N. C. Project 117

WORKING PAPER SERIES

Studies of the Organization and Control of the U.S. Food System

Risk Management in Imperfect Markets: Commodity Procurement Strategy in the Food Manufacturing Sector

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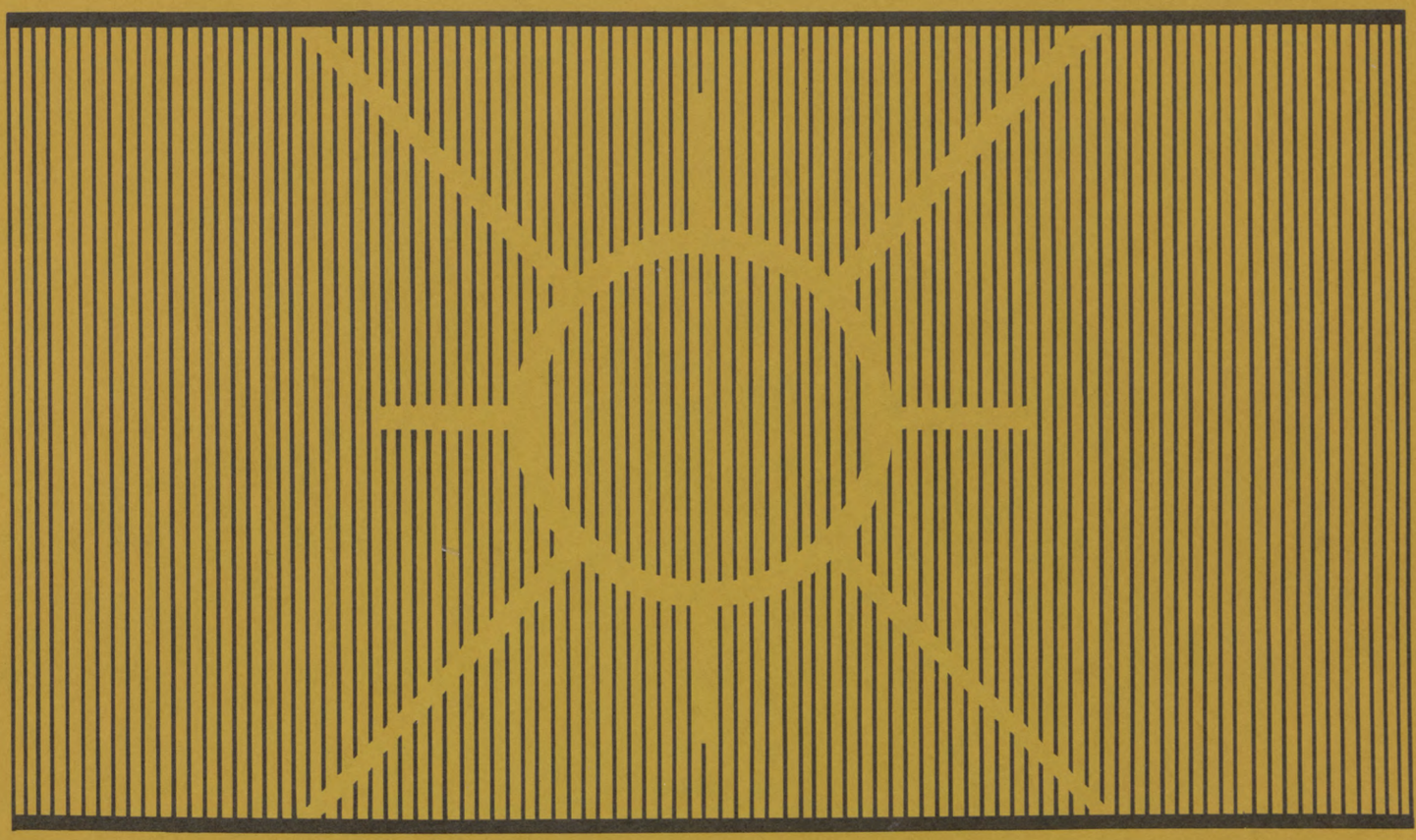
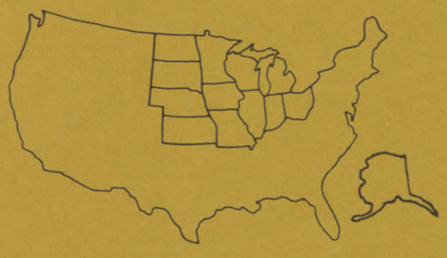
Marvin L. Hayenga

