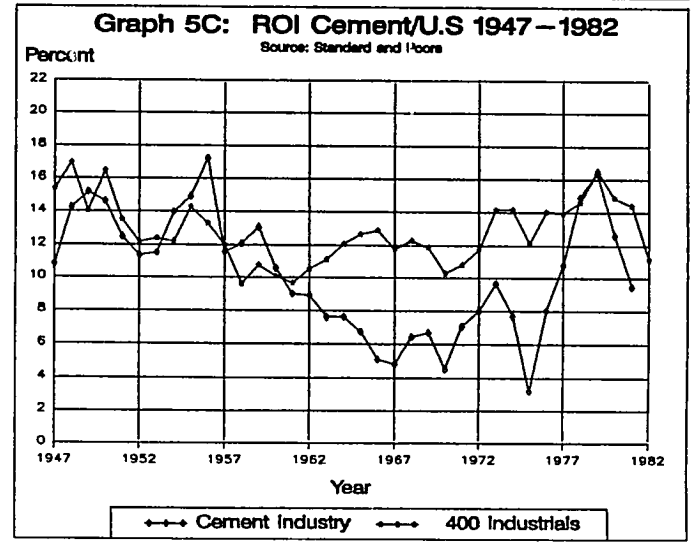


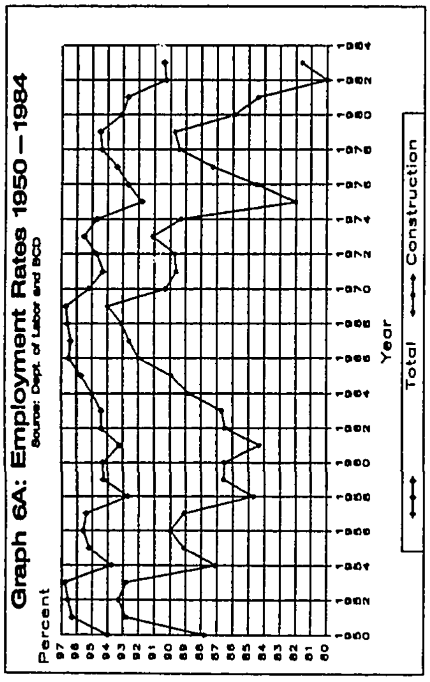


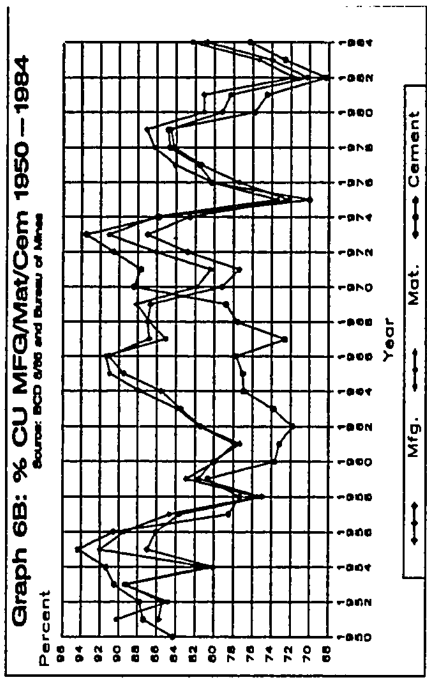


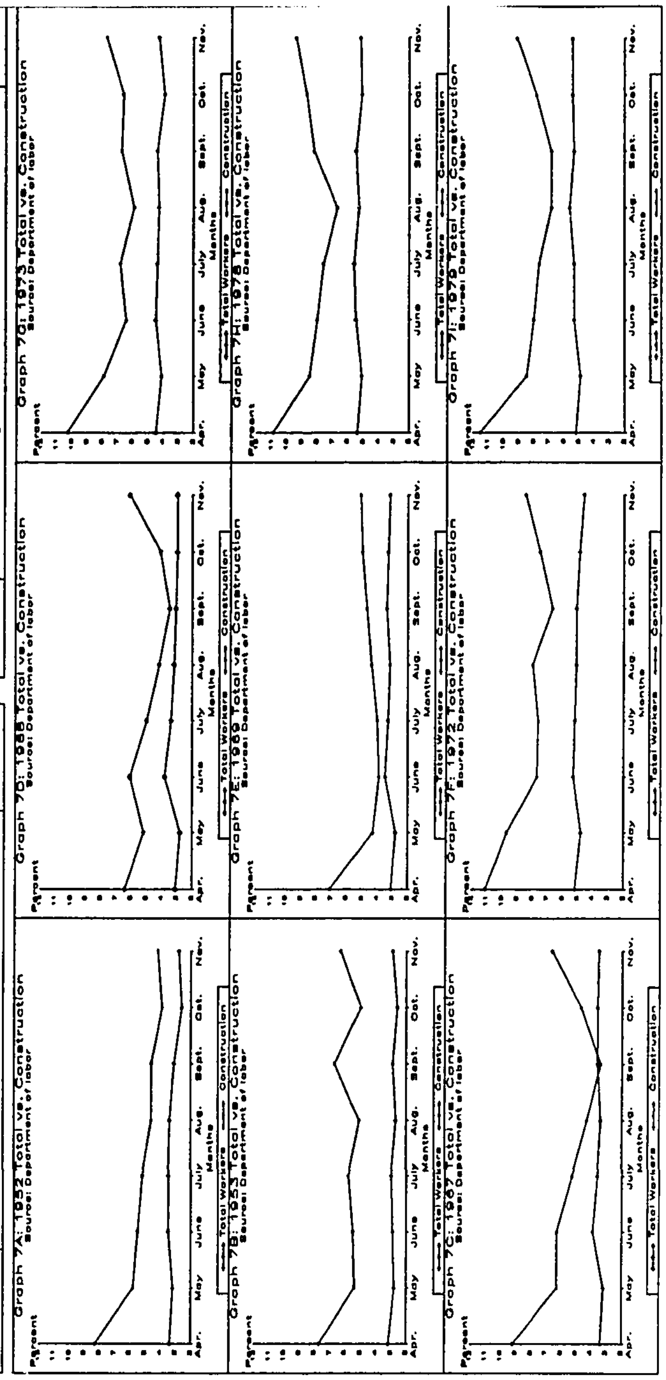












2 Transfer Pricing for Short-Run Profit Maximization in Manufacturing

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This article points out that transfer pricing is essentially another form of the peak-load problem, which is a short-run problem on how to make optimal use of given fixed assets under conditions of fluctuating demand. The major implication is to support marginal cost, incremental cost plus fixed fee, or dual pricing—in other words, a low transfer price during periods of idle capacity. This article develops three theoretical ingredients for the transfer price problem in a simple manufacturing model: a quoted price system, durable and specific assets, and demand fluctuation.

