The Impact of Agricultural Marketing Cooperatives on Market Performance in U.S. Food Manufacturing Industries for 1982

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Abstract

This research examines market performance in the U.S. food manufacturing product classes for 1982 and the effect cooperatives have as market participants. It addresses the public policy concern that cooperatives may obtain market power through favorable public policy and may exercise that market power to the detriment of society through undue price-enhancement. Because of this concern the partial antitrust exemption granted cooperatives under the Capper-Volstead Act of 1922 is likely to re-emerge on the public policy agenda.

A basic industrial organization structure-performance model extended by the theory of cooperatives is used to test the effect of cooperatives on market performance, here measured as the market's price-cost margin. After controlling for differences in the geographic size of markets and the effects of demand growth on prices, key structural elements affecting margins included measures of concentration, the degree of product differentiation and capital utilization and the minimum efficient scale.

Cooperative theory predicts improved performance in markets where cooperatives are present through the 'competitive yardstick' effect. The underlying hypothesis that the degree of cooperative participation is inversely related to the level of price-cost margins has rarely been fully tested across a large cross section of food manufacturing markets because of limited market data on cooperative participation. This study used a Special Tabulation of Census of Manufactures data for 1982 to construct a continuous variable representing the aggregate market share of the 100 largest agricultural marketing cooperatives in each of 134 food product classes. This extended structure-performance model was then estimated using ordinary least squares methods.

The cooperative share of market sales had a significant, negative impact on the level of margins supporting the yardstick effect hypothesis that cooperatives improve market performance. Product differentiation, measured by advertising-to-sales ratios, was positively related to margins but at a decreasing rate as advertising intensity increased. Capital intensity and minimum efficient scale were insignificant factors.

These results serve to confirm the basic industrial organization model and provide empirical support for the competitive yardstick effect of cooperatives on market performance.

1. Introduction

The structure of the vast majority of markets within the domestic farm sector, ignoring government programs, has historically fit the definition of a competitive industry—a large number of atomistic firms producing a homogeneous good, each facing a perfectly elastic demand function with no imposing barriers to entry or exit. In contrast, the food marketing sector began a structural transformation during the late 1800's from one that served demand for predominately unprocessed foods, towards a more concentrated one, handling increasing amounts of processed food. Currently unprocessed foods comprise only 10% of wholesale and retail sales, while processed foods account for 75% of the sales and nonfood grocery items the remaining 15% (Marion, 1986). The lengthening of the marketing chain between the farm gate and the final consumer is a key characteristic of the modern food manufacturing industry.

The growth in importance of very large, capital intensive, and diversified food manufacturing firms has been the result of the need to achieve economies of scale in mass production and distribution and control over new food processing technologies (Marion, 1986). New competitive strategies for expanding market share have depended on the ability of the food manufacturing industries to capitalize on an expanding advertising industry and product differentiation. Hence, individual farmers face a marketing environment where buyers of the raw agricultural output have significant power and the market may be lost as a means of efficient and equitable exchange.

Farmer cooperatives have been a major response to perceived problems of uneven power between farmers and buyers. As early as 1875 the Grange, one of the first U.S. farm organizations, encouraged the implementation of the cooperative organizational mode to help farmers fare better in the market place. Farmers would send their agricultural output to their member-owned cooperative processor instead of a private processor. The consequences of farmers' participation in the cooperative would be to give them (1) assurances of and access to available markets for the duration of their investments; (2) countervailing power when facing the exploitative tendencies of price-discriminating corporate monopsonists; and (3) enhanced net returns. Nourse

(1922) found that the attractiveness of cooperative organizations in the early twentieth century was partially due to the perception that democracy was compatible with cooperative philosophy. The cooperative allowed farmers a "functional reorganization" amidst the shortcomings of the economy, which was characteristic of excess capacity, a redundant, inefficient service industry and excessive costs arising from nonprice competition.

In general form, the cooperative is an association of independent member farm firms that generates zero profits. All cooperative surplus is returned to members in proportion to individual patronage (in volume). Some portion of this patronage refund may be channeled back into the cooperative as internal financing. Members can access their equity contributions at a later date as specified by the terms of the revolving equity and/or redemption plans. In contrast, an investor-owned firm (IOF) that generates a profit dispenses the surplus as dividends to stock owners or holds them as retained earnings.

The cooperative is bound to serving members' interests by a board of directors. Today, these interests are more heterogeneous and often in conflict. The board is comprised of members who are elected by a democratic mechanism which is guided by limitations on the dividends paid on member capital and the separation of voting rights from stock held.

The growth of the cooperative movement from 1890 to 1920 was first limited and then encouraged by legislation. The Sherman Act of 1890 was an antimonopoly statute that was then used to stop growing trusts. As no distinction was made between the cooperative and the IOF as market participants, cooperatives were also challenged. Cooperatives were regarded as illegal forms of collusion. The Capper-Volstead Act of 1922 reduced this legal challenge to cooperatives by granting them a limited exemption from the antitrust laws contingent on their compliance with its Sections 1 and 2.

Section 1 states that persons engaged in the production of agricultural products may act together in association for collective purchasing, processing, bargaining and/or marketing, with the necessary contracts to affect the specific function. This collective action is permitted provided the association is operated for the mutual benefit of all members and either of the following requirements is met: no member has more than one vote because of the amount of stock held or dividends on stock or

membership capital be limited to eight percent per annum.

Section 2 of the Capper-Volstead Act specifies the criterion for detecting noncompetitive practices among cooperatives. The Secretary of Agriculture is charged with assessing whether a cooperative is monopolizing or restraining trade to the extent that prices are *unduly* enhanced and initiating the proper corrective action against the association. Since the Act does not specify what constitutes undue price enhancement, as well as monopolization and restraints on trade, the enforcement of Section 2 has been on a case by case basis using a 'rule of reason' approach. The Secretary has never found a case of unduly enhancing price.

Cooperatives may possess tax advantages (Sexton, 1986) because they are taxed only on net income at the personal level, in contrast to the taxation on corporations at both corporate and personal levels. While the tax mechanism creates a neutrality between internal and external forms of financing a cooperative, it promotes internal financing for IOFs. This distinction, however, may not hold if there is no difference in the marginal cost of capital facing the cooperative and the IOF.

Debate continues over whether the limited antitrust exemption and the tax advantages enjoyed by cooperatives can lead to their excessive use of market power. Noncompetitive practices resulting from exertion of market power may compromise market performance where the agricultural sector is already subcompetitive.

Concern over cooperatives' possible excessive market power to enhance prices and thus compromise market performance has been a central factor in a number of antitrust investigations. It is also an impetus for research linking theories of cooperation with emerging empirical findings in the area of cooperative performance. Torgerson (1978), in assessing cooperative market power, states that cooperatives, as well as other enterprises, have to recognize the risks associated with possessing market power and, more importantly, with how the public fears it might be used.

This issue of the market performance impact of cooperatives as industry participants has prompted both theoretical and empirical research. Market performance is linked to market power through both a theoretical framework and empirical research. Studies have sought to measure market power, understand how cooperatives acquire it, and analyze cooperatives' ability to use it. The performance implications of various industry structural conditions have also been analyzed to explore whether all forms of market power are detrimental to society.

Torgerson establishes five possible capabilities associated with cooperative market power as the ability to: (1) influence factor costs of production, (2) match or exceed the capability of other firms in meeting market requirements, (3) return greater benefits to members than any other firm, (4) establish a reputation for management and product integrity, and (5) achieve size and depth of operations to cause other firms to consider the cooperative as an industry leader when making their decisions.

Commons (1959) defines market power as the ability through managerial expertise and pressure to obtain and maintain control over one or several factors determining price and income, including the willful restriction of supply to increase the value of firm assets. Increasing the value of firm assets is, in turn, a crucial dimension of growth. Scherer (1970) and Shepherd (1970) identify firm and industry growth as interacting factors influencing the structural characteristics of a market. Internal growth has the potential to rehabilitate a subcompetitive industry while creating new capacity through de novo entry. Such internal expansion can lead to greater technical and allocative efficiency, but also results in market power. On the other hand, the role of external acquisitions in firm growth may pose a societal tradeoff between allocative efficiency and social welfare.

The two routes to firm growth must be examined within the characteristics of a particular market to determine if firm growth is translated into market power. Taking into account the concentration and growth rate of an industry, and the market share of the expanding firm, it is then possible to analyze the effects of market power within that industry.

Firm growth is but one possible way to acquire market power. A firm may use other strategies to build market power. Investing in barriers to entry may maintain the current industry positioning of incumbent firms in terms of market share and concentration. Heavy investment in barriers to entry could eventually take on a predatory stance and eliminate those firms on the fringe of the industry thus achieving two goals by first discouraging entry and second by increasing market power.

Thus market power may have different impacts depending on how it is acquired and the type of market it exists in. The central question addressed here is whether there is a difference between market power held by a cooperative (if it indeed can be acquired) and that held by an IOF. Garoyan (1961) points to the fact that cooperatives are not seen expanding at the same rate as their IOF counterparts and thus they are less effective in the marketing environment. Farmers' bargaining power has been eroded as a result of declining cooperative effectiveness in an environment of increasing concentration in the agribusiness sector. Changes in market structure will most likely reveal IOFs as more responsive than cooperatives in their operations and financial strategies.

Clodius (1957) addresses both the role of and opportunities for cooperatives through market power stating "...the role cooperatives play in maintaining workable competition and the bargaining power of farmers depends on cooperatives of adequate power being present...the ability of cooperatives to grow externally through merger is regarded as a determining factor in cooperative survival." Torgerson (1978) cites Justice Department economists conceding that cooperatives require opportunities to gain higher market shares than IOFs because of the conglomerate nature of the profit-seeking firms within the food industry. Unlike their IOF counterparts, cooperatives bound to their member-related business constraint are limited in their ability to diversify. As a result, cooperatives cannot cross-subsidize a loss in the member-related product line with profits from a non-related activity.

If market power is a key to cooperative survival when competing with large IOFs exercising their established market power, can cooperatives effectively use market power? Galbraith (1964) identified four fatal structural deficiencies in cooperative organization that infringe on exercising market power: (1) the loose association of individuals, (2) nonexhaustive inclusion of all producers of a product, (3) the lack of control over member production, and (4) a less than absolute control over the decision to sell.

Even though cooperatives share certain basic commonalities, the structural organizations among them need not be uniform. Eschenberg (1971) stated "...the consequences for cooperative theory construction are that one can and must derive as many different theories as there are different cooperative organizational structures.* Therefore if cooperative performance vis-a-vis market power is to be examined, it must be done so within its particular structural setting.

Two theoretical studies by Youde and Helmberger (1966) and Youde (1978) are developed from this premise. Youde's study proposed that cooperative performance and market power potential were dictated by the cooperative's membership policies. He examined open (OM) versus restricted (RM) membership cooperatives.