WP-23 October 1978





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Analyses of firm behavior in imperfect markets have typically stressed the nature of competition in the output or product markets, with little attention to a firm's input market behavior, its relation to product market structure, and corresponding impact on the firm's financial performance and competitive viability. In this paper, attention is focused on the input market behavior of food manufacturing firms operating in imperfect market structures. We briefly consider the nature of the input market environment and the procurement options available for the most important inputs in most food manufacturing firms--agricultural commodities. Following that, the complex of factors which simultaneously affect the firm's commodity procurement strategy are explored. While internal firm considerations--financial viability, product diversification, and management objectives--are briefly discussed, primary emphasis is placed on the product market structure in which the firm is competing and its influence on commodity procurement strategy. Some interrelationships between product market structure and input market behavior are postulated, and their implications for product price levels and volatility are suggested.

Theoretically, a firm would be expected to minimize the unit cost of raw materials purchased in order to maximize its profits and survive in a perfectly competitive environment. But food manufacturing firms deal in volatile and uncertain commodity markets and in imperfect market structures where the actions of rivals in commodity (input) markets and product (output) markets may significantly influence the firm's optimal procurement strategy and overall performance. Kaysen has suggested ... "the firm in the less

competitive market can choose whether to seek maximum profit or to be satisfied with some 'acceptable' return and to seek other goals...The more dominant the position of any particular firm in a single market...the wider will be its range of significant choice." (Kaysen, p. 90) We shall explore whether a similar line of reasoning seems appropriate in explaining the commodity procurement behavior of food manufacturing firms, as we consider the complex of factors that would be relevant in developing a game theory or similar risk-management model for firms in a variety of imperfect product market settings.

The Commodity Procurement Decision Process

In recent years, the volatility of prices in world commodity markets--record price levels have been achieved in one commodity or another almost every year in the early and mid- 1970's--has caused the commodity procurement decision to be increasingly important in food manufacturing firms.

Food manufacturing firms have the option of:

a. establishing their commodity unit cost (purchase price) at the time of use, or very close to it ("hand to mouth" purchasing), or

b. taking a market position in advance of the time of use, establishing the unit cost of some or all of their anticipated commodity requirements through futures markets (anticipatory hedging), fixed price purchase contracts with suppliers, or advance purchase and storage of the commodity.

In markets where significant price fluctuations are frequent, the timing of commodity purchases can have a significant influence on the firm's costs. Key elements in the decision must include the forecast probability distribution of the relevant cash and future delivery commodity price levels (and their "basis" relationships) over the time period prior to use, the key

contingencies or environmental factors (weather, government policy changes, etc.) affecting those probabilities, the typical distribution of forecast error, and the current cash and future contract prices.

In most commodity markets, an accurate assessment of the probability distribution of future commodity price levels is quite difficult but, whether considered explicitly or implicitly in the decision process, is critical in effective risk management for firms facing volatile commodity markets. In Figure 1, the expected probability distribution of commodity prices which will be available to the firm in future time periods is illustrated; prices in more distant time periods are portrayed with a larger variance, reflecting the greater number of factors influencing prices which have not yet been determined (e.g. domestic and foreign crop production). By taking commodity prices presently available for current and future delivery, and outlaying them on the expected prices in the future, the probability and size of possible price increases or decreases after a "forward" purchase can be approximated, and incorporated into a rational management decision process. Additional factors critical to the management decision on the commodity price level at which a forward price ought to be made include the expected price of the product to be sold by the firm, the resulting margin, expectations regarding competitor's behavior in both the commodity and product markets (e.g. their cost levels, product pricing and advertising behavior, and the potential sales and market share of each competing firm), and the level of risk acceptable to firm management. These will be briefly considered in the following sections.