Transfer prices are prices charged between divisions, units, subsidiaries, branches, or responsibility centers of a company for goods or services. Since intra-company profits or losses are eliminated in consolidation, transfer prices have no direct effect on a company's consolidated financial statements. Nevertheless, transfer prices can *indirectly* affect corporate profits if, for example, transfer prices affect management decisions about how to use resources or how to price finished goods. It is this *indirect* impact that transfer prices can have on income that this article addresses.

Assuming certain economic conditions that are explained, this article suggests

how companies can maximize short-run profits by setting optimal transfer prices. The beginning sections of this article present the economic environment of a simple manufacturing model. Later sections present the three prerequisites (or ingredients) of the transfer price problem. The "peak-load" problem is then presented, including the general economic solution to this problem. Finally, recommendations on transfer pricing are presented, along with conclusions and implications.

2.1 Economics of Fixed Costs and Demand Fluctuations

This study of transfer pricing has been prompted largely by reading John M. Clark on the economics of fixed costs and demand fluctuations. Making optimal use of temporary idle capacity was a central problem for Clark. In 1923, he summarized the focus of his research as follows:

> ...indeed the whole subject of the book might be defined as a study of the discrepancies between an ever fluctuating demand and a relatively inelastic fund of productive capacity, resulting in wastes of partial idleness, and many other economic disturbances. Unused capacity is its central theme.[1]

Most modern cost accounting textbooks address the subject of transfer pricing in a separate chapter at (or near) the end of the book. Typically, textbooks establish that:

[1]John M. Clark, *Studies in the Economics of Overhead Costs*, Chicago: University of Chicago Press, 1923.), p. ix.

- Transfer prices have no direct financial statement consequences;[2] and

- Setting transfer prices is fundamentally a behavioral or sociological problem relating to decentralized operations. (As Solomons notes: "The motivating aspect of transfer prices is of primary importance. It is clear that a system which makes it possible for a division to add to its own profit while reducing that of the corporation as a whole is not to be tolerated. A badly chosen set of transfer prices may, however, do just that."[3])

Cost accounting textbooks that focus on manufacturing models first discuss the social and psychological questions of organizational design and incentives before they address the economics of transfer pricing.[4] The common approach is then to demonstrate the existence of a transfer price problem by means of numerical examples. These examples quantify the cost of having non-optimal transfer prices. The examples can be about any of he following types of short-run decision:

- Decisions to make or buy;

- Decisions to sell or process further;

[2]Maurice L. Hirsch, Jr. and Joseph G. Louderback III, *Cost Accounting Accumulation, Analysis, and Use*, second edition (Kent Publishing Company, 1986), p. 751: "A transfer price may induce a divisional manager to make a decision that would lower (or raise) the income, ROI, or residual income of the firm. It is for that reason that corporate management pays attention to transfer prices. However, in and of itself, a transfer price does not affect the firm's income."

[3]David Solomons, *Divisional Performance Measurement and Control*, (Richard D. Irwin. 1965), pp. 166–167.

[4]See, e.g., Charles T. Horngren and George Foster, *Cost Accounting: A Managerial Emphasis*, 6th ed. (Prentice-Hall, 1987). Note also the title of Horngren and Foster's chapter "System Choice: Decentralization and Transfer Pricing."

- Decisions to accept or reject special orders;
- Decisions about the pricing of final goods or services;
- Decisions about selecting a product mix;
- Decisions about selecting an input mix;
- Decisions about inventory reorder points; and
- Decisions about inventory safety stocks;

Usually, cost accounting textbooks calculate a transfer price that will prove optimal for the company as a whole. They then show how setting a nonoptimal transfer price leads to behavior that hurts the company as a whole. The effect of having nonoptimal transfer prices is calculated by taking the difference between the company's consolidated income based on the optimal versus the nonoptimal transfer price.

Most cost accounting textbooks then analyze the pros and cons of alternative pricing solutions. Kaplan, for example, analyzes the following pricing methods:

- Market price;
- Marginal-cost;
- Incremental cost plus fixed fee;
- Full cost;

- Negotiated market-based price; and
- Transfer prices from mathematical programming models.[5]

Horngren and Foster,[6] Hirsch and Louderback,[7] and others add the dual-pricing method.

2.2 Main Assumptions of Model

The following are the main assumptions used in the analysis of transfer pricing for this article:

1. *Decentralized organizational and incentive structure.* In a centralized organization, transfer price problems do not arise. However, decentralized operations are assumed here. For example, top management may believe that the benefits of decentralization (e.g., management autonomy, employee morale, specialized training, the ability to attract better people) outweigh the costs of having to deal with transfer price problems in a decentralized organization. Senior managers may also tend to minimize the cost of the transfer price problem because they do not know its true cost to the company.

2. *No economies of scale* (in the sense that joint coordination by divisions in purchasing or manufacturing could lower costs because of an increase in scale

[5]Robert S. Kaplan, *Advanced Management Accounting*, (Prentice-Hall, 1982) pp. 483–497.
[6]Horngren and Foster, *Cost Accounting A Managerial Emphasis*, pp. 836–845.
[7]Hirsch and Louderback, *Cost Accounting Accumulation, Analysis, and Use*, pp. 751–768.

of operations). The transfer price problem as commonly treated in cost accounting literature is wholly unrelated to issues of economies of scale.

3. *No externalities* in consumption or production (in the sense that joint coordination by divisions in purchasing or manufacturing might lower costs). Externalities include positive externalities (such as training by one division that benefits other divisions as well) and also negative externalities (such as pollution by one division that negatively affects other divisions). As in the preceding, transfer pricing problems in most of the cost accounting literature ignore the question of externalities.

4. *No specialized information.* All divisions are assumed to know each other's cost curves, demand curves, and patterns of demand fluctuations. The problem of setting transfer prices is not usually considered a problem caused by poor intercompany coordination and communication. Although managers certainly have both incentives and opportunities to provide misinformation, (e.g., by overstating their true costs), this is not considered a transfer price problem.

5. *Divisions are profit centers and not investment centers.* The assumption might be that division managers are paid by salaries and bonuses that depend on divisional annual profits. Divisions are assumed not to be responsible for the acquisition and disposition of their productive assets. This simplification allows the focus of transfer pricing to be on the short-run impact of alternative transfer pricing policies.

6. *No revenue or cost interdependencies.*[8] If one division raises or lowers its price for the goods it sells to customers outside the firm or for resources purchased from outside the firm, the assumption is that other divisions will not be affected by this. This is similar to the assumption of no externalities in consumption or production. Externalities and interdependencies greatly complicate optimal transfer pricing decisions. Centralized decision making and less autonomy would be justified where externalities and interdependencies are significant.

With these assumptions, the transfer pricing problem boils down to the problem of utilization of idle capacity.