Youde states that cooperative membership policies are governed by the supply and demand conditions of the cooperative. Adoption of restricted membership policies could result from two forces acting separately or simultaneously. The first occurs if the cooperative holds sufficient market power such that a probable increase in its final product supply depresses prices, thus necessitating limited membership to prevent net losses to both members and the association. The second force, fairly typical of the food processing cooperatives, involves short-run diseconomies of scale whereby member returns are decreasing, average costs increasing and membership will have to be restricted until cooperative capacity can be expanded.

Youde's conclusions were that RM cooperatives may lead to performance inferior to that of an equally efficient IOF (a case made by Youde and Helmberger for the cooperative as a monopsonist). OM cooperatives on the other hand, cannot possess significant market power without the ability to control members' production decisions or the distribution of their finished product sales. Their economic appeal is that OM cooperatives tend to push performance toward maximum social welfare levels attainable within the structure of the markets they face.

Two important issues warrant examination in this decade. The first concerns whether it is time for cooperatives to emerge from under the umbrella of limited antitrust exemption provided by the Capper-Volstead Act. Have cooperatives used this exemption as an offensive strategy for amassing excessive market power? While the reasons for cooperative formation have been examined widely to produce a diverse set of motives, theory offers little direction concerning the expected life cycle of the association after its formation.

Nourse (1945) proposed that cooperatives could serve a real

purpose by entering agricultural markets characterized by services that were either inadequate or inefficient. Relying on innovative, superior tactics, the cooperative would dispel the ill-effects of monopoly and then cease to grow. The association would then assume a 'vigilant' role by maintaining stand-by capacity or a 'yardstick' operational position, instead of pursuing the entire market or a dominant position therein. Some instances may warrant dissolution of the cooperative once it has stimulated regular commercial or manufacturing agencies to competition amongst themselves.

The possible existence of motives other than the altruism of the competitive yardstick notion has led to questions of whether cooperatives should be allowed an antitrust exemption if their market power is abusive. Public policy analysis of these questions should examine the welfare implications of both cooperative and proprietary organizational forms.

The second issue emerges from the increasing concentration in the food manufacturing industry and the declining leverage individual farmers have when making transactions. Do the organizational features of the cooperative association make it an adequate marketing alternative for farmers, also capable of withstanding competition from investor-owned firms? It is necessary to determine whether the cooperative is equipped to adapt to the ever-changing marketing environment and compete against firms that have several advantages ensuring their survival.

1.1 Problem Statement

The purpose of this research is to examine market power opportunities in the food and tobacco manufacturing sectors in 1982 and determine the extent of cooperative participation across the markets under study. Of primary interest to the future role of the Capper-Volstead exemption is whether the presence of cooperatives in markets is associated with undue price enhancement.

The link between agricultural marketing cooperatives' participation and market performance will be developed using two separate theoretical bases. Industrial organization (IO) theory provides the basic model for explaining market performance. It is derived from the paradigm that basic market conditions combined with elements of market structure and firm conduct determine the level of market performance. The performance model used in this study will not directly include elements of firm conduct as data are not available. The resulting structure-performance model can be justified by an assumption of some IO practitioners; a firm chooses its conduct based on its structural environment that maximizes its objectives. Figure 1 displays some of the basic conditions and elements of market structure and firm conduct that determine market performance, which is itself a multidimensional concept (Scherer 1980, p.4; Greer 1980, p.12). The short-run time frame imparts a static dimension to the model and the causation is unidirectional along the solid arrows. However, over time, market performance and firm conduct influence the structure of the market as well as other logical feedbacks denoted by the dotted arrows in Figure 1.

The usefulness of the IO model lies in its linkage of productive activities with the demand for goods and services in society through a hypothetical free market mechanism. The model is then able to predict changes in performance as departures from the free market mode occur. These departures translate into changes in some or all of the model's determining factors.

The theory of cooperative performance is the second theoretical base employed. It is used to extend the analytical construct of IO economics to consider the impact of cooperative participation on market performance.

Four and five digit product class data from two major groups in the Standard Industrial Classification (SIC) system will be studied for 1982. The major groups studied are SIC 20 (Food and Kindred Products Manufacturing) and SIC 21 (Tobacco Products Manufacturing). The extended IO model linking structure and performance will be estimated using linear regression methods. The empirical results will be used to explain the various degrees of market performance, measured as the price-cost margin (PCM), in food and tobacco manufacturing. Based on the theory of cooperative performance, it is hypothesized that cooperative presence in a market will improve market performance.

This research is organized in the following manner. Chapter 2 presents a review of cooperative theory and explicates the competitive yardstick effect. Chapter 3 reviews empirical IO performance studies useful in the construction of a model for the current research needs and brings to light some of the theoretical debates behind certain areas in the model's specification. The

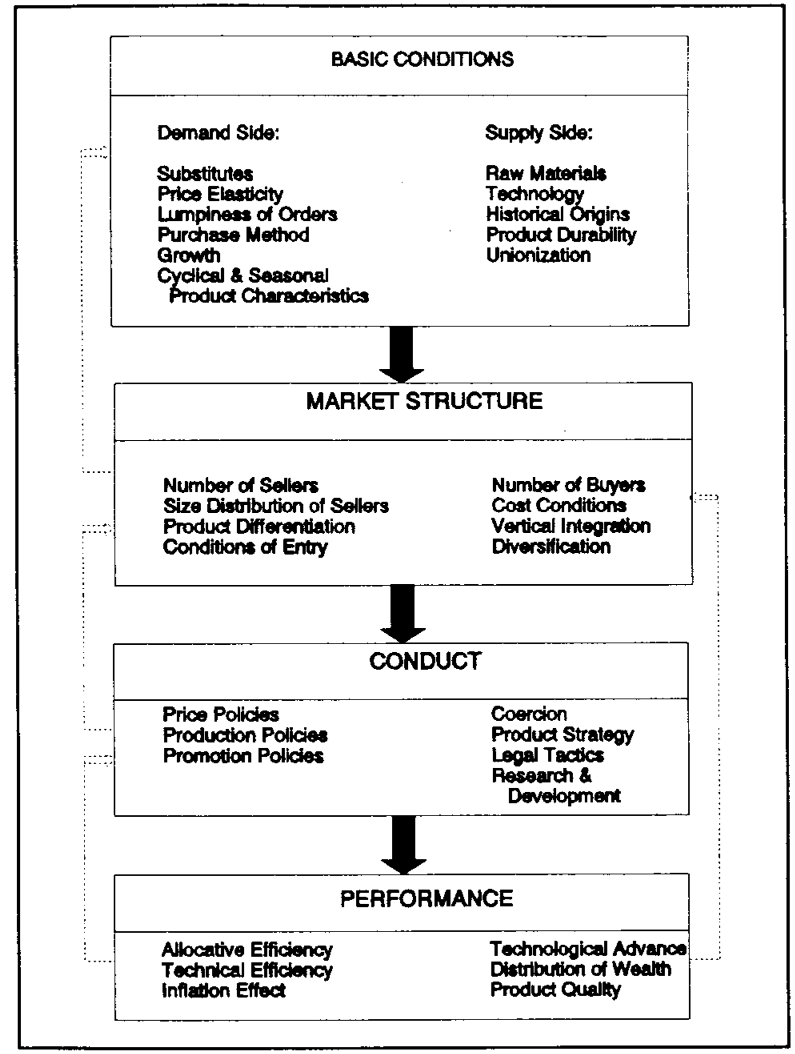

Figure 1 A Model of Industrial Organization Analysis

initial model is presented at the close of this chapter. Chapter 4 addresses the data requirements for this study, including variable and sample construction. The empirical results of the initial model and additional embellished models will be presented in Chapter 5, followed by a summary of the study and its conclusions in Chapter 6.

2. A Review of the Theory on Cooperative Performance: The Competitive Yardstick Effect.

Questions of whether cooperatives' limited antitrust exemption has given rise to excessive market power has led to linking cooperative presence in a market to the market's performance. Several hypotheses identifying the nature of the cooperative-market performance link have been extracted from a normative theory which addresses how cooperatives 'should be' functioning and affecting markets. These theories often lack the analytical framework necessary to make public policy evaluations.

The purpose of this chapter is to introduce the normative 'competitive yardstick' theory of cooperatives as developed by Nourse and present the theoretical model which Helmberger and Hoos (1962) used to determine market opportunities available to cooperatives for enhancing prices. Using the principles of their model, cooperative performance in the market will then be assessed for different structural settings and membership policies.

Nourse's competitive yardstick theory (1922) established on normative grounds the effect cooperatives would have on the market place. The cooperative upon its establishment as a legal institution was viewed as being endowed with the ability and desire to take a competitive stance in subcompetitive markets. Where cooperatives were providing better services and fairer prices to farmers in the association, investor-owned firms (IOFs) were obliged to follow or else their suppliers would defect to transact business with the open membership (OM) cooperative. Relative to IOFs, cooperatives were able to pay their members higher per-unit returns and to process a larger volume of the input. The reason for these differences is that the cooperative returns all positive profits as patronage refunds. This was possible since the cooperative pursued a different economic objective than the investor-owned firm. This also translated into a larger quantity of finished product entering the finished market and a lower finished product price for the consumer. The economy would become more efficient as a result of competitive pricing in the processor's input market. Cooperatives became responsible for pushing markets toward competitive performance.

Once the long-run equilibrium was established in the input market, farmers would no longer profit from further output expansion. At this point, Nourse suggested that cooperatives would dissociate as their role in the market was fulfilled. This however, assumed that private firms would maintain this improved competitive stance. In terms of the cooperative, there was a zero cost of entry and exit assumption.

2.1 The Helmberger-Hoos Model

Helmberger and Hoos (1962) applied the theory of organizations to extend the neoclassical theory of the firm to address cooperatives. They defined the firm in general terms as a type of organization of which the profit-seeking firm and cooperative are two special cases.

> A firm is a cooperative system which consists of organization, persons to contribute activity to organization, and a private-owned physical plant in which (1) physical resources are mobilized; (2) goods and services are produced for sale and (3) the primary reliance is on proceeds from product sale to cover production costs. Organization emerges with persons contributing activity to the system, participants sharing one or more common goals, and communication among members being present. (JFE 1962, p.277)

The cooperative is viewed from a micro-microeconomic approach which permits the construction of the model to follow the neoclassical microeconomic analytical framework. Cotterill argues that the neoclassical approach is necessitated by the existence of a supply curve, where the objective of the processing cooperative's management becomes deciding where on the curve to operate. This objective provides the guidelines for several decisions facing the cooperative, including price, finance, and investment. By assuming profit-maximizing on the part of the cooperative and its members, behavioral relations and equilibrium positions can be determined from traditional marginal analysis.

Helmberger and Hoos present dynamic short-run to long-run models of cooperatives with open membership policies. The results support the competitive 'yardstick' role of cooperatives espoused by Nourse.