Product Market Structure

Commodity Contribution to Product Cost

As the contribution of a commodity to variable manufacturing costs increases, its potential influence on wholesale and retail product prices also increases. As a consequence, mistakes in procuring the commodities contributing a high percentage of product cost can result in greater competitive disadvantages or adverse consumer reactions.

In contrast, commodities which have little influence on product costs if their price changes significantly are less likely to warrant risk-taking or management time, since payoffs are greater elsewhere. As a consequence, one would expect the primary management motivation to be achieving planned cost levels and avoiding surprises regarding minor commodity costs, resulting in a forward commodity purchase even when there may be a fairly high probability of lower prices in the future, and small chance of higher prices. If the minor commodity is a necessary part of the production process, has little or no substitution possibilities, and there is some uncertainty regarding the dependability of supply sources, security of supply would be expected to be considered more important than price. Thus, we would postulate that the probability threshold or trigger point at which the commodity price would be fixed for minor commodities would be higher than for comparable "major" commodity inputs; a lower probability of a competitor achieving a lower price would be generally acceptable for "major" commodity inputs, since there typically is a much larger potential loss associated with a "major" commodity competitive disadvantage.

Product Differentiation and Market Share

The demand curve for a food manufacturing firm's product reflects (a) the industry demand curve for the product in the relevant market (reflecting degree of product differentiation or substitutability), and

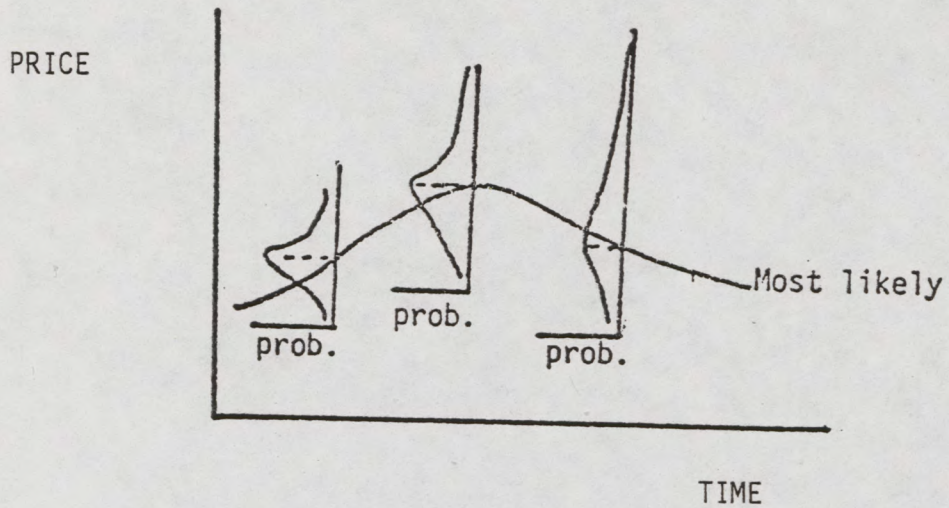

Figure 1

(b) the influence of rivals' behavior in pricing, advertising and promotion. While specification of the relative strength of these factors is a formidable task (Scherer, p. 149), the firm's evaluation of the potential advantages and disadvantages of alternative commodity procurement strategies would be strongly influenced by their relative importance.

Let us first consider a firm with a strongly differentiated product or a very large market share. A small rival who gains a short term cost advantage may have difficulty in significantly expanding sales from current retail space, or gaining retail shelf space in stores where they previously haven't been represented, even if the small firm utilizes the cost advantage to increase advertising and promotion or maintain a lower product price than its large rival. In a similar vein, firms faced with few small competitors with little excess production capacity, or in an industry with high barriers to entry, would have little concern that their comparatively high commodity costs and product prices might be quickly and dramatically exploited by competitors. On the other hand, large, well financed competitors with significant excess production capacity might be more likely to exploit any competitive advantage as quickly and decisively as possible; typically, though, the cross-elasticity of demand for the dominant firm or the firm with a strongly differentiated product, especially in the short run, may appear sufficiently small that the sales impact of movements along the firm's demand curve would be the primary management concern.