2.3 Three Prerequisites of the Transfer Pricing Problem

There are three theoretical prerequisites or ingredients to the transfer price problem as it is usually treated in cost accounting literature:

1. A quoted-price pricing system;

2. Durable and specific assets; and

3. Demand fluctuations.

Each is discussed herein.

[8]See Hirsch and Louderback, *Cost Accounting Accumulation, Analysis, and Use*, p. 761: "The previous analysis requires that the divisions be independent in the sense that the actions of one do not affect the results of the other... Two types of independence are of especial importance: revenue and cost."

Also, see Jack Hirshleifer,"On the Economics of Transfer Pricing," *Journal of Business*, (July 1956), p. 173; and "Economics of the Divisionalized Firm," *Journal of Business*, (April 1957), pp. 96–97.

2.3.1 First Prerequisite: A Quoted-Price Pricing System

The first prerequisite or ingredient is that the pricing system be a quoted-price system. Clark divides price making into three main types: "supply-and-demand pricing, the quoted price, and the negotiated price."[9]

In *supply-and-demand pricing*, goods are traded on organized commodity exchanges. Thus, individual sellers can rarely influence the going market price appreciably. In economic terms, the demand schedules facing individual sellers are viewed as infinitely elastic. Thus, sellers are pure price takers and quantity adjusters. Transfer pricing problem ordinarily do not arise when supply-and-demand pricing occurs, because a company's divisions have no motivation to deviate from using the going market price, which is also the optimal price. In other words, the buying division would not pay above the going market price, and the selling division would not sell below the market price.[10]

Under the *quoted price system*, sellers are not quantity adjusters. Instead, they first quote a price and then try to fill orders from inventory, through production, or by ordering. Under this system, Clark observes: "For most of the output, the force on the supply side is not a literal supply but an amount of productive capacity and

[9]John M. Clark, *Competition as a Dynamic Process*, (Brookings Institution, 1961), p. 108. Also see Gerald Aranoff, "Appendix: The Economics of Product Pricing" reprinted in Ralph S. Polimeni, Frank J. Fabozzi, and Arthur H. Adelberg's *Cost Accounting Concepts and Applications for Managerial Decision Making*, 2nd ed. (McGraw-Hill, 1986), pp. 587–588.

[10]Jack Hirshleifer may have been the first to clearly establish this point: "The argument made in the present paper is that market price is the correct transfer price only where the commodity being transferred is produced in a competitive market, that is, competitive in the theoretical sense that no single producer considers himself large enough to influence price by his own output decision." Hirshleifer, "On the Economics of Transfer Pricing," p. 172.

the producer's wish to utilize as much of it as he profitably can."[11] In a quoted price system, a selling division can be motivated to charge a transfer price to a buying division which might increase the selling division's profits but lead to a reduction in the company's aggregate profit—this is, in other words, a classic example of the transfer price problem.

Under the *negotiated price system*, transactions are few but important enough such that extensive bargaining occurs between the buyer and the seller. This occurs, for example, "the real estate market and [in] collective bargaining by organized labor."[12] In the negotiated price system, typically a wide range of price indeterminacy exists, which reduces the role of economics.

2.3.2 The Second Ingredient: Durable and Specific Assets

The second ingredient or prerequisite to the transfer price problem is durable and specific productive assets. *Durable* implies that the productive assets are economically useful for many years. *Specific* means that the assets are specialized for the manufacture of a single product and cannot be adapted to manufacture a different product without incurring a high conversion cost.

Durable and specific assets create a long-term economic commitment to the manufacture of the particular product. Thus, even if prices fall below average total costs, production will continue as long as prices are above average variable costs—

[11]Clark, *Competition as a Dynamic Process*, p. 109
[12]*Id.* p. 110.

the shutdown point. Owners may sell their ownership interest, but the assets will continue to be used to produce the same product. An example would be a cement kiln, which should last at least fifty years and is costly to relocate or to convert to another use.

2.3.3 The Third Ingredient: Demand Fluctuations

The third ingredient or prerequisite is demand fluctuations. Under demand fluctuations, assuming that a company's assets are both durable and specific and that the pricing system in question is the quoted price system, some idle capacity is a normal and desirable situation most of the time.[13] In periods of idle capacity, the opportunity cost of the idle assets is zero, because temporary alternative uses of the assets cannot be found.

A distinction is made in cost accounting between:

- *Idle capacity*, which arises from capacity to handle peak or projected future growth in demand; and
- *Excess capacity*, which arises from an error in judgment in the original invest-

[13]This is a major theme in the literature of business cycles. See, e.g., Simon Kuznets, "Relation Between Capital Goods and Finished Products in the Business Cycle," reprinted in Simon Kuznets' *Economic Change: Selected Essays in Business Cycles National Income and Economic Growth*, (W. W. Norton & Company: New York, 1953), p. 68. Also see current Federal Reserve Board publications—e.g., Lawrence R. Forest, Jr.,"Capacity Utilization: Concepts and Measurements," (printed in *Staff Studies 105 Measures of Capacity Utilization: Problems and Tasks*, by the U.S. Board of Governors of the Federal Reserve System, July 1979), p. 65: "...the role of excess capacity as a buffer against shifts in demand is not always appreciated, thus the persistence of excess capacity, as indicated by available statistical measures, is occasionally misunderstood. One popular misconception—exaggerated here for clarity—holds that measured rates of utilization of less than 100 percent utilization necessarily indicate economics waste..."

ment: "...The cost of unused capacity should be separated into the cost of *excess* capacity and the cost of *idle* capacity."[14]

The cost of excess capacity is a period cost. By charging a loss account, management is made aware that something must be done to eliminate (or at least reduce) existing facilities that are in excess of what the sales department can ever hope to sell in the long run. The cost of idle capacity, on the other hand, is a product cost. This includes, for example, existing facilities that are temporarily not used due to seasonal and cyclical variations in customer demand. Some idle capacity is unavoidable and a necessary cost of providing a normal level of productive capacity.

2.4 The Peak-Load Problem

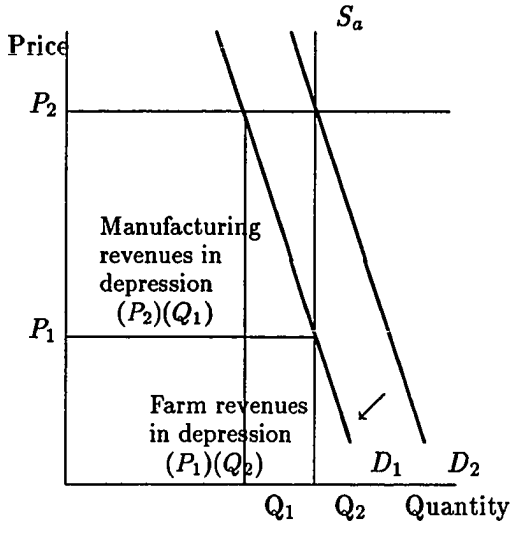
The three prerequisites of the transfer pricing problem resemble those of the peak-load demand problem, which is a situation that has been widely discussed, for example in economic literature on public utilities and public finance. The peak-load problem can be demonstrated by a classic graph of farm income versus manufacturing income during a recession (see Figure 2).