The setting for the Helmberger-Hoos model is an open membership agricultural processing cooperative, facing competitive input and output markets. Farmers agree by contract to market all their raw agricultural output (***M***) through the nonprofit cooperative. Each member can identify his/her own positively inclined long-run (short-run) supply curve as that portion of their individual marginal cost curve that lies above average total (variable) cost. The aggregate supply curve of the cooperative is generated by the horizontal summation of the members' supply curves. Farmers are paid according to a net average return (***NAR***) schedule, which is the difference between the competitive finished product price and the sum of the average processing costs and fixed costs for the cooperative. It is assumed that all inputs, excluding that of the members, are optimally adjusted and prices for all other inputs, as well as the final output, are fixed. The price paid to farmers, P_{rc}, is net of all other input costs and fixed costs in the short-run analysis. The functional relationship between the price paid by the cooperative to its farmer-members and the output they supply can be written as

$$P_{rc} = P_{rc}(M). \tag{1}$$

According to the ***NAR*** schedule, for any given M, there exists a maximum per-unit return to members which is P_{rc}, due to the implicit cost minimization underlying the cost curves. Those farmers selling their output to a private processor instead are price takers, where the per-unit price received is not determined by the amount of agricultural input they supply to the IOF but rather by the atomistic input market establishing the equilibrium price. When the cooperative is competing for raw input with IOFs, its complete demand curve becomes that portion of the IOFs net marginal revenue (***NMR***) schedule below maximum ***NMR*** and above maximum ***NAR***, along with that portion of ***NAR*** > ***NMR***. This is necessary if the cooperative is not to lose members to private firms paying higher prices. However that portion of the ***NMR*** curve that the cooperative incorporates onto its demand curve is associated with levels of member input that earn the firm negative profits (since ***NMR*** > ***NAR***). Therefore, it is not likely a firm will operate within this range except in the short run. The dotted curve in Figure 2 traces out this demand relation.

In keeping with the incentives for cooperative organization under the competitive yardstick theory, farmers should receive

fair prices and have access to the markets they require. Should cooperative management choose to maximize profits and not distribute the gains to members, then the cooperative is really functioning as an IOF. Likewise, if cooperative management pursues an objective of maximizing price returned to members at the expense of providing access to the input market for other farmers, then the cooperative fails to be socially beneficial to all farmers. In some settings, consumers also do not benefit when output restrictions lead to elevated final prices. Assuming then that a reasonable goal for cooperative management is to maximize net average return to members, while accepting all the output members (including new members) wish to market, then the following analytic framework reveals how the objective is achieved. The cooperative's profit (π) equation can be written as:

$$\pi = \bar{P}_y \cdot Y - \sum_{i=1}^{n} \bar{P}_i \cdot x_i - P_{rc} \cdot M - F, \tag{2}$$

where,

$\bar{P}_y$ = competitive finished product price,
Y = cooperative's processed output,
P_i = competitive input price for the i^th^ input,
x_i = quantity of i^th^ input used,
P_{rc} = per unit net average return to farmers,
M = raw agricultural output supplied by farmers, and
F = fixed costs.

Since cooperatives transfer to members what would be realized as profits for stockholders of IOF's, the objective can be restated as maximizing cooperative surplus. Equation (2) can be rearranged by equating the cooperative surplus, CS, defined as ($P_{rc} \cdot M$), to the net revenue exclusive of the cost of M.

$$MAX\ CS = P_{rc} \cdot M = \bar{P}_y \cdot Y - \sum_{i=1}^{n} \bar{P}_i \cdot x_i - F. \tag{2a}$$

The surplus is then used to return the highest per-unit price for

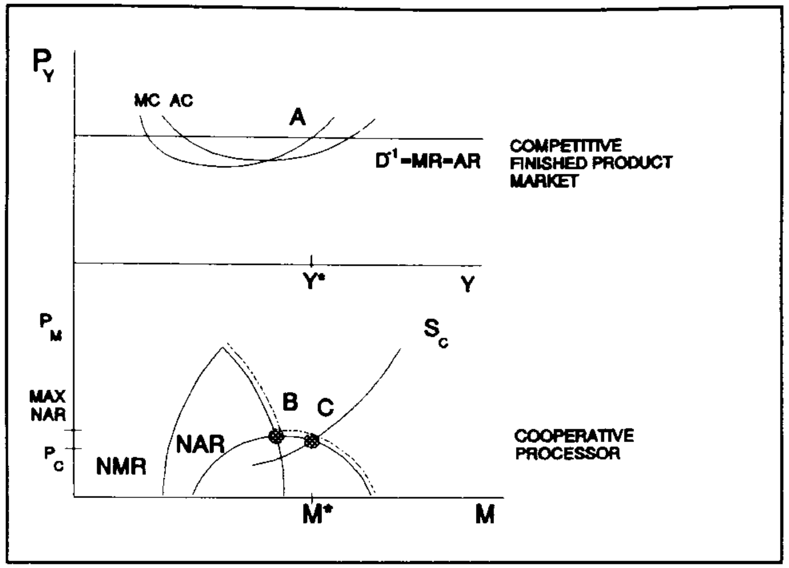

Figure 2 DERIVATION OF COOPERATIVE PROCESSOR REVENUE CURVES FROM THE COMPETITIVE FINISHED OUTPUT MARKET

member input possible for any M. M is determined apart from the cooperative decision-making process and is therefore a parameter ($\bar{M}$). Maximization of CS implies maximization of per unit return to members, P_{rc}. This can be represented as:

$$\text{(2b)} \qquad MAX\ P_{rc} = \frac{\bar{P}_y \cdot Y - \sum_{i=1}^{n} \bar{P}_i \cdot x_i - F}{\bar{M}}.$$

Equation (2b) represents the functional form of the NAR curve, the cooperative's demand schedule. The term, $\sum p_i \cdot x_i$, represents total variable cost exclusive of M. When processing levels are such that the ratio of the input-price to the input's marginal product is equal for all inputs, the minimum cost curve is defined as $C = C(Y)$. Thus, when

$$\text{(3)} \qquad \frac{P_i}{MP_i} = K \text{ for all } i$$

where K = constant, then

$$\text{(4)} \qquad C = C(Y)$$

where (4) represents the minimum cost of producing a given level of finished product, Y.

The cooperative's maximization problem (2a) can then be expressed in terms of a single decision variable, Y, the finished product, by replacing $\sum P_i \cdot x_i$ with $C(Y)$ in equation 5.

$$\text{(5)} \qquad CS = P_{rc} \cdot \bar{M} = \bar{P}_y \cdot Y - C(Y) - F.$$

The cooperative maximizes CS by setting the partial derivative of CS with respect to Y equal to zero (equation 6).

$$\text{(6)} \qquad \frac{\partial CS}{\partial Y} = \bar{P}_y - C'_c(Y) = 0$$

therefore:

$$\bar{P}_y = MC_c.$$

Equation (6) indicates CS will be at a maximum when the competitive finished product price equals the OM cooperative's marginal cost assuming the second order conditions hold. This can be represented graphically using both the finished product market and the processing cooperative as shown in Figure 2.

The cooperative's established behavioral condition of maximizing CS by equating $\bar{P}_y = MC_c$ at point A in the finished product market is analogous to a profit-seeking IOF, as the partial derivative of profit with respect to finished output, $\partial\pi/\partial Y = 0$ implies that $MR = MC$, which is also satisfied at point A. It also is the maximum cooperative surplus position.

The members' individual production equilibrium decisions when considered collectively, determine M. These decisions are guided by equating the sum of the member's marginal cost and the average cost in the joint plant, the cooperative, to the net average revenue of the joint plant. As will be discussed later, the traditional theory of the multiplant firm states it is the sum of the marginal costs in the individual and joint plant that is equated to the marginal revenue in the joint plant in order to maximize profits. However, there is some question as to whether the marginal cost curve in the joint plant can be identified due to the underlying volatility of the supply curve resulting from open membership policies. In the event that this is true, the average cost of the cooperative is deemed more appropriate in members' decisions. Aresvik (1955) was one of the first to draw attention to this problem by noting that Norwegian dairy cooperatives employed the average cost/revenue curves in decision-making. For the farmer, profit maximization would imply setting $MR = MC$ where marginal revenue is perceived as P_{rc} if the farmer does not acknowledge that $P_{rc} = P_{rc}(M)$. Thus Aresvik's average cost-revenue analysis is incorporated in the work of Helmberger and Hoos, by the following: if (a) $MC_i = P_{rc} = MR_i$, as perceived in the i^{th} individual's maximizing behavior, and (b) $MC_i = P_{rc} = (\overline{P}_y - ATC)Y/M$, by rearranging (2b) and imposing the assumption that one unit of raw input is converted into one unit of finished product, thus causing ratio $Y/M = 1$, gives:

$$P_{rc} + ATC = \overline{P}_y$$

which is equivalent to

$$MC_i + ATC = MR_c$$

thus demonstrating Aresvik's postulated member behavior.

Cooperative equilibrium in the short run need not be consistent with the cooperative achieving the maximum cooperative surplus. The former is guaranteed by management choosing to operate along the members' aggregate supply curve, S_c in Figure 2, where it intersects the NAR curve. The supply curve is the result of aggregating that portion of the individual member's MC curves where $MC > AC$. Shifting of S_c may be under the cooperative's control if a restricted membership policy is pursued. When this is not the case, the location of S_c and the resultant equilibrium are attributable to the combined individual member's profit-maximizing decisions (or the hypothesized production equilibrium).

As was demonstrated, the initial results of cooperative maximizing behavior are identical to the IOF maximizing profits. To contrast the profit maximizing position in the finished output market with the dynamic mechanism attributable to open membership policies, it is necessary to employ the traditional value marginal product (*VMP*) and average value product (*AVP*) curves derived from a production function exhibiting at first

increasing marginal productivity of M followed by its diminution. *VMP* and *AVP* curves are identical for both IOF and cooperative processors under the assumption of equal technological efficiency invoked by Helmberger and Hoos. Since an IOF in the input market does not make its decisions using the method ascribed to by a cooperative, the IOF does not identify a *NMR* or *NAR* curve in the same fashion as a cooperative does because the IOF does not distinguish the cost of input M as separate from $\sum p_i \cdot x_i$, the total variable cost. The *VMP* and *AVP* curves, while identical to both firms, provide the mechanism to show the point of departure once both firms have maximized profits.

To reiterate, the ratio of finished output to the level of input M is assumed to equal one. While this simplifies the transition from the input market for M to the finished output market, it is not an unrealistic assumption. For example, a milk processor purchases 1 unit of raw milk and converts it to 1 unit of processed milk. More importantly, removing this assumption does not affect the general results.

In Figure 3, M^* represents the level of input M that maximizes profits, which translates from the profit maximizing level of finished output, Y, in the finished output market. The IOF will use its *VMP* curve as its demand curve and pay farmers P_{IOF} per-unit of M. P_{IOF} represents the market clearing input price from the competitive input market equilibrium. The *OM* cooperative on the other hand, uses *AVP* as its demand schedule and pays its members P_c, a higher per-unit price than offered by the IOF. The difference between P_c and P_{IOF} can be understood as a premium paid on top of the market clearing input price in the form of a patronage refund when profits are positive.