The marketing manager of a dominant firm with a differentiated product, though still with an elastic demand curve in the short run, would be expected to be concerned primarily with the potential sales losses incurred if commodity cost increases forced retail price increases, especially if the product was a frequently purchased item and the unit retail price would move up into a particularly elastic segment of the demand curve

(like into the next decile, the next dollar level, or a level that would trigger significant media attention as occurred during some periods of rapid food price inflation in the mid-70's). While the market power of the firm might allow it to pass increased costs on to the consumer, the effect of a price increase on a firm's unit sales and market share, though relatively small, may be sufficiently large to prompt marketing managers rewarded on the basis of sales and market share to generally recommend procurement strategies which would minimize the risk of increased commodity costs. Correspondingly, firms with strong brand franchises or dominant market shares would be expected to be more likely to establish their commodity costs in advance of use, and at price levels where the probability of significantly lower costs was still high (perhaps higher than 50%) to eliminate the risk, though small, of significant commodity cost and product price increases. Following that strategy, the firm would be more likely to avoid jeopardizing the achievement of their short run profit plans.

Food manufacturing firms operating in product markets characterized by slight product differentiation would be expected to be acutely conscious of the behavior rivals in the product and commodity markets (Scherer, p. 131). Unless the rivals had little excess capacity, or couldn't exploit a competitive advantage for some other reason (perhaps a dominant position of its competitor), one would expect the firm's commodity procurement strategy to be based primarily upon expectations regarding commodity price movements and those elements of rivals' commodity and product market strategies which would significantly influence the position and shape of the firm's demand curve (and the corresponding commodity demand).

Most firms dealing in weakly differentiated products would be expected to follow the same procurement strategy as its primary rivals to avoid the risk of a significant competitive disadvantage. Procurement strategies

would be avoided which might lead to significant losses on commodity inventories, through forcing product prices higher than competitors', or through a reduced value of inventory (sometimes required to be reported in quarterly financial statements). In most firms, this would be evident through "forward" pricing of commodities only if forward product sales had been made, general avoidance of forward purchases, or policies of hedging commodity inventories if forward commodity purchases were required to insure adequate supply. Exceptions would be anticipated if (a) competitors were expected to make forward purchases, and matching that strategy reduced the chance of a significant competitive disadvantage; or (b) if commodity prices could not drop significantly lower, perhaps due to the influence of government price support programs, making a competitive disadvantage resulting from a forward purchasing mistake highly unlikely.

The Rivalry Process in Imperfect Markets

How might a firm exploit a competitive advantage in raw material cost? If the advantage is small for a short period of time, it may not be sufficient to offer a significantly lower retail price, to significantly increase the firm's advertising and promotion, or to enter a new market area. However, the cost advantage required to initiate such efforts successfully is clearly greater in markets involving sharply differentiated products. Thus, the probability is much greater that a significant competitive advantage could be gained by firms dealing in less differentiated products and volatile input (commodity) markets. Since the relative impact of a unit change in relative price or advertising and promotion expenditures on the firm's undifferentiated product sales would be expected to be large, managers would attempt to minimize the risk of a competitive cost disadvantage in that structural environment.

A rival may choose to let a cost advantage filter down to the "bottom line" in the form on increased profits, particularly if other costs are rising rapidly or other parts of the business aren't faring well. However, a firm may elect to exploit a cost advantage via lowering prices or increasing advertising and promotion, hoping to expand market share and enhance long term growth and profit prospects. The firm's choice of strategies regarding price or discretionary expenditures would depend upon its evaluation of:

a. the likelihood of competitors meeting its price,

b. the consumer response to the price,

c. the likelihood of competitors matching the firm's changed advertising and promotion expenditures,

d. the consumer response to the firm's advertising and promotion.

where the consumer response (b and d) would be contingent upon the extent to which rivals match the firm's actions (a and c). Some possible choices of strategy are illustrated in Figure 2.