In Figure 2, farm products represent goods that follow supply-and-demand pricing, and manufactured products represent goods that follow a quoted-price pricing system.[15] Individual farmers have no ability to influence market prices. They pro-

[14]Polimeni, Fabozzi, and Adelberg, *Cost Accounting Concepts and Applications*, p. 145.

[15]Modified from Leonard Weiss, *Case Studies in American Industry*, 2nd ed. (John Wiley & Sons, Inc., 1971), p. 52.

Figure 2: Farm Versus Manufacturing Revenues in Depression



duce at approximately their capacity, Q_2, whether demand is high or low. Individual manufacturers, on the other hand, can influence the market prices, which means that they might maintain the same price, P_2, whether demand is high or low. They would sell at their capacity, Q_2, in high-demand times and sell at Q_1 in low-demand times. In low-demand times, the interval between Q_2 and Q_1 represents idle capacity. This idle capacity is the essence of the peak-load problem. It is commonly treated in public utility economics dealing with a perishable product (such as electricity), but even if the product can be economically stored, there is still an economic need for idle capacity for a significant portion of time.[16]

[16]D. T. Nguyen, "The Problems of Peak-Loads and Inventories," *Bell Journal of Economics*, (Spring 1976), p. 232: "It may appear at first sight that the possibility of storage removes the peak-load problem. However, storage is costly so that problems associated with peaking demand are modified rather than removed."

Clark's 1908 dissertation on railway rates (a classic peak-load problem) cites older economists who discuss a value-of-service principle and a method to determine a price that would "absorb in every case a reasonable and fairly uniform share of the average consumers' and producers' surplus..."[17]

Economists have long known that the fixed costs of durable and specific assets acquired to serve peak and off-peak demand times can be considered a *joint cost* for which allocation is arbitrary. Note that the peak-load problem arises only where:

- The assets are durable and specific;
- The goods are not traded on organized exchanges; and
- Demand fluctuates widely.

During downturns in demand, significant idle capacity exists. A long-established principle in peak-load economics is that if idle capacity exists in both high and low demand, consumers should be charged only incremental costs for incremental use; the fixed costs are passed to consumers as a flat fee or by a heavy initial charge. If there is no idle capacity during high-demand times, consumers should be charged a low price (perhaps variable costs) during low demand times and a high price (perhaps variable costs plus a surcharge) during high demand times. The surcharge could be such that it covers the fixed costs of operations. The aim of this pricing policy is to encourage more off-peak usage and less peak-time usage. Telephone companies,

[17]John M. Clark, *Standards of Reasonableness in Local Freight Discriminations*, (Columbia University Press, New York, 1910), p. 141.

for example, charge varying rates according to the time of day, with high rates for usage during peak business hours, and low rates for usage during off-peak hours. This is called an "efficient solution" to peak-load pricing.[18]

2.5 Transfer Pricing to Maximize Short-Run Profits

The basic long-run decision that a company faces is selecting optimal capacity, while the basic short-run decision is selecting optimal use of existing resources. It is well established that investment decisions should be made using discounted cash flow analysis and net present value calculations. The investment process is assumed independent of the short-run decision on optimal use of existing resources.

The basic long-run decision that a company faces is selecting optimal capacity, while the basic short-run decision is selecting optimal use of existing resources.

The theoretical solution is clear for the short-run decision on optimal use of

[18]See, e.g., Richard A. Musgrave and Peggy B. Musgrave, *Public Finance in Theory and Practice*, 2nd ed. (McGraw-Hill, 1976) pp. 698–700, and footnote references they cite.

existing resources to maximize profits: Use relevant costing on an opportunity cost basis. In other words, only future revenues and expenses that are expected to change are included in the analysis. All future fixed costs that are expected to be the same regardless of the use of the plant are irrelevant and must not be considered in deciding how to make optimal use of productive assets.

2.5.1 Need for Price Cutting

One of Clark's main recommendations, which this paper aims to reinforce, is the need for price cutting during periods of idle capacity. Clark eloquently states:[19]

> If one had to choose a motto of six words expressing the most central economic consequence of overhead costs, the first choice might fall upon some such phrase as: "Full utilization is worth the cost," but a close second would be: "Discrimination is the secret of efficiency." This last, to be sure, needs to be taken with a proviso: one must know where to stop. The economic basis of it is simple. Existing business may or may not cover all overhead costs, but in either case, if there is spare capacity, added business will cause no added overhead, and will be a gain at anything above differential cost, *so long as it can be kept separate from existing business.*

Clark frequently stresses the importance of economies of fuller utilization. He argued that these economies are generally far greater than economies of scale.[20] *Economies of fuller utilization* refer to the decrease in cost per unit as percentage capacity utilization rises to near full utilization. *Economies of scale*, on the other hand, refer to the decrease in cost per unit as scale of operations increases. A price

[19]Clark, 1923, 416.

[20]See, e.g., Clark, *Competition as a Dynamic Process*, pp. 142–143.

cut in slack times should ordinarily stimulate demand and increase overall percentage capacity utilization, which will lower cost per unit and thus lead to economies of fuller utilization.

2.5.2 Price Discrimination

Clark also writes of price discrimination—the charging of different prices (technically, different price-cost ratios) for essentially the same product. Charging a low price in times of low demand and a high price in times of high demand can be considered price discrimination across time.[21]

Price discrimination serves to increase the profit-maximizing output level and to raise overall percentage capacity utilization and profits. This can be explained in economic language as a result of the fact that price discrimination raises the marginal revenue curve, even if the demand curve is unchanged. When a firm charges only one price for its goods, its marginal revenue curves lies substantially below its demand curve, since any price cut will be available to all the customers equally. With different prices charged different customer groups, the marginal revenue curve will lie only slightly below the firm's demand curve. Profit-maximization output is that output where marginal cost intersects marginal revenues. Thus, profit-maximizing output and percent capacity utilization will be raised under price discrimination.

Illegal price discrimination. In setting transfer prices, corporations can

[21]See George J. Stigler, *The Theory of Price*, 4th ed. (Macmillan Publishing Company, 1987), p. 210.

sometimes put aside the perplexing issues of fairness, legality, and administrative complexity that often complicate the setting of prices for outside customers. This makes it possible to concentrate more on pricing to maximize short-run profits.

The Robinson-Patman Act makes some price discrimination illegal if the discrimination would substantially impede competition. Price discrimination is legal, however, if the customers do not compete with one another or if the discrimination is in response to changing conditions that affect the market.

Charging low prices in times of low demand and high prices in times of high demand is certainly legal, because the customers are not in competition with one another and because the discrimination is in response to changing market conditions.