The IOF will try to maintain its position at M^* until competitive forces in the long run drive profits to zero and all processors operate at point B, handling M_{LR}. The *OM* cooperative takes a different path from M^* determined by its behavioral objective. Since the cooperative dispenses positive earnings to members in the per-unit return, members have incentive to expand production. Also, nonmember farmers receiving only P_{IOF} will seek membership in the cooperative. Thus there is a component of the overall supply expansion that is attributable to new membership. These two refund-induced supply responses combine to shift S_c in Figure 3 out from point C towards point D. Members are able to sell output in excess of M^* up until M^1 and still

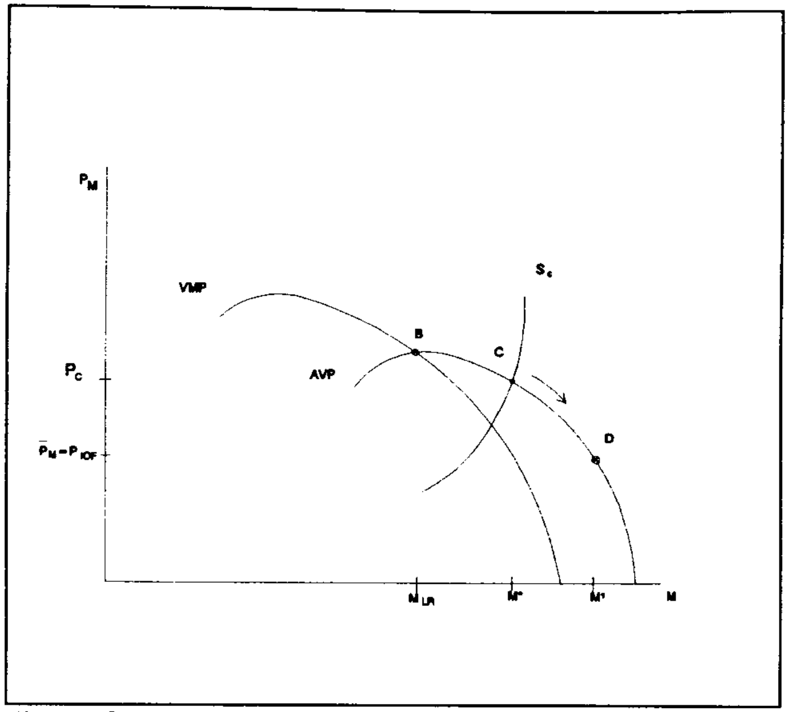

Figure 3 COMPARISON OF PRICES PAID FARMERS BY AN OM COOPERATIVE AND IOF

receive a higher price than the IOF would pay. Also, since the IOF is concerned with maximizing profits, it will not handle more than M^*. At M^1, the cooperative pays the same per-unit price as the private processor, the market clearing price. Entry into the cooperative is forestalled at M^1 due to this equality in price paid for M. Should the cooperative handle a quantity of member output greater than M^1, it would return a price lower than P_{IOF} as indicated by the *AVP* schedule, and lose members.

Thus, there is a transitory nature to the surplus a cooperative generates due to the supply-expansion mechanism operative in open membership policies. While still considering the short-run positive profits setting, the difference between IOF and cooperative processors in the input market can be illustrated by Figure 4.

For any market clearing equilibrium input price less than P_{LR} positive profits are present. Examination of $P_{(+)}$ indicates the

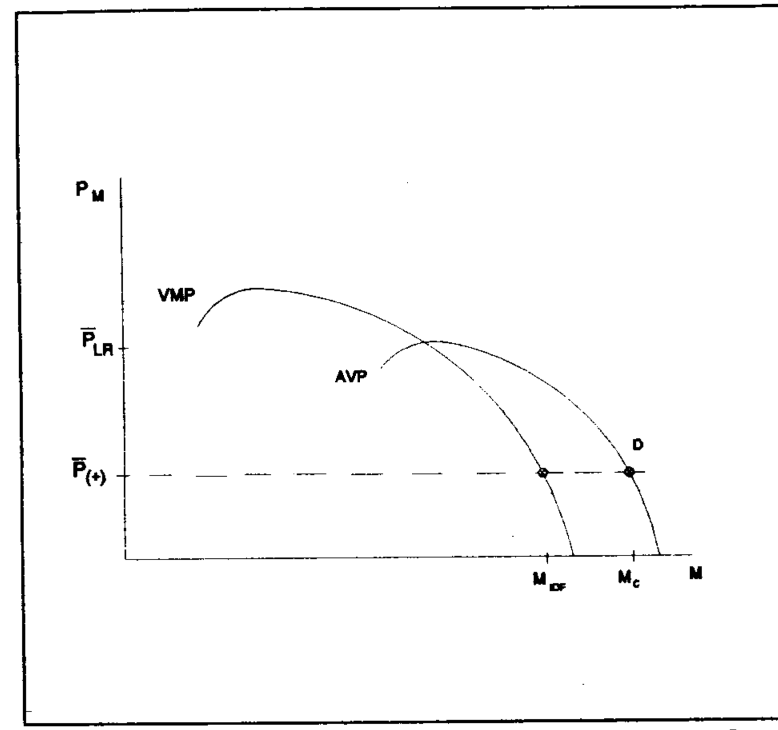

Figure 4 THE SHORT-RUN COMPARATIVE EFFECT OF COOPERATIVE PROCESSORS PAYING A MARKET CLEARING INPUT PRICE

OM cooperative will process more product (M_c) than the IOF (M_{IOF}) and hence bring more to the competitive finished output market. This demonstrates the competitive yardstick effect of cooperatives.

In the long-run specification, fixed costs vanish, and M is free to vary. For the restricted membership (RM) cooperative, M is under its control and hence it must solve for M in order to determine the maximum price it can return to members. The long-run model for the OM cooperative is identical to equation (2b) excluding fixed costs.

To maximize the price paid to its member-owners, the RM cooperative management shifts the supply curve to the left, from S_o to S_r in Figure 5, in order to intersect *LR-NAR* at its maximum. The shape of the *LR-NAR* curve can be explained by economies of specialization initially lowering costs, followed by diseconomies

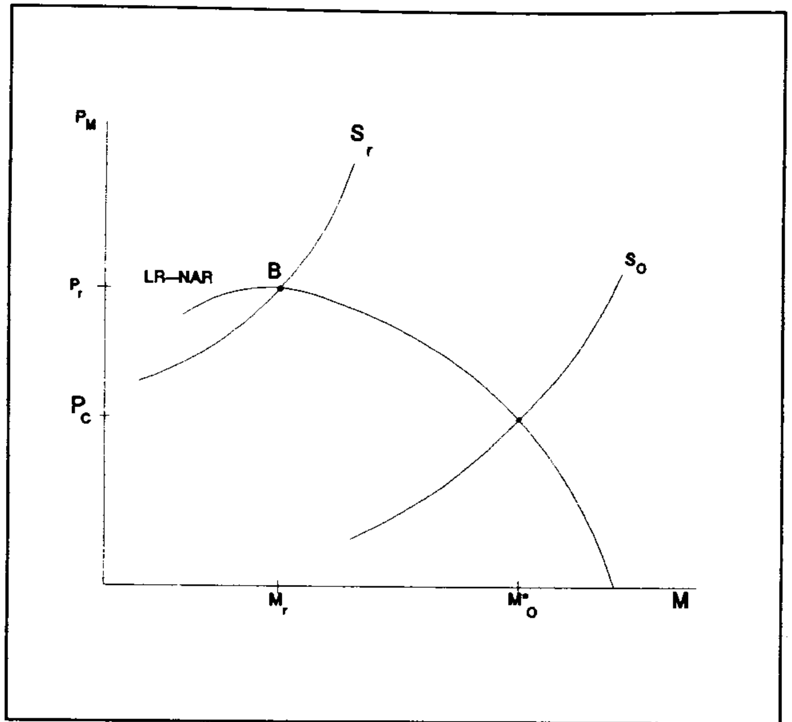

Figure 5 THE RM COOPERATIVE'S INPUT SUPPLY AND DEMAND CURVES FOR M

associated with management difficulties as output increases. The cooperative's goal is to process that M associated with the maximum P_{rc}.

At point B, a select group of members whose aggregate production is M_r, is paid a higher return than an OM cooperative with supply curve S_o in long-run equilibrium. As a result of less raw commodity being processed, a lower quantity of finished product enters the final market than that made possible by S_o and M^*_o. In contrast, the OM cooperative in the long run undergoes a constrained maximization of P_M that covers all variable costs for a variable M, not under its control.

To summarize, in the atomistic input and output market setting the following can be stated: the short-run excess profit case indicates that OM cooperatives enhance market performance by initially paying members more for the profit maximizing level of

M. Once ensuing aggregate supply adjustments have been made, the cooperative brings more to the final output market than an IOF would. The RM cooperative in the same setting is expected to deviate from the IOF solution but the direction is ambiguous. In the short and long run cases where profits equal zero, all three market entities achieve perfectly competitive results.

Certain assumptions underlying the Helmberger and Hoos model have been criticized. For example, under their assumptions the cooperative's peak coordinator can envisage the cooperative's ***NAR*** curve which specifies the maximum price the cooperative should pay for any M and keep net margins equal to zero. This would make patronage refunds obsolete. This assumption was necessary to avoid the indeterminacy problem of an ambiguous supply function which arises whenever farmers have incentive to expand M due to positive net margins. Not only does this assumption attribute considerable foresight on the part of cooperative management, but it also imposes a zero net surplus strategy, which clearly is not representative of observed cooperative practices (Staatz 1987).

2.2 *Performance in Alternative Structural Settings*

Despite the limitations, the introduction of the Helmberger-Hoos model provided the most complete framework for determining cooperative price-output solutions by building on a neoclassical marginal treatment of the cooperative as a special type of firm. With this accomplished, the model can be extended to examine cooperative performance in settings other than perfect competition.

In a working paper, Jesse and Johnson (1980) expanded on the Helmberger-Hoos model by examining the theoretical aspects of cooperatives and undue price enhancement for eight market structure combinations with a three stage vertical food marketing channel. The channel consists of primary producers (farmers), processors and distributors. They configured alternative market settings within which cooperative performance could be assessed. In particular they considered the organization of (1) the buyers of raw input, (2) the sellers of finished output and (3) the buyers of finished output. This discussion assumes that the cooperative represents both the buyer of raw input and the seller of finished output.

Certain of the eight structural combinations, as pointed out by Jesse and Johnson, are not realistic. For example, it is not likely that atomistically organized purchasers of raw input are monopolistic as sellers of the finished output. The structural settings to be examined here are summarized in Table 1. Note that where the cooperative has a monopoly in the final output market, the organization of purchasers becomes important in determining the market outcome. The cases presented come from theoretical models extended by Jesse and Johnson (1980) and Cotterill (1987).