How might a firm combat a rival who has a short term, but significant cost advantage? If the rival elects to simply increase short term profits, little effect will be felt and no reaction may be required. If, however, the rival elects a lower price, the firm can maintain its higher price, and takes its consequences in reduced current (and probably future) sales. Alternately, the firm could meet the lower price, and reduce its profit margin or its spending on discretionary activities like advertising and promotion, new product development, etc. A reduced profit margin would hurt primarily in the current period, while reduced new product development or research spending primarily would hurt firm growth and profitability in subsequent time periods. Reduced advertising and promotion, in contrast, would affect sales and profitability currently, and in the future if lost customers are difficult to win back. The firm's evaluation of the costs or

Market price trend after forward purchase	Procurement Strategy: Forward Purchase	Procurement Strategy: Purchase at Time of Use
Increase	Exploit advantage by: (1) maintain product price, increase market share. (2) increase price, increase advertising, and promotion, market share. (3) increase price and profit margin.	Minimize disadvantage by: (1) increase price, and hope competitors follow. (2) increase advertising, couponing, to minimize sales decline at a higher price. (3) match competitors prices, maintain sales, but accept lower margin. (4) maintain prices, and cut discretionary expenditures to minimize short run profit decline.
Decrease	Minimize disadvantage by: (1) meet rival's lower price, maintain sales, but accept lower margins. (2) maintain price, but increase promotion to counter sales losses. (3) maintain price, accepting reduced sales and share. (4) meet lower price, and cut discretionary expenditures to minimize short run profit decline	Exploit advantage by: (1) reduce product price, possibly increasing sales and market share. (2) maintain price, and increase discretionary expenditures (R&D, advertising), increasing sales and market share. (3) maintain price, increasing profit margin.

Figure 2

A Simplified Illustration:

Some Firm Responses to Commodity Cost Advantages/Disadvantages

benefits associated with procurement strategy mistakes or successes in their competitive environment would be a critical influence in determining the optimum procurement strategy guidelines for individual product lines within the firm.

Influence Of Business Objectives

At different stages of a product or business life cycle, the priorities among alternative management objectives might be quite different, leading to different choices of commodity procurement strategies. Within many multiproduct corporations, individual lines of business are classified according to their future growth and profit potential, with management objectives and strategies tailored accordingly[1]:

(a) very low growth and profit potential--new investment and discretionary expenditures on advertising and research are minimzed, except as required to extract the maximum cash flow from previous investment. Cost reduction is a primary goal, perhaps even to the extreme of a small sacrifice of product quality.

(b) very high growth and future profit potential--funds for plant and equipment, research and new product development, advertising and promotion are channeled into these businesses, with the objectives being maximum sales growth, satisfactory current returns, and little concern regarding a negative cash flow.

(c) slow growth, but still good profit potential--usually an established business; funds would be channeled into the business to maintain the slow growth and established profit contribution, but some funds generated would be allocated to the high growth potential enterprises.

In products where sales and market share growth are primary short term objectives to ultimately enhance long term profitability, managers would be expected to be quite reluctant to adopt a strategy having even a slight risk of a rival gaining a short term competitive advantage. Market share losses would be considered anathema by top management. In contrast, managers of businesses where short term profits and increased cash flow are highest priority would be expected to be more flexible and willing to accept a moderate risk of competitive disadvantage, especially if the potential cost advantage from the procurement strategy are sufficiently large and probable in the manager's view. However, the size and probability of the potential competitive disadvantage would generally have to be within "tolerable" limits, or the strategy which otherwise would seem to be an attractive option would not be selected. Such risk management behavior seems consistent with the usual structure of management reward systems in food manufacturing firms; these typically are asymmetric, providing moderately positive rewards for extraordinarily good results, but reductions in a manager's promotion potential, or even loss of a job if negative results occur occasionally, even though the risk taken might seem reasonable a priori.

Other Internal Firm Considerations

The firm's commodity procurement strategy will often reflect its financial strength and degree of product (and commodity) diversification. While well financed firms may be more flexible in their procurement strategy because of their ability to weather any short term competitive disadvantage, firms in a weak financial position may be forced to strategies minimizing the chance of any competitive disadvantage. In some situations, a highly probable low commodity cost opportunity may have to be foregone because of the firm's inability to withstand the adversities associated with being wrong, even though it was a very low probability event.