Therefore, the main questions a firm must ask in contemplating price cuts in slack times are:

1. Whether price cuts would hurt the firm's regular sales in high demand;

2. Whether the price cuts will induce buyers to wait for further price cuts; and

3. Whether the price cuts will "spoil the market"[22] (in the sense that industry pricing discipline may deteriorate.)

Assume, for example, that division A is a primary process or material manufacturer and that division B is an advanced processor that uses the output of division A. For division A to charge a single price whether demand is high or low would

[22]See Clark, *Studies in the Economics of Overhead Costs*, pp. 439–444.

make division B ignore the pressures on division A to cut prices to stimulate demand when demand is low. This is a general problem Clark wrote about under the heading, "The Shifting and Conversion of Overhead Costs"[23] as a causal factor of the business cycle. Short-run decision making is distorted, Clark argues, because—by paying a single price per unit for the intermediate good—the fixed costs of one producer are shifted and converted to a variable cost to the second producer. The second producer has a higher variable cost than the true variable costs and a lower fixed cost than the true fixed costs. Accordingly, his calculations will be wrong in all his short-run decision making. The second producer will not be willing to cut his prices as much as he should be willingly to if he had the correct information about both variable and fixed costs. Clark writes of this reluctance to cut prices as a causal factor that blocks or delays the recovery phase of a business cycle.

2.5.3 Incorrect Cost Data

In sum, having incorrect cost data on variable and fixed costs, having durable and specific assets, having quoted-price goods, and having demand fluctuations are the ingredients for the common textbook transfer pricing problem. Having the wrong data affects all short-run decision making. For example, optimal inventory level calculations will be wrong because the buying division will over-estimate inventory holding costs, since only inventory variable costs should be considered. Another example is a linear programming problem on how much of various alternative products

[23] *Id.*, p. 397.

the buying division should manufacture. The coefficients in the objective function of the linear programming problem are the contribution margins of each product. The buying division will make a wrong calculation because the buying division will overstate the true variable cost and thus understate the true contribution margin.

2.6 Conclusions and Implications

This article synthesizes the transfer pricing problem for a simple manufacturing model to three ingredients: durable and specific assets, quoted-price system, and demand fluctuations. The usual transfer pricing problem in most cost accounting textbooks is in actuality identical to the peak-load problem in utility economics.

One implication is that firms with conditions similar to those assumed in this article should adopt a flexible transfer pricing system that sets lower transfer prices in periods of slack demand, because doing so can lead to better decision making. The transfer prices can be set using incremental cost, incremental costs plus a lump sum fixed cost, or dual pricing. In high-demand times, if the plant is at or near capacity, the transfer price should be set high because incremental costs are high. If idle capacity exists even in high-demand times, short-run profits are maximized by low transfer prices in both periods.

3 The Economics of Product Pricing

Published in R. S. Polimeni, Frank J. Fabozzi, and Arthur H. Adelberg's *Cost Accounting Concepts and Applications for Managerial Decision Making*, 2nd edition, McGraw-Hill, 1986, pp. 587–593, 626. Reprinted with the permission of the publisher.

Pricing is often the key determinant of quantities that can be sold and profits that can be earned. Thus, proper pricing is of vital importance to a firm's profits. It should be realized, however, that firms have widely varying degrees of discretion in price setting. At one extreme, firms have virtually no discretion for goods on organized commodity exchanges for which price quotes are published in financial newspapers such as *The Wall Street Journal* and *The Journal of Commerce.* Prices in these markets are generally set by the actions of large numbers of buyers and sellers each of whom, with only rare exceptions, can influence the going market price but only to a very small degree. These goods are highly standardized homogeneous products such as agricultural products. For goods not traded on organized commodity exchanges, firms have at least some degree of discretion in price setting. At the other extreme, firms have total discretion in price setting if they are a sole supplier, i.e., a monopolist, and no close substitutes exist.

3.1 Goods Traded on Organized Commodity Exchanges

Economists have described price setting for goods traded on organized exchanges as "supply and demand pricing" because the individual buyers and sellers are said to

be "price takers" and "quantity adjusters," while the industry as a whole behaves as commonly depicted in economics textbooks, with an upward sloping supply curve and a downward sloping demand curve. Theoretically, pricing policy plays no role because individual buyers and sellers do not attempt to change the market price directly, but rather accept the market price and then decide only on quantities to be bought or sold at the going market price. This makes the market participants "price takers" and "quantity adjusters." The market is viewed as an impersonal automatic mechanism that adjusts prices so that quantities demanded by buyers at the going market price are equal to quantities supplied at the same market price. Excess demand, meaning that quantities demanded at the going market price exceed quantities supplied, or excess supply, meaning that quantities supplied exceed quantities demanded at the going market price should never arise for goods traded on organized commodity exchanges.

Firms selling goods on organized commodity exchanges typically spend considerable efforts on obtaining market information on the basic conditions behind their industry supply and demand schedules. This is necessary for the development of forecasts as accurate as feasible of future market prices in order to (1) better plan production and time sales and (2) make maximum use of a futures market, if one exists, to hedge and protect basic operating profits or to try to make additional profits by speculation in futures contracts.[1] Although there is no role for pricing policy

[1]A futures contract is an agreement to make or take delivery of a specified commodity at a specified price some time in the future.

because firms have virtually no discretion over prices, they can consider avoiding the organized commodity exchange by making long-term contract sales. Both sellers and buyers often gain substantial advantages from making long-term sales contracts because they facilitate long range planning in that sellers have an assured outlet for sales at a known price and buyers have an assured source of supply also at a known price.

3.2 Goods Not Traded on Organized Commodity Exchanges

For goods not traded on organized Commodity exchanges, firms typically set a price first and then try to fill whatever orders are received. Orders are filled from inventory, production, or from other suppliers. If sales are poor, firms may lower the sales price or take other actions such as making modifications or changing selling and advertising strategies. "Price appeals" to stimulate poor sales is recognized as the easiest action to communicate to potential customers. Other appeals, such as product improvements, are often less likely to be recognized and accepted by customers.

3.3 Economic Theory of Product Pricing

The main contribution of economic theory to product pricing in order to maximize a firm's profits is the concept of using marginal or incremental analysis. In economic textbooks the diagram in Figure 3 is presented to illustrate marginal analysis.