2.2.1 Case A. Monopolistic Input/Competitive Output

For the cooperative monopsonist facing a competitive output market, Cotterill examined three relevant objectives: maximizing cooperative net margins, member welfare, and the price paid farmers. He assumed an open membership policy and that patronage refunds did not enter member's production decisions but rather were considered windfall gains.

Despite the fact that the cooperative is a monopsonist in the input market, the choice to maximize the per-unit price paid to farmers leads to point 3 in Figure 6 being identical with point C of Figure 2. The cooperative pursuing the maximization of net margins introduces the traditional marginal expense (***ME***) curve and seeks to equate ***ME*** with net marginal return (***NMR***). This brings about a solution equivalent to that achieved by an IOF monopsonist. Keeping in mind that refunds extracted from

Table 1 STRUCTURAL CONFIGURATION OF THE MARKET CHANNEL

Case	Input Procurement	Final Output Sale	Purchasers
A	Monopsonistic	Competitive	–
B	Monopsonistic	Monopolistic	Competitive
C	Oligopsonistic	Competitive	–

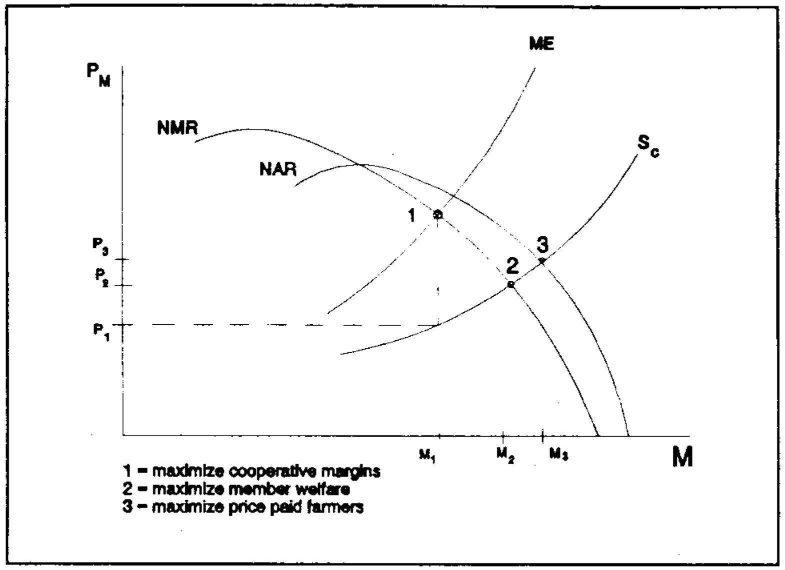

Figure 6 DETERMINIATION OF PRICE AND INPUT LEVEL UTILIZATION FOR AN OM COOPERATIVE MONOPSONIST UNDER ALTERNATIVE OBJECTIVES

positive margins do not provide incentive for output expansion, then members would be better off if management chose to maximize member welfare. Point 2 allows members to sell more raw output to the cooperative, M_2, and receive a higher per-unit return, P_2 than possible with an IOF processor. Margins are still positive but less than at point 1.

When patronage refunds are taken into account, farmers respond to the expected price, which consists of the transaction price (P_{rc}) plus the expected refund. The latter is simply modeled after the previous period's refund. The effect of including patronage refunds into the members' decision-making process makes maximizing the price paid to farmers the only sustainable price-quantity equilibrium pair in the long run.

With a restricted membership policy, the supply curve in Figure 5 shifts to the left so that the equilibrium can be established at the maximum of the ***NAR*** curve. The sustainable equilibrium of paying maximum ***NAR*** to members yields a higher price to a select group of farmers and a smaller quantity processed compared to an OM cooperative and in some instances, to an IOF, depending on where its supply curve is positioned. Consumers, however, are not worse off, due to the processed product market being competitive. In the long run, when profits equal zero, setting $\overline{P}_y = MC$ also implies $\overline{P}_y = AC$ at P^*, the long-run equilibrium price (see Figure 7). The ***NAR*** curve derived as in the Helmberger and Hoos model becomes perfectly elastic at P^* and the IOF monopsonist, again, handles less volume than the OM cooperative ($M_{IOF} < M_c$) and pays farmers less ($P_{IOF} < P^* = P_c$).

2.2.2 Case B. Monopsonistic Input/Monopolistic Output

Jesse and Johnson examined the performance implications of a cooperative with market power in both input procurement and final output markets. As a result, the cooperative faces the entire raw input supply schedule as well as the entire finished product demand schedule of atomistic purchasers. A comparison of the price-quantity solutions achieved by IOF, OM and RM cooperative firms in the raw input and finished product markets is shown in Figures 8a and 8b.

The cooperative as a raw input monopsonist is shown in Figure 8a. The average product (***AP***) and marginal product (***MP***) curves of the raw input are derived from the processor's production function, which is assumed to exhibit constant returns to scale.

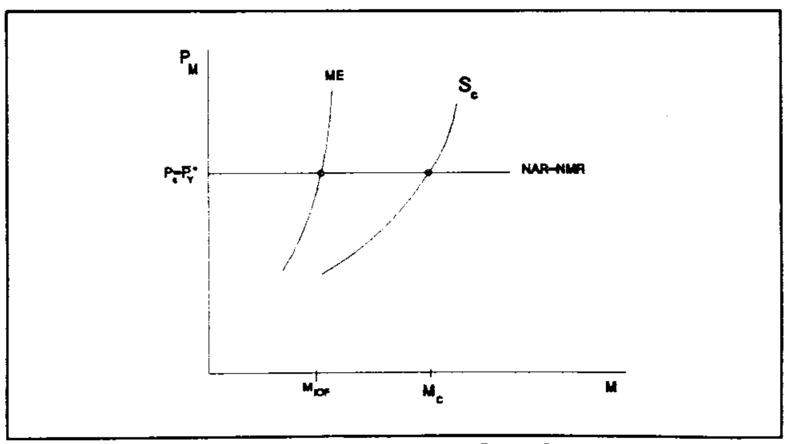

Figure 7 COMPARISON OF IOF AND OM COOPERATIVE MONOPSONIST INPUT-PRICE VECTORS IN THE LONG RUN

Multiplying each by a declining marginal revenue yields the derived average revenue product (***ARP***) and marginal revenue product (***MRP***) curves shown in Figure 8a. The OM cooperative's and the IOF's aggregate supply curve of members' raw input is shown by ***SS***. The curve marginal to ***SS***, termed the marginal expense curve, is shown as ***ME***.

The profit maximizing IOF will equate ***ME*** to ***MRP*** and purchase M_{IOF} at P_{IOF} per unit to farmers. The OM cooperative, paying its members according to the ***ARP*** function, handles a greater quantity of raw input, M_{OM}, and pays its members P_c which exceeds the price paid by the IOF. The relative impact of these two different input utilization decisions on the finished product market is shown in Figure 8b.

Figure 8b shows the OM cooperative brings more output, Y_{OM}, to the finished product market at a lower price P_{OM}, than the IOF monopolist. Thus despite a monopoly in both the raw input and finished product markets, the OM cooperative solution results in the maximum social welfare associated with a perfectly competitive processing sector. The IOF solution is welfare inferior.

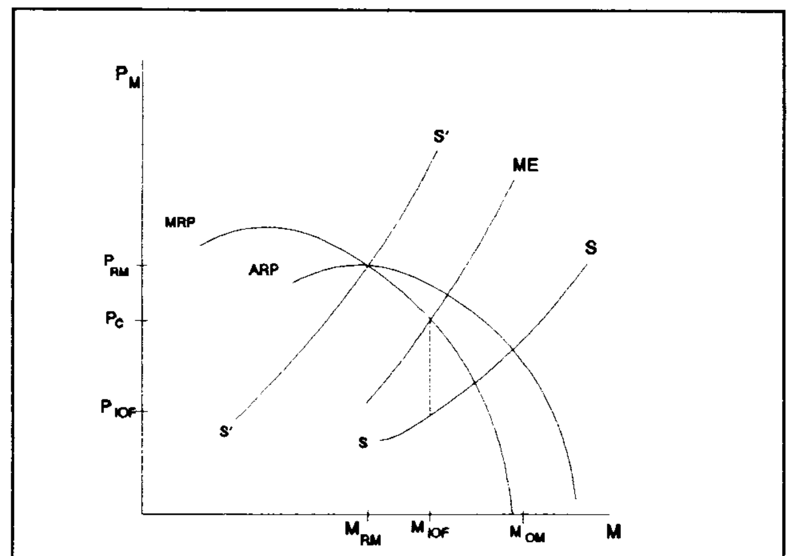

Figure 8a PROCESSOR WITH MONOPSONY POWER IN THE RAW INPUT MARKET

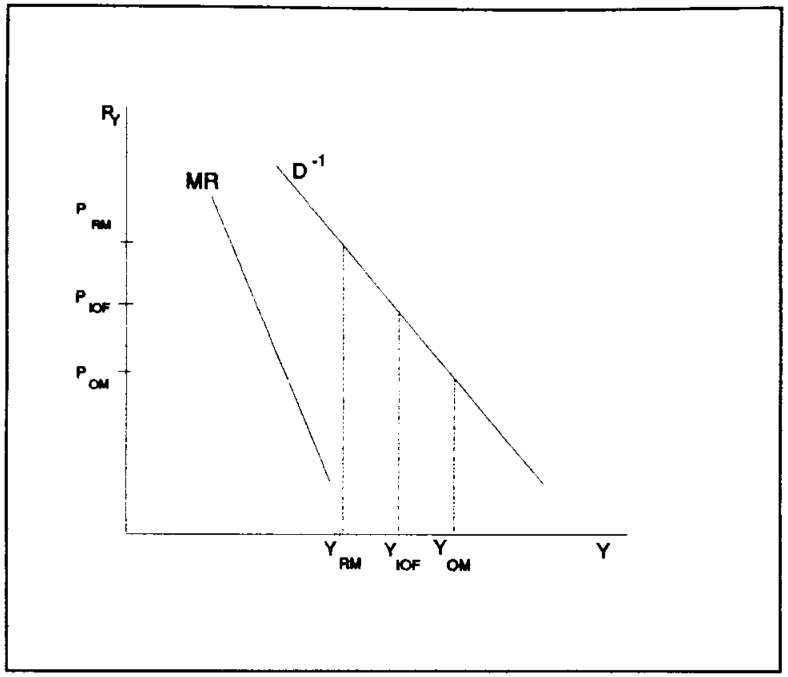

Figure 8b PROCESSOR WITH MONOPOLY POWER IN THE FINISHED PRODUCT MARKET

If the cooperative in this structural setting has a restricted membership policy then a scenario can be developed in which cooperative involvement leads to a solution inferior to that of an IOF. These results however, are dependent on the position of the IOF's supply curve. If ***SS*** were positioned to the left of maximum ***ARP***, the OM cooperative solution would be inferior relative to that of the RM cooperative in the short run. The IOF solution is inferior to that of the RM cooperative if ***SS*** is to the left in Figure 8a, causing ***ME*** to intersect ***MRP*** to the left of maximum ***ARP***. Given public policy concern over market power exercised by cooperatives, structural settings in which cooperatives can yield hypothesized inferior solutions relative to IOF's need to be further analyzed. In the long run, the RM cooperative will tailor its membership such that its aggregate supply curve, ***S'S'***, intersects ***ARP*** at its maximum, as in Figure 8a. These select members are paid P_{RM}, which is greater than the price paid by an OM cooperative, but supply a quantity, M_{RM}, smaller than supplied to the IOF. Extended into the finished product market, the RM cooperative monopolist charges consumers the most, P_{RM}, while making the least available. This case shows that the collusive ability of farmers leads to an inferior welfare solution than possible by an IOF monopolist.