While managers of single product businesses would tend to minimize the risk of the most discomforting results in their product and key commodities, even when the odds of favorable consequences might be reasonably high, multiproduct firm managers would tend to accept greater risk of adversity in individual products or commodities. The consequences of loss in one product or commodity would be proportionately less in the diversified business, and the odds favoring positive results in many individual strategies would generally lead to favorable results outweighing losses. Such differences in behavior require that the overall corporate risk management objectives are communicated clearly to managers of individual product businesses within the diversified corporation, and that risk management guidelines are adjusted from the single product management objectives that the middle manager would otherwise be expected to have.

Available Evidence

Commodity procurement strategies and results in most food manufacturing firms are typically very closely held within the firm because of the potential competitive repercussions. As a consequence, available evidence is not extensive, and must frequently be camouflaged to avoid disclosure of individual firm behavior.

There have been a few published case studies of firm procurement behavior in imperfect markets. Arthur (Arthur, Part III) cites several examples of firms dealing in undifferentiated products (wheat flour, industrial chocolate, soybean oil, fresh meat) where the price of key commodities typically is not established until immediately prior to use unless advance fixed-price product sales have been made. In contrast, Arthur cites several examples of "proprietary grocery items" (i.e., differentiated consumer products) where the firm's procurement policy

allows commodity costs to be established prior to the time of use. Some of the products cited in this category include chocolate chips, other cocoa-based products, candy, and orange juice.

Managers in more than a dozen large food manufacturing firms, and specialized commodity consultants dealing with another 20-30 food manufacturing firms, were interviewed on a"not for attribution basis". The observations of those interviewed (and the author's experience in a diversified food manufacturing firm) were generally consistent with the postulated behavioral relationships discussed earlier. Some case examples cited by those interviewed are discussed below.

Managers producing slightly differentiated products (vegetable oils and margarine, industrial flour, packaged grocery flour, industrial and retail sugar, industrial chocolate, a wide variety of "private label" products, frozen orange juice, and fresh meat) have a strong tendency to avoid exposure to a competitive disadvantage related to commodity procurement mistakes. Inventories are typically hedged where possible, kept to a minimum, or kept on a par with competitors to reduce the risk of a significant competitive disadvantage. Open forward positions occasionally will be taken, but only when a significant profit potential is quite probable, and the probability of commodity prices dropping is quite low.

Manufacturers of refined beet sugar and frozen orange juice are two examples where their commodity procurement risk is minimized through the use of contracts (called participation plans in the citrus industry) under which the price paid to the supplier is based on the selling price of the manufactured product, shifting most of the price risk from the manufacturer. Vegetable canners and freezers are an interesting contrast, in that forward purchases via production (acreage) contracts are apparently essential to insure adequate supply and quality, but fixed price sales or "hedging" of the contractual commitment are typically not feasible (in

contrast to commodities like flour, cocoa, and sugar); while production is contracted for well in advance of sales, most contracts are negotiated at approximately the same time, with careful attention to competitors' offers to acquire adequate supply without exceeding competitors' costs in the relevant producing areas. These and other manufacturers of slightly differentiated products typically follow strategies similar to most feed manufacturers and grain merchandisers, avoiding price risk or exposure in commodity markets when sales or selling prices of their product are quite responsive to actions of competitors. The responsiveness of sales to even small differences in price is so intense that any cost disadvantages are virtually certain to be directly and fully reflected in reduced firm profits, unless there is insufficient capacity among competitors to satisfy consumer requirements.