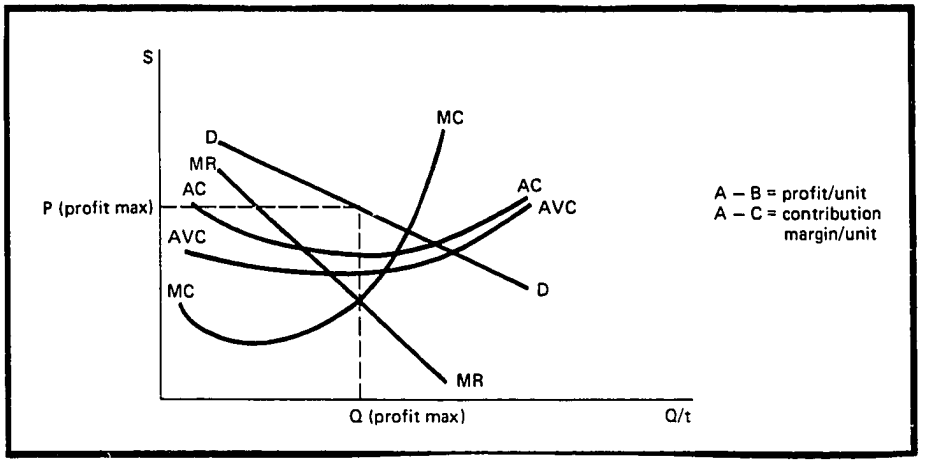


Figure 3: Illustration of Marginal Analysis

The profit maximizing price is determined by the point on the demand curve above the intersection of the marginal revenue and marginal cost curves. A most important conceptual idea in marginal analysis is that fixed costs, costs which do not change as output changes, are irrelevant in the determination of the profit maximizing price. Because fixed costs are considered irrelevant, it may be that at the point of profit maximization firms are incurring losses if the price is below average total cost (the AC curve in Figure 3). Yet, as long as the profit maximization price is above variable costs per unit (the AVC curve in Figure 3), it is beneficial for the firm to continue producing and selling at the profit maximizing price because any other arrangement would lead to larger losses. If the profit maximization price is below variable cost per unit, the firm would reduce its losses by shutting down.

Economists, cost accountants, and managers working on real-life problems within firms to find profit maximizing prices for a product usually work with linear total cost functions; i.e., total costs are described as a fixed cost element plus a constant

variable cost per unit for a fairly wide range of activity. Variable costs would start to rise as the firm reaches or nears its practical capacity level. This practical capacity level could be of the absolute type as in continuous production processes such as cement or glass manufacturing, or not of the absolute type as in most industries where firms can exceed practical capacity by, for example, adding overtime or subcontracting out part of the work. Economists define capacity as the output rate where the average cost curve reaches its minimum. Figure 4 shows two diagrams using linear cost functions until practical capacity is reached. In the first diagram the practical capacity is an absolute limit and in the second diagram practical capacity is not an absolute limit and the firms incurs rising marginal costs. The general rule for finding the profit maximization price remains the same—the profit-maximizing price is the point on the demand curve above the intersection of the marginal cost and marginal revenue curves shown in Figure 4.

For example, suppose a firm has some degree of discretion in price setting and faces the following negatively sloped demand schedule:

Sales price per unit	Expected sales in units
1.750	1,000
1.350	2,000
1.100	3,000
0.925	4,000
0.800	5,000
0.667	6,000

Assume further that the firm's total cost function is total costs = \$250 + \$0.60

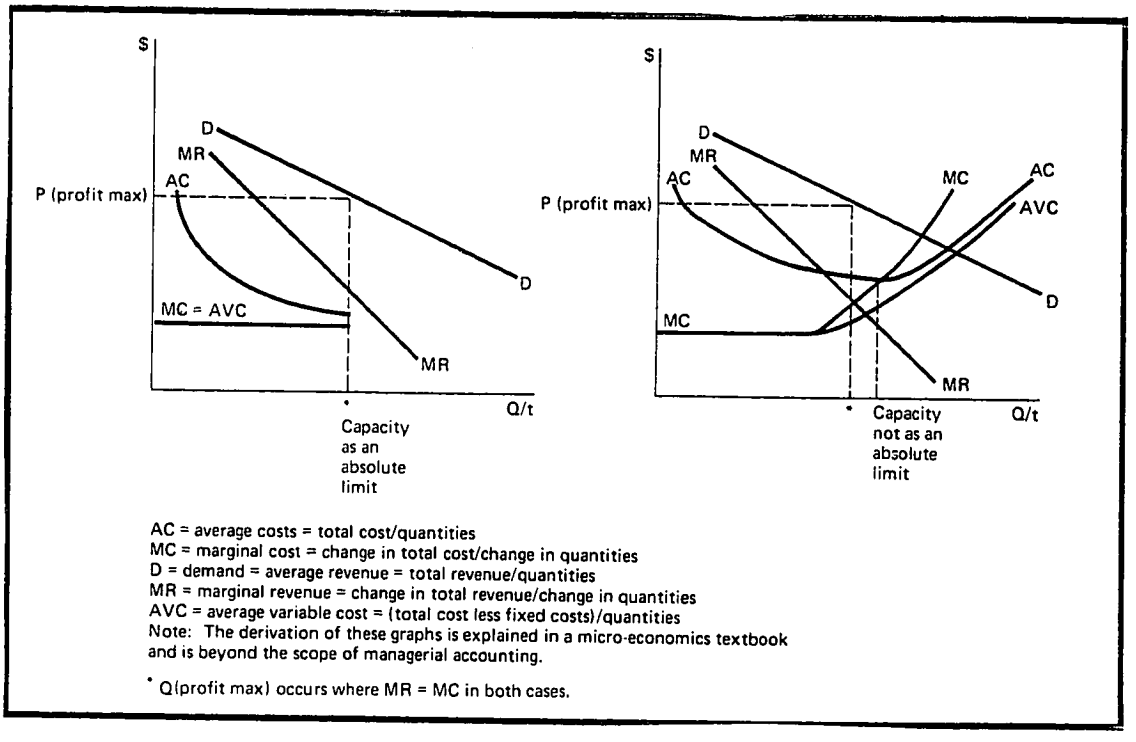


Figure 4: Profit Maximization with Two Types of Behavior

per unit produced within the relevant range of 1,000 to 6,000 units. What is the profit-maximizing price?

By using marginal analysis, the firm can focus on contribution margin and leave out the fixed costs of $250 which are irrelevant since they do not change in total as the output levels change within the relevant range. Because the variable costs are constant at $0.60 per unit produced, the easiest way to solve this problem is to list the different total contribution margins that would be earned with different prices and select the price that gives the highest total contribution margin, as follows:

Sales price	Expected sales	Total contribution margin
\$1.750	1,000	$(1.750 - 0.60) \times 1,000 = \$1,150$
1.325 Best	2,000	$(1.325 - 0.60) \times 2,000 = 1,450$
1.100	3,000	$(1.100 - 0.60) \times 3,000 = 1,500$
0.925	4,000	$(0.925 - 0.60) \times 4,000 = 1,300$
0.800	5,000	$(0.800 - 0.60) \times 5,000 = 1,000$
0.667	6,000	$(0.667 - 0.60) \times 6,000 = 402$

The same answer could be obtained by developing a marginal revenue curve. For a continuous demand schedule, the marginal revenue curve is the first derivative of the demand curve with respect to quantities. (The meaning of a derivative is explained in Chapter 20). For a discrete demand schedule as in this case, marginal revenue is simply the change in total revenues divided by the change in unit sales. Profit maximization occurs when marginal revenue equals marginal costs (which are \$0.60 per unit at all output levels in this illustration):

Sales price	Unit sales	Total revenue	Marginal revenue	Marginal cost
\$1.750	1,000	\$1,750		\$.60
			\$.90⋆	
1.325	2,000	2,650		0.60
			0.65	
1.100	3,000	3,300	†	0.60 Best
			0.40	
0.925	4,000	3,700		0.60
			0.30	
0.800	5,000	4,000		0.60
			0.00	
0.667	6,000	4,002		0.60

⋆(\$2650 − \$1750)/(2000 − 1000) = \$.90

† Marginal revenue is approximately .60 with a sales price of \$1.10.