This analysis suggests three welfare implications. First, with an RM cooperative monopsonist-monopolist, select farmers are paid supracompetitive prices, while other farmers have no outlet for their output. Second, there is undue price enhancement and third, output is restricted. The last two effects are also typical of an IOF. Only the OM cooperative results in the competitive outcome. The dynamics of the raw input and finished product markets are closely linked because the monopsonist (be it an IOF or RM cooperative), exploiting a positively-sloped supply curve, restricts raw input purchases and thus output sales as well. It is equally plausible to argue that a monopolist (again either an IOF or RM cooperative) exploiting a negatively-sloped inverse demand curve in order to maximize profits restricts output sales and consequently input purchase. The OM cooperative lacking the objectives of the IOF and RM cooperative will not be associated with undue price enhancement.

While monopsony-monopoly settings represent degrees of market imperfection rarely seen in agricultural markets, it is possible these models are reasonably appropriate when a firm can recognize the price effect of its input purchase and output sale decisions.

2.2.3 Case C. Oligopsonistic Input/Competitive Output

Cotterill considers the implications of the cooperative as an oligopsonist competing with IOF's for supply of the raw agricultural input. All firms recognize their interdependence, face symmetric processing costs and final demand price, and hence possess identical ***NMR*** and ***NAR*** curves. The supply curve facing a firm may be typical of a 'followership' or 'non-followership' curve. A followership supply curve (S_F) preserves the existing market shares as all firms change price in tandem. As shown in Figure 9, the non-followership curve (S_{NF}) is more elastic as membership fluctuates for both the price-mover and the non-follower.

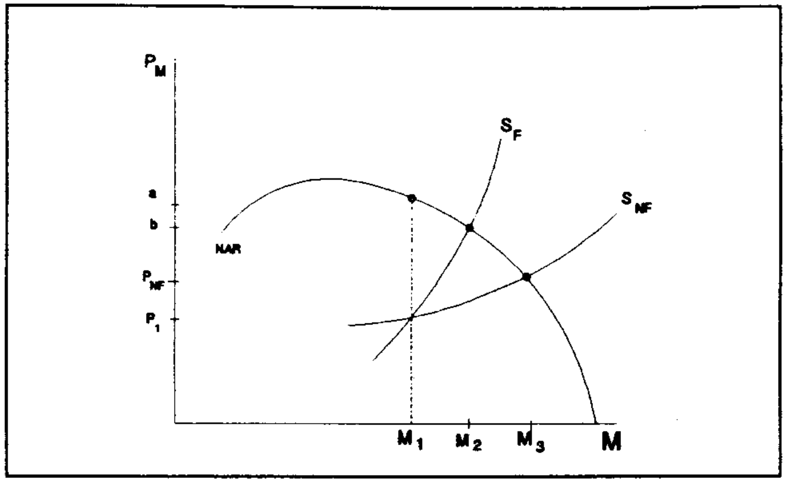

Figure 9 FOLLOWERSHIP (F) AND NON-FOLLOWERSHIP (NF) SUPPLY CURVES FOR COOPERATIVE IN OLIGOPSONY SETTING

The OM cooperative can decide not to participate in joint profit maximizing with the other oligopsonists and opt to pay farmers more. Two scenarios are possible. One is that the IOF competitors match the cooperative price paid and a competitive yardstick effect results. The second case is that IOF's do not match the price, the cooperative takes on a non-followership supply curve and an expanded market share. Existing membership will also expand output.

On the other hand, the RM cooperative equilibrium will not disturb the oligopsonistic joint profit maximizing equilibrium in the industry. The RM cooperative is not interested in attracting new members, thus it is not likely to possess a non-followership supply curve. It must, however, keep pace with higher prices being paid elsewhere in the industry if it is to avoid defection of its select members. Referring to Figure 9, the management could agree to pay the market price set by the oligopsonists and refund the difference between the market price and the price indicated by the ***NAR*** schedule. If the market price for M is set at P_1, the RM cooperative can refund P_1a to its members. While the refund translates into a higher price received by members, it enables the cooperative to move up along its supply curve until it reaches equilibrium with M_2 supplied at a price of b per unit.

The closed structure of the cooperative prevents the yardstick effect on market price from being operative.

Tables 2 and 3 summarize the price-quantity results in both the short and long run profit scenarios for OM and RM cooperatives relative to the results achieved by a profit maximizing IOF. Cooperative participation may maintain (0), enhance (+), or compromise (-) market performance compared to the price-quantity solution obtained in the market by an IOF.

The base case reveals a supracompetitive impact from OM cooperatives when short-run profits are greater than zero. Here, OM cooperative performance is preferable to the economic welfare level associated with perfect competition. In the long run, or short run with zero profits, OM, RM cooperatives and IOFs are indistinguishable and all lead to market performance at the perfectly competitive level.

Case A is very characteristic of the agribusiness sector. Due to the perishable and bulky nature of many raw agricultural products, the area of procurement for processing is limited. However, once processed, finished goods often enter national markets. This case in the long run, shows both OM and RM cooperatives achieving a competitive solution that enhances market performance when compared to the subcompetitive raw input price paid and the supracompetitive output price charged by an IOF.

These first two cases do not illuminate the issue of undue price enhancement because it is not present. Case B reveals the OM cooperative in the long run achieving a competitive solution enhancing market performance while the RM cooperative yields a welfare inferior solution relative to an IOF.

Case C, which is commonly termed bilateral monopoly, is indeterminate and dependent on the relative bargaining strength of both parties.

Cases B and C indicate that the OM cooperative, even as a monopolist, does not derive the 'conventional' market power associated with monopoly power. This is because the OM cooperative does not restrict output for the purposes of maximizing profits or servicing a limited membership. Rather, it was established to market the entire output of all members, and is therefore unable to set price.

Rhodes (1983) highlights the point that in the short run, OM cooperatives have not been able to choose output levels that

Table 2 COMPARISON OF MARKET PERFORMANCE IMPACT OF OM COOPERATIVE AND IOF

Case	Profit	Input Price Paid Farmers' Raw Output	Price of Finished Output	Output Level	Market Performance
Base	SR > 0	c	-	+	+
Base	SR,LR = 0	c	c	c	0
A	SR > 0	+	-	+	+
A	SR,LR = 0	c,+	c,-	c,+	+
B	LR = 0	c,+	c,-	c,+	+
C			INDETERMINATE		

CASE:
Base = competitive input and output markets,
A = monopsonistic input, competitive output market,
B = monopolistic output sale, competitive output purchase,
C = monopolistic output sale, monopsonistic output purchase,
where
c = competitive results,
c,+ = competitive results with higher solution vector,
c,- = competitive results with lower solution vector,
+ = supracompetitive,
- = subcompetitive.

generate earnings, and feels the short-run overloading that accompanies the cooperative's role of being a 'quantity taker' can be imprudent. The ability to avoid profit eliminating overloading does not have to be inconsistent with open membership policies.

Aggregate supply may be controlled via a number of institutional devices such as long-term marketing agreements, restrictive contracts that limit the amount each member may market, and stringent quality standards. While none of these production control programs may be as effective as the 'net return' signal, they attempt to help the cooperative operate without economic loss in the short run while keeping membership open.

Table 3 COMPARISON OF MARKET PERFORMANCE IMPACT OF RM COOPERATIVE AND IOF

Case	Profit	Input Price Paid Farmers' Raw Output	Price of Finished Output	Output Level	Market Perf.
Base	SR > 0		INDETERMINATE		
Base	SR,LR = 0	c	c	c	0
A	SR > 0	+	-	+	+
A	SR,LR = 0	c,+	c,-	c,+	+
B	SR,LR = 0	+	+	-	-
C		+	+	-	-

CASE:
Base = competitive input and output markets,
A = monopsonistic input, competitive output market,
B = monopolistic output sale, competitive output purchase,
C = monopolistic output sale, monopsonistic output purchase,
where
c = competitive results,
c,+ = competitive results with higher solution vector,
c,- = competitive results with lower solution vector,
+ = supracompetitive,
- = subcompetitive.

The market performance conclusions reached from examining alternative structural settings flow from the stated underlying assumptions of the Helmberger-Hoos model. To the extent that cooperatives can control both aggregate membership supply and the intermarket distribution of sales as well as fail to fully reflect the finished product price in members' net returns, one would expect departures from the expected performance and use of market power.

2.3 Extensions of the Theory of the Cooperative as a Firm

Extensions on the theory of the cooperative as a firm have developed in response to more complex considerations of the cooperative as some of the underlying assumptions of the Helmberger-Hoos model have been removed.

More recent theoretical work has considered various cooperative objectives as candidates for the single objective maximization model. The intent was to trace the consequences of pursuing a particular maximand on the organization's market outcomes, with particular emphasis on cooperative finance issues and industrial organization hypotheses.

Cotterill (1987) extends the theory of the firm to challenge the separate treatment of pricing and finance decisions in previous modeling of cooperatives. Despite the renewed interest in various dimensions of cooperative organization since the 1950's, a scant body of literature on cooperative finance has been produced. Given that corporate finance theory poorly represents cooperative finance issues, there is a need to develop this theory simultaneously with the static price theory that is prevalent in performance modeling. To assess financial performance of the cooperative solely in terms of net average returns to members overlooks the cash flow requirements a cooperative has in order to function in the finished product market. Instead, Cotterill proposed evaluating financial performance in terms of both consumer and producer surplus.

Cotterill synthesized a unified theory of cooperatives to explain price, investment and finance decisions under certainty and uncertainty, with an application to firm-level models in order to examine cooperative impact on market performance. The latter is similar to the theoretical performance models established by Helmberger (1964). Cotterill develops a theory that embodies the normative behavioral solutions, which many economists felt were already adequate in explaining cooperative behavior, but offers the added advantage of being testable by empirical work. He examines cooperative price-quantity equilibria in various structural settings for both supply and processing cooperatives. The results coincide with the findings of Tables 2 and 3.