Business managers with strongly differentiated products (e.g., specialty breads, candy and confectionery products, snack foods, cake mixes, cookies, cereals, canned and soft moist dog foods) or dominant market shares have a strong tendency to take "forward" positions in their minor commodity inputs and avoid the risk of higher costs, even when their forecasts may suggest a reasonably high probability (e.g. 50-65%) of slightly lower costs, and a 20-25% probability of significantly lower costs in the future, especially if purchase prices are within the parameters of their financial plan for that business segment. The tendency is nearly as strong for primary commodities used in those products to be purchased in advance, though the acceptable probability of significantly lower costs is typically lower (e.g. 10-15%) than for minor commodities in the same business (e.g., soybean meal vs. sugar in dog food). There

clearly is a strong tendency for the manufacturers of strongly differentiated food products or with strong market positions to buy in advance and "lock up" a planned margin, thus avoiding a product price increase when there is an opportunity to do so.

Summary and Conclusions

What conclusions can we draw about firm and industry performance in imperfect market structures? Firms producing products which are slightly differentiated will generally forego forward commodity purchases that may lead to a competitive disadvantage unless there is very little chance of prices dropping prior to use. As a result, they are apt to have a more volatile cost and price structure, but might also have a long term lower average commodity cost in a noninflationary commodity price environment.

Firms with strongly differentiated products or a dominant market share are less concerned with the reactions of rivals, and more apt to make forward purchases to avoid cost and product price increases, even though the opportunity for still lower costs may be both attractive and probable. Such a purchasing strategy certainly can help suppliers' operating efficiencies, reduce suppliers' uncertainty, and sometimes result in higher selling prices, though there may be a quid pro quo for the buyer if advance purchases provide significant benefits to the supplier. In markets involving firms with large market shares or strongly differentiated products, commodity costs and product prices would be expected to be generally higher and more stable in a noninflationary commodity market environment. However, in the inflationary commodity market environment in the early '70's, the commodity price increases may have benefited firms more willing to make advance purcahses, and compensated for their tendency

to more readily make a "forward" purchase and forego the future possibility of lower costs even when the forecast probability was high.

In contrast to industries facing supply firms with administered pricing systems, the volatility of commodity (input) prices in the food manufacturing sector may result in more unsettled competitive relationships among firms than in otherwise comparable manufacturing industries; it seems likely that shifts in the "low cost producer" position resulting from commodity procurement success or mistakes relative to competitors makes joint profit maximization behavior less likely to be attempted or to succeed in oligopolistic market structures in the food industry. There would probably be more opportunities for the potential "maverick" to find himself in a position where price cutting or additional advertising could be afforded due to a commodity cost advantage, putting rivals in an awkward competitive position and enhancing his own position.

What are the implications for effective purchasing management systems? Clearly, there is a strong interrelationship between a firm's product market and commodity market risks. As a consequence, having the commodity procurement function managed as a separate profit center, or commodity purchase decisions made without considering relevant product market risks, could jeopardize the viability of the firm or business unit. In a very stable commodity market environment, procurement mistakes seldom could be very large. The increased commodity market volatility observed in recent years makes essential the effective integration of commodity market and product market risk management in most food processing and manufacturing firms. As the magnitude of potential gains or losses from alternate procurement and marketing strategies, and the complexity of the management task increase, the talent and resources required for effective management has clearly escalated.

In conclusion, this is a very complicated risk management problem--one that isn't unique to the food industry, but one which most economists and many managers have not analyzed comprehensively even though this element of risk management in the food industry has become much more important in the recent volatile commodity market environment. Food manufacturing firms dealing in imperfect product market structures and uncertain and volatile commodity (input) markets have a complex, multi-faceted management decision process where maximum profit, at least in the short run, is clearly not the sole decision criterion, even for those firms dealing in product markets characterized by little product differentiation or concentration of market power. Thus, we see that it might be quite rational for firms to take quite different actions in volatile commodity markets, leading to corresponding differences in firm and industry behavior and performance. While realistic deterministic models of firm behavior in such imperfect market settings may not be feasible, exploring the behavior of firms dealing with varying degrees of product market and input market risks appears to be a very fruitful area of research which can be instrumental in improving our understanding of behavior and performance in the entire food marketing and distribution system.

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Footnotes

[1] In the food industry, Heinz and Standard Brands are two examples cited in the literature (see References) who use this fairly common approach. Many others use similar approaches, following procedures similar to those developed by General Electric or some prominent management consulting firms.