3.4 Dealing with Uncertainty

Firms rarely have difficulty in estimating a total cost function—cost levels for different quantities of production. They can use linear regression techniques working with its history of costs at different production levels or they can use engineering techniques to develop a cost schedule on a fairly objective and scientific basis. It should be realized that demand schedules, however, almost invariably require considerable subjective judgment. The demand schedule assumes that prices for related goods (both substitute and complementary goods), customer tastes, and incomes are all held constant.

In looking at recent past quantities buyers purchased at different prices will not likely produce a reliable demand curve because prices of related goods, customer tastes, and incomes probably have been changing in a way not amenable to a simple adjustment. It is well recognized that questionnaires to customers on how much they would buy at various prices would not likely be a true reflection of the quantities a customer would buy in a realistic situation actually confronted with a particular quoted price. The ideal method is to use carefully designed test marketing situations. These are generally costly and economically justifiable only in infrequent cases. For the vast majority of cases, firm rely on senior executives or marketing personnel intimately familiar with customers and general market conditions to develop *subjective* determinations of quantities customers would buy at various prices. This demand schedule would be subjective because different knowledgeable peo-

ple looking at the same underlying circumstances would likely come to somewhat different conclusions on quantities customers would buy at various prices.

As explained in the chapters dealing with risk (see Chapters 10, 18, and 20), firms can work with probability distributions of uncertain factors, such as quantities customers will buy at various prices (the demand curve or demand schedule), and/or costs at various output levels.

3.5 Advantage of Price Discrimination

Economic theory teaches that there is an advantage to firms in price discrimination, the charging of different prices to different customers for essentially the same product. The marginal revenue curve as shown in Figures 3 and 4 always lies below a negatively sloped demand curve only when the firm sets one price for its product, i.e., no price discrimination. When a firm practices price discrimination it, in effect, raises the marginal revenue curve even if the demand curve is unchanged.

The Robinson-Patman Act prohibits price discrimination of products of like grade and quality if the discrimination may substantially injure competition. Price discrimination is generally legal if the customers are not in competition one with another, such as a foreign versus a domestic customer or if the price discrimination is in response to changing conditions that effect the market or the marketability of the goods such as in response to seasonal obsolescence. Price discrimination is also allowed if the price differentials do not exceed the difference in the cost of

manufacture, sale or delivery resulting from a different method of sale or delivery of the product.

Firms should explore all legal means to effect price discriminations, such as making sales to remotely located customers who are not in competition one with another. This can be achieved through special orders or export sales. On such sales, if excess capacity exists, any amount over the variable cost of production and delivery adds to the firm's profits. Firms should consider adding product lines where the products would be perceived as not of like grade and quality. This would allow the firm to charge different prices for the different products where perhaps for only a slightly higher quality the firm could obtain substantially higher prices.

3.6 Cost-Plus Pricing

For various reasons, firms may decide not to seek a profit maximizing price, but rather to work with alternative rules such as pricing with a set relationship to a competitor's pricing (also called pricing to meet competition) or using an add-on percentage formula to costs. The reason for this includes the enormous uncertainty that often exists over possible customer and competitor responses. Many people feel that the profit maximizing price using commonly depicted relatively steep negatively sloped demand curves is too short-run oriented in that prices that give high profits tend to invite new entry into the industry which lowers the quantities that the firm can sell at various prices.

Cost-plus pricing that gives approximately average returns on investment gains positive acceptance among customers and good relations among fellow competitors. Cost-plus pricing is the general rule in retailing. The National Retail Merchants Association, the industry association for department and specialty stores, annually publishes a book of merchandising operating results and a book of financial and operating results for department and specialty stores. Managers of department and specialty stores can compare detailed merchandising information such as mark-on, mark-down, shortage percentages, inventory turnover, etc. and detailed operating data such as expense analysis for their store versus industry averages. Individual department and specialty stores could decide on a pricing policy that is in line with industry averages or slightly above or below depending on such factors as their store image and the competition they face.

For example, suppose a specialty store with sales over $5 million decides that its pricing policy should be changed to the median mark-on percentages as reported by the National Retail Merchants Association. The firm firms wants to price a watch that costs $8. The National Retail merchants Association's Department and Specialty Store Merchandising and Operating Results of 1982 shows a median cumulative mark-on percent for specialty stores with sales over $5 million of 53.3% for the category "all jewelry and watches." What price should the firm should set for the watches?

In retailing the mark-on percentages are based on the retail price due to long

established custom. Smaller percentages are used than would be needed if the mark-on percentages were based on cost. This may avoid misinterpretation by the general public who often does not realize the profit margins necessary to make even minimally satisfactory profits. Also, in retailing much more than in manufacturing, firms focus more on the ultimate sales price than on the cost price. This is the basis of the retail method of accounting which keeps a separate column in the inventory records of the retail value of the inventory.

The suggested retail price for the watch for this firm could be calculated as follows:

$$\text{Gross margin} = \text{Sales price} - \text{Cost} = 0.533 \times \text{Sales price}$$

$$\text{Sales price} - (0.533 \times \text{Sales price}) = \text{Cost} = \$8.00$$

$$\text{Sales price} = \frac{\$8}{1-0.533} = \$17.13$$

3.6.1 Need for Flexibility in Cost-Plus Pricing Formulas

Firms can usually increase their profits by being flexible in applying cost-plus pricing formulas. Firms should consider, for example, that a high priced item perhaps should have a lower mark-on percentage because the expenses of handling the high priced item may not be commensurate with the extra of purchasing or manufacturing the item.

Flexibility is clearly needed to recognize changes in general market conditions. Firms can usually add to their profits by lowering markup percentages in recessions and raising them somewhat in prosperous times. Economists claim that a

major cause of business maladjustment is the tendency of firms to strictly adhere to their established prices and markup percentages without regard to the fact that an economic recession indicates that prices and markup percentages should be lowered.