Attempts to derive theoretical models describing cooperative behavior using neoclassical foundations were made 20 years prior to the Helmberger-Hoos model. The Helmberger-Hoos model was the result of understanding some of the shortcomings in previous applications of traditional neoclassical theory and integrating principles from organizational theory to move beyond some of the theoretical debate concerning the cooperative's definition. The historical span of the literature on cooperative theory encompasses three separate treatments of the cooperative: as a form of vertical integration, as a firm and as a coalition. The perspective of the cooperative as a firm has been covered above. Petraglia (1989) presents a chronological summary of the developments in the remaining two areas, which are currently strong focuses in recent study aimed at improving models of cooperative market behavior. Gaining importance is the coalitional approach as it emphasizes realistically the dilemma posed to cooperative management by a heterogeneous membership and the conflict of interest that ensues (Sexton; Staatz, 1983).

2.4 Summary

While the historical perspectives and recent developments offer alternatives for theoretically identifying the cooperative and establishing an appropriate behavioral model, they do not provide the basis for the model used in this research. The goal of determining the impact of cooperatives on market performance requires a standard of what is a socially acceptable level of market performance and a method of deriving comparisons where cooperatives are present. For this research, the price-quantity outcome of perfect competition is used as the standard of comparison in assessing performance.

This chapter began by providing a normative theory on cooperative behavior in the market and presented the model of Helmberger and Hoos as a means of verifying Nourse's competitive yardstick theory. It is important to realize that Nourse's theory is one of few that gives weight to the normative dimensions of cooperative organization in proposing models of cooperative behavior. The Helmberger-Hoos model also provides outcomes that are directly comparable to the perfectly competitive norm. It was shown that the static-price theory model could be extended from the single setting of competitive input and output markets examined by Helmberger and Hoos into alternative structural settings. While this theory is criticized for simplifying the decision-making process of a cooperative, its ability to extrapolate into different market settings allows diverse applications. The empirical work presented in this research provides a test of the competitive yardstick theory.

3. A Review of Empirical Performance Model Studies

Empirical models are often used to test theoretical models. Several empirical models have tested the structure-performance relationships but without inclusion of the role of cooperatives. There are numerous theoretical models conjecturing cooperative performance, yet little empirical work has been done to date. An empirical test of the theoretical yardstick role cooperatives have in specific industries is needed. To test that hypothesis, a traditional structure-performance model must be expanded to address the competitive yardstick hypothesis of cooperatives. While a history of structure-performance models in food manufacturing exists and continues to grow, little incorporates cooperatives as market participants.

The past 30 years of empirical market performance studies have relied on the industrial organizational (IO) paradigm established by Bain. Most studies have utilized the direct or 'partial' IO model linking performance directly to structure. The implicit assumption is that a firm in a given market structure is able to execute the conduct consistent with the structural constraints imposed on it.

Historically, all theoretical and empirical assessments of performance (at either aggregate or disaggregate levels) have used the perfectly competitive results of the neoclassical theory of the firm as a yardstick. As stated by Connor *et al.* (1985), perfect competition possesses analytic tractability and aesthetic appeal, while also embodying widely accepted social and economic ideals. However, perfect competition is rarely realized among U.S. industries. Considering that the structure of the food manufacturing industries has moved far afield from perfect competition, economists such as Bain, Sosnick, Stigler and Clodius have proposed using the concept of 'workable' or 'effective' competition.

Bain (1950) addresses the disparity between the current structure of U.S. markets and the yardstick of perfect competition. When perfect competition is absent due to technological and other factors, it is important for policy purposes to know what kinds of imperfect markets will have competitive behavior that is reasonably compatible with a viable capitalism and enhance general economic welfare. Sosnick (1968) defines effective competition as a standard against which functioning markets can be judged and guidelines for the formation and

administration of antitrust and other public policies can be established.

The expanse of structure-performance applications in the literature is in part due to the multidimensional nature of both market structure and performance, as well as the ability of these models to monitor performance at various levels of the economy. While the structural aspects of a market that factor into its performance are important enough to have fueled an ongoing theoretical debate over the true specification of their effects, the choice of performance criterion has been the primary issue of debate. See Petraglia (1989) for summaries of the models used in the referenced studies below.

Connor *et al.* (1985) discuss seven performance criteria that fall into two categories. The first category includes static, allocative efficiency measures of performance. These include profits, prices and operational efficiency. The second category concerns societal goals of national economic growth. These are technological progressiveness, long-run price changes, consumption patterns and redistribution effects. Choice of a relevant performance criterion inevitably commits the researcher to focus on either a welfare based measure, as embodied in the second category, or one solely concerning producer surplus (e.g. any of the static allocative efficiency measures). Each has drawbacks and advantages.

3.1 Issues Surrounding Profits as a Performance Criterion

The profit performance criterion has been fairly widely used due to availability of accounting profit data. Of the four sources of profits (long-run return on equity capital, rewards for risk-taking, windfalls and rents) there is empirical concern over that portion of rents, namely monopoly rents, that are derived from the structure of a given market.

Employing the profit criterion involves at least two drawbacks. First, this disaggregate analysis at the firm level often calls for some correction for diversification across firms in the same industry. Collins and Preston (1968) found that the short-run nature of observations on profit makes them inappropriate as evidence of a profit differential in competitive industries. High profits may be misconstrued as the result of a stable monopolistic condition, when in reality they reflect the initial stages of competitive adjustment in the long run.

Other interpretive problems arose for Weiss and Stigler, who both tried to separate pure rents from monopoly rents. Stigler argued "...the existence of monopoly gains in the payments to factors of production, other than capital, may be quite large." Hence a large percentage of potential profits goes towards hiring superior labor which earns the firm pure rents from greater productivity. Since a given profit performance may be indicative of a number of economic settings (e.g., static versus dynamic), profits can be an ambiguous proxy for market performance.

3.2 *Efficiency and/or Market Power in Firm Profit-Structure Models*

Debate has focused on the interpretation of high profits when they are concurrent with high levels of concentration. Two schools of thought have emerged on this issue. One explains higher profits by larger firms in concentrated industries as being the result of their ability to be more efficient and attain lower costs of production. Demsetz (1974) is a proponent of this school. The other school sees higher profits as stemming from the exercise of market power; in particular, the ability to increase price above marginal cost.

An empirical study by Martin (1988) to determine whether profitability was a result of market concentration or efficiency led to the conclusion that the two factors were complementary explanations. Martin chose to examine profitability among the larger firms in an industry in contrast to Demsetz's (1973) belief that smaller firms in a highly concentrated market experience larger rates of return when compared to larger firms. Bain and Collins and Preston disagreed that smaller firms would benefit from highly collusive market settings. Martin interpreted the finding that concentration's positive effect on the profitability of large firms supported the collusion-profitability hypothesis. He further noted that this finding also supported the efficiency-profitability hypothesis on the basis that industries become concentrated when it is efficient to organize production in large units. Martin felt that this confirmation of the efficiency-profitability hypothesis was not a new development but rather a reflection that this hypothesis had not been advanced in a manner which would distinguish it from the collusion dimension.

The relative contributions of the efficiency and market power explanations in industry profit studies was examined by Allen (1983), who attempted to reconcile contrasting results in the work of Imel and Helmberger (1971) and Shepherd (1972). Shepherd's results indicated the impact of efficiency on profits was more than 4.5 times that of collusion's, while Imel and Helmberger found collusion to be twice as strong as efficiency in determining profit.

Allen studied industry profit margins enhancing the basic structure-performance model in two ways. First he introduced a firm measure of efficiency defined in a manner to address cost advantages of the 4 largest firms relative to firms 5 to 8. Second, a measure of the collusive ability or market power derived from within strategic groups was added along with the traditional collusion variables.

Wage differentials were regressed on the efficiency variable to see if productivity differences could be explained largely by differing wages. Only 2 percent of a 10 percent change in productivity was attributable to wage differentials. Also, firm efficiency when translated into greater value-added, may result not only from the lower costs of scale economies and/or vertical integration but also from charging higher prices as an exercise of market power. Allen was able to conclude that market power (expressed as strategic group concentration ratios) was the dominant influence in elevated industry profits.

3.3 *Price as a Performance Criterion*

Weiss (1979) suggested that the true oligopoly nature would be revealed through higher prices, not higher profits (although under certain circumstances these are synonymous) thus necessitating structure-price models. Weiss (1987) stressed that while true oligopolists were by theory implicitly maximizing profits, tacit collusion would lead to higher maintained prices while profits would eventually dissipate into the pool of excess capacity. Thus price became the appropriate dependent variable in examining the competitive degree of a market. Profits, as a dependent variable, made sense when drawing interindustry comparisons since price comparisons on nonsubstitutable goods were meaningless. This debate is presented in further detail in Petraglia (1989).

3.4 The Price-Cost Margin in Industry Level Performance Studies

The availability of industry level data provided the opportunity to control for a firm's diversification when examining a cross-section of industries by relying on aggregated profit data. Alternatively, researchers have left firm level models and used the industry price-cost margin as a measure of industry performance. This index is thought to be more closely linked to the structural features of a market than other market performance measures.

3.5 Empirical Studies of the Food Manufacturing Industries

Several studies have addressed the structure-profits relationship in the food manufacturing industries. In addition to Ravenscraft's study, five more studies will be reviewed here. Schrader and Collins (1960) employed OLS methods in estimating a cross-sectional model across 34 food industries. Profits, expressed as a percentage of assets and as a percentage of sales, were hypothesized to be determined by CR_4(+), a dispersion index for geographic market differences (?), the number of firms in the industry (+) and the sales-to-assets ratio (-). Separate equations were estimated for the two profit definitions used. The equation that employed profit as a percent of sales as the dependent variable had higher explanatory power than that with profits as percent of assets (R^2 = .61 versus R^2 = .30). Both equations yielded sign consistent results and statistical significance (only the dispersion variable was insignificant). The study used a sample that was skewed toward large firms in that it consisted of 64 firms, chosen from a list of top 1,000 firms in 1950, all ranked among the leading four firms in one or more SIC industries. The authors note that inferences made about industry performance from knowledge of the performance of its largest members are subject to error.

As part of their broader performance study of manufacturing industries for 1968, Collins and Preston estimated this model for 32 food manufacturing industries. They were able to explain 80% of the inter-industry variation in price-cost margins using the structural variables of four-firm concentration, its squared value, the capital-output ratio and a geographic dispersion variable. The squared four-firm concentration ratio had a positive effect on the price-cost margin while CR_4 had a negative effect suggesting that concentration's impact on *PCM* was nonlinear. The authors noted that the curvilinear patterns were not indicated for all cross-sectional data under analysis.