3.7 Behavioral Impact of Accounting Methods on Pricing

In setting up accounting methods and procedures, firms should consider the behavioral impact on pricing of alternative accounting methods. For example, retail firms should use the gross purchase price method of recording inventories and not the net purchase price method where the difference represents cash discounts because the National Retail Merchants Association in reporting markup percentages assumes the gross purchase price method. A second example is that manufacturing firms should use normal activity level as the denominator base for allocating fixed factory overhead—or possibly even practical capacity—but not expected annual activity for product pricing purposes. The advantages of using normal capacity as the denominator base can best be seen with the following example:

Suppose that the Acme Cement Company has a practical capacity of 1,000,000 tons per year, a normal activity level of 800,000 tons per year, and expected annual sales for the next three years as follows: year 1, 800,000 tons; year 2, 1,000,000 tons; and year 3, 600,000 tons. The variable cost per ton is $40 for all three years and the fixed manufacturing costs per year are $8,000,000 for the next three years. The firm operates with a pricing rule such that price equals full absorption cost times a factor

equal to 1.25. What is the price per ton of cement for each of the next three years using three different denominator bases for allocating fixed manufacturing costs and comment on the relative advantages/disadvantages of using each denominator base?

Using normal activity as the denominator base the price would be \$62.50 per ton for each of the next three years because the full absorption cost would be \$50, made up of \$40 variable cost + \$10 fixed costs ($\$8,000,000/800,000 = \$10$). The price is $1.25 \times \$50 = \$62.50$.

Using practical capacity as the denominator base the price would be \$60 for each of the next three years because the full absorption cost would be \$48, made up of \$40 variable cost + \$8 fixed costs ($\$8,000,000/1,000,000 = \$8$). The price is $1.25 \times \$48 = \$60$. The use of practical capacity has the disadvantage of leading to a lower selling price than the use of normal activity level.

Using expected annual sales, the prices would vary as follows:

Year 1: Absorption cost = $\$40 + \$8,000,000/800,000 = \$50$.
The price is $\$50 \times 1.25 = \$62.50$

Year 2: Absorption cost = $\$40 + \$8,000,000/1,000,000 = \$48$.
The price is $\$48 \times 1.25 = \$60.00$.

Year 3: Absorption cost = $\$40 + \$8,000,000/600,000 = \$53.33$.
The price is $\$53.33 \times 1.25 = \$66.66$.

Using the expected annual sales as the denominator activity base, prices fall during the prosperous year, year 2, when it probably would be more advantageous to raise prices, and prices rise during the recession year, year 3, when it probably would be more advantageous to lower prices. Certainly, customers tend to expect price

increases during prosperous periods and price decreases during recession periods.

In general, in all cases of cost allocation where alternative methods exist, firms should consider the behavioral impact on pricing. Another example would be accounting methods for inventories of by-products. Firms that credit the production costs of the main product with the net realizable value of the by-product will end up with a lower cost of the main product than a firm that assigns no book value to the by-product inventory.

3.8 Problems

3.8.1 Problem 20: Economics of Product Pricing

1. A firm plans to manufacture a particular product X that has the following negatively sloped demand schedule:

Sales price per unit	Expected sales in units
\$46	12
44	24
42	36
40	48
38	60
36	72

The firm faces two possible technologies in manufacturing product X, technology 1 and technology 2. The following are the total cost functions for each technology:

TC1 = \$600 + \$24 per unit produced

TC2 = \$150 + \$31 per unit produced

Required:

Find the profit maximizing price and technology the firm should select.

Solution to Problem 20 The firm must calculate for each technology the profit that can be earned for every possible price. Profit equals total revenues less total costs.

Price	Quantities	Total revenues	Total costs with technology #1	Profits (losses) with technology #1	
\$46	12	\$ 552	\$888	\$(336)	
\$44	24	1056	1176	\$(120)	
\$42	36	1512	1464	48	
\$40	48	1920	1752	168	
\$38	60	2280	2040	240	
\$36	72	2592	2328	264	profit maximizing for tech.#1

Price	Quantities	Total revenues	Total costs with technology #2	Profits with technology #2	
\$46	12	\$552	\$522	\$30	
\$44	24	1056	894	162	
\$42	36	1512	1266	246	
\$40	48	1920	1638	282	Best
\$38	60	2280	2010	270	
\$36	72	2592	2382	210	

The profit maximizing price, therefore, is \$40 and technology #2 should be used.

3.8.2 Problem 21: Economics of Product Pricing

A retail specialty store with annual sales over $5 million has been selling watches with a 53.3% mark-on to be in line with the "median" mark-on percentage as listed in a recent survey by the National Retail Merchants Association. The store is considering raising the mark-on percentage to 54.4% to be in line with the "superior" mark-on percentage as reported by the National Retail Merchants Association. Assuming that the wholesale cost of the watches are expected to remain constant.

Required:

Determine the following:

a The average increase in selling prices that would result.

b The decrease in unit sales that could be allowed that would give the same gross margin.

Solution to Problem 21

a. Let the current price of the watch be $100. With a 53.3% mark-on, the cost would be calculated as follows:

$$\text{price} = \text{cost} + \text{gross margin}$$

$$100 = \text{cost} + (.533 \times 100)$$

$$\text{cost} = 100 - 53.3 = \$46.70$$

Applying a 54.4% mark-on to this $46.70 cost watch gives the following price:

$$\text{price} = \text{cost} + \text{gross margin}$$

price $= 46.70 + (.544\times$ price)

price $= 46.70/(1 - .544) = \$102.41$

Thus a 2.41% increase in retail prices would result.

b. With the current price of the watch \$100 and cost \$46.70, gross margin dollars per unit is \$53.3. With the new price at \$102.41 and the same cost of \$46.70 the new gross margin dollars per unit is \$55.71.

$53.3 \times$ current unit sales $= 55.71\times$ new unit sales

new unit sales $= 53.3/55.71\times$ current unit sales $=$

$0.95674\times$ current unit sales. Thus a decrease of 4.33%

$(1 - .9567 = 0.0433)$ in unit sales would give the same gross margin.

The following demonstration should convince skeptical students:

Let the average cost of the watches be \$50 and unit sales at 1000 with a mark-on percentage of 53.3%. The average price becomes $50/(1 - .533) = \$107.066$. The average gross margin per unit is $\$107.066 - \$50 = \$57.066$. Total gross margin becomes $1000 \times \$57.066 = \$57,0666$. With the same average wholesale cost of \$50, and a 54.4% mark-on, the new average price becomes $50/(1 - 0.544) = \$109.649$. This is a 2.41% increase $(109.649/107.066 = 1.0241)$. The new average gross margin per unit is $\$109.649 - \$50 = \$59.649$. To get the same \$57,066 total gross margin dollars only 956.697 unit sales are required $(57,066/59.649 = 956.687)$. 956.697 represents a decrease in unit sales of 4.33% $(1 - 956.697/1000 = 0.433)$.

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