Imel and Helmberger (1971) used 99 companies from the food processing sector as an application of their proposed model for estimating the structure-profits relationship. The data were used in two models. The first examined company profits as a function of both market structure and firm related variables and was a disaggregate approach. The second model examined industry profits as defined by 3-digit SIC industries. Their results showed that even company profit data, though disaggregate, was prone to heteroskedasticity. The authors used averages of variables to avoid strictly short-run phenomena, and employed GLS procedures so the resultant t-ratios would have validity. Their explanatory structural variables included CR_4, estimated advertising expenditure as a proxy for product differentiation, estimated R&D expenditures, estimated minimum optimal scale (*MOS*) sales share in an industry, sales share in markets not classified as the firm's primary 4-digit Census industry, and the compound growth rate.

The results indicated that concentration and product differentiation were important in explaining variation in profit rates. With the industry level analysis there was an improving effect of defining industries to more nearly coincide with economic markets by reconstructing census data instead of using standard 2, 4 and 5-digit data. A number of explanatory variables lost statistical significance with the narrower market definition, but the concentration and product differentiation variables remained positive and statistically significant. Inclusion of both the *MOS* and CR_4 variables led to deflated t-ratios due to the high collinearity between the two variables.

Parker and Connor (1979) estimated consumer-loss as a result of monopoly in U.S. food manufacturing as a performance criterion. Three different methods were employed in computing consumer loss. Among these, the price-cost margin approach is of interest here. The authors define consumer overcharge as that portion of excess margins that results from a lack of competition.

Four-firm concentration ratios were used to measure the degree of monopoly. A four-firm concentration ratio ≤ 40% was considered to be effectively competitive while anything in excess indicated a significant degree of oligopoly and hence potential competitive problems were expected to arise. The authors defined any margin in excess of the level corresponding to competitive levels of concentration as overcharges. Parker and Connor drew upon the work of Collins and Preston in formulating a curvilinear model with both a ***CR*** variable and a squared ***CR*** variable for 1972 data. A dispersion variable (-) and a capital-output ratio (+) were also included. CR_4 had a negative but insignificant sign and CR_4 squared had a positive sign while all other variables were sign-consistent and significant.

In an attempt to modify and extend the model, CR_4^2 was removed and a growth variable (+), an advertising-to-sales ratio (+) and its squared counterpart (-) were included. Reestimation led to signs consistent with expectations, and all variables being significant.

Rogers (1985) conducted a cross-sectional, time-series analysis of market structure and price-cost margins in U.S. food manufacturing for the period 1954 to 1977. The objective was to test the positive relationship between margins and concentration and the strength of the relationship in periods of inflation and recession.

The data used were gathered from the Census of Manufactures, conducted approximately every 5 years since 1954. Relying on 4-digit industry and 5-digit product class data, he constructed observations approximating relevant economic markets. The OLS regression model defined the price-cost margin (***PCM***) as a function of the four-firm concentration ratio (CR_4,+), advertising-to-sales ratio (***AS***,+), growth rate between census years for a given product class (***G***, -), capital-output ratio (gross fixed assets/value of sales, ***KO***, +), and a variable approximating the minimal optimal scale (***MOS***, +). The model was estimated for each census year.

The results revealed not only the magnitude and sign of the relationships, but trends as well. Concentration consistently carried a positive coefficient, however it was not significant in 1954, 1958 and 1963. Contrary to expectations, the profit-concentration relationship was strongest during inflationary periods. Rogers' conclusion was that food manufacturing industries were less susceptible to the business cycle than other manufacturing industries. The coefficient on the advertising-to sales ratio was positive in all years but because the ***PCM*** is calculated not net of advertising expenditures a t-statistic was calculated on the hypothesis that the advertising coefficient was greater than unity for all Census years. The first three Census years indicated an insignificant coefficient. However, statistical significance increased over the last three Census years.

The growth coefficient was positive and significant in all but the last two Census years. Rogers offered the explanation that 1972 and 1977 were embedded in an inflationary period and the nominal measurement of growth would account for its declining significance in explaining performance. Partial support of this explanation was found when real growth rates between Census years were calculated as the percentage change in physical output, and substituted for the original growth variable. The capital-output variable was a strong, positive explanatory variable and fairly constant over time.

The last variable, ***MOS***, was positive and only strongly significant in the first Census year, 1954, after which it declined. Rogers noted the opposing trends in the estimated coefficients and their statistical significance for ***MOS*** and CR_4. ***MOS*** became less important while concentration became more important in explaining price-cost margins over time.

3.6 *Empirical Performance Studies Including Cooperatives in the Food Manufacturing Industries*

Wills (1985) constructed a multivariate regression model to explain price heterogeneity among 50 branded food items. The goal was to determine if price variance across a particular food item reflected differences in quality or market power (whereby the effects of heavy advertising create a subjective differentiation among products). Among the determinants of retail brand price was a dummy advertising variable to account for cooperatives active in branded food items. Wills hypothesized that for a given level of advertising, cooperative brands may be priced lower than those of proprietary firms as a result of the cooperative's inability to reduce raw input supply in attempting to maximize profits. This hypothesis was tested by including a dummy variable ***C*** interaction term with each of the advertising variables (CA_1,CA_2, and CA_3) which would change the slope of the price-advertising relationship.

The results showed a positive relationship between price and quality as well as a much stronger positive relationship between price and advertising. The price effect in going from the lowest to highest advertised item was 4 times greater than going from the lowest to highest quality item. The cooperative brand advertising variable, CA_1, carried a negative coefficient that was significant, while advertising split into its media components (CA_2 and CA_3) did not. Wills concluded that the results were consistent with his hypothesis that cooperatives charged relatively lower prices.

A study performed by Combs and Marion (1984) examined the food manufacturing activities and market power opportunities of the 100 largest agricultural marketing cooperatives using 1977 Census data. Food manufacturing activities accounted for 37.6% of the total value of shipments of the 100 largest cooperatives, with cooperatives ranked 21 through 100 deriving a greater portion of their business here (51% vs 33% for the top 20). The top 20 cooperatives dominated in the grain, livestock, cotton and dairy categories, which are for the most part low value-added but high volume.

Participation rates, measured as the number of cooperatives in a size group participating in a product class divided by the number of cooperatives in that size group participating in at least one food manufacturing product class, were examined at the 3 and 4-digit industry and 5-digit product class SIC levels for the top 20 and then again for the remaining 80 largest cooperatives to establish some pattern of where cooperatives are located in the food manufacturing sector. Comparison of the top 20, 21-50, 51-100, and 100 cooperatives to the 20 largest food and tobacco manufacturing IOF's showed a relative lack of diversity in food manufacturing activities by cooperatives. Combs and Marion attributed this to: (1) cooperative operation in product areas in which members already have direct involvement at the raw product level and (2) to entry barriers in branded manufacturing activities. (See Petraglia (1989) for a presentation of various descriptive tables constructed by Combs and Marion.)

Analysis by OLS regression confirmed the structural characteristics of participation in given 5-digit product classes demonstrated by the descriptive tables. Explanatory structural variables at the product class level included value of shipments 1977 (***VOS***), CR_4, value-added as a percentage of ***VOS*** (***VAVOS***) and a categorical product differentiation (***PDIF***) variable, ranging from 0 to 3, with 0 = producer good (no differentiation), and the

values 1, 2 and 3 indicating consumer goods with increasing differentiation as measured by the advertising-to-sales ratio being < 1% (***PDIF*** = 1) between 1 and 3% (***PDIF*** = 2), and > 3% (***PDIF*** = 3).

All variables, except ***VOS***, were expected to carry negative coefficients and the results were consistent with these expectations. The results supported the hypotheses that cooperatives restrict their food manufacturing activities to areas offering the largest outlets for members' raw product, requiring lower levels of processing and market activity, and having relatively low market concentration and product differentiation.

The overall importance of cooperatives (determined by the top 4 leading positions held) was also examined. Results suggested that agricultural marketing cooperatives have limited market power with the top 100 occupying only 11% of the possible top 4 positions in 41 food industries, compared to 69% held by the top 100 food and tobacco manufacturing IOFs.

3.7 The Model

An empirical structure-performance regression model can be constructed by merging the theoretical basis of the structure-performance models within the industrial organizational paradigm with cooperative performance theory. This requires constructing those relevant structural variables which may explain product class performance as well as the extent of cooperative participation. The proposed model will be:

$$(1)\quad PCM_i = \beta_o + \beta_1[NL]_i + \beta_2[ADS]_i + \beta_3[MES]_i + \beta_4[CR_4]_i + \beta_5[KO]_i + \beta_6[G]_i + \beta_7[\%COOP]_i + \epsilon_i, i = 1,\ldots,136$$

where:

PCM	=	the price-cost margin for industry i,
NL	=	dichotomous geographic dispersion variable indicating whether the product class is predominately a national (0) or local (1) market,
ADS	=	product class advertising to sales ratio as a proxy for product differentiation,
MES	=	plant economies of scale variable, representing the percentage of total value-added attributable to midpoint size plant,
CR_4	=	four-firm concentration ratio,

KO	=	capital-output ratio to explain differentials in capital intensities across industries, defined as [Gross Fixed Assets/VOS],
G	=	nominal growth rate of VOS_i between Census years,
%COOP	=	percentage of market accounted for by cooperatives, expressed in terms of VOS,
ϵ	=	stochastic error term.

ϵ is a structural disturbance term assumed to possess the usual properties of the classical regression model. β_0 through β_7 are parameters to be estimated. Expected signs for the parameters are as follows:

$$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \textit{ and } \beta_6 > 0$$
$$\beta_7 < 0$$

3.8 Summary

This chapter presented a review of some of the empirical models developed within the structure-performance framework of industrial organization theory.

The theory and debate surrounding the choice of a performance index were introduced. Profit measures have been used because of the availability of accounting profit data and the relative ease of calculating the industry price-cost margin. Firm profits are criticized for not being an accurate representation of profits defined by theory. They also require controlling for firm size in disaggregate studies. The industry price-cost margin is an imperfect measure since it includes some costs that should have been excluded. However, empirical work has been able to work around this shortcoming by performing the appropriate t-tests for coefficient significance. Margins have advantages in interindustry comparisons by avoiding problems of firm diversification.

The interpretive debate pertaining to high profit-high concentration market settings has proceeded along three paths: one ascribing an efficiency argument, the second as a result of market power and the third as a combination of the two.

While there is certainly a need to further empirical studies with

cooperatives as a focus beyond Wills and Combs and Marion, cooperative theory can meld not only with the theories of IO and imperfect markets but with the results of empirical models thus far, as they have confirmed some important relationships between structure and performance. There is enough strong evidence in well-tested dimensions of market structure that makes it unnecessary to reexamine these variables when modeling the impact of cooperatives on market performance. We can expect a positive relationship between industry profits and concentration, as well as with the degree of product differentiation and the value-added in processing. Growth can be considered a crucial (perhaps ambiguous) aspect in market profitability along with an industry's minimum efficient scale. Differing capital intensities might be incorporated in explaining interindustry profit differentials. The model proposed in this chapter builds from these elements of market structure and integrates a key element from cooperative theory.

4. The Nature of the Population, Sample and Variables

The nature of the data provided on the top 100 agricultural marketing cooperatives does not reveal the membership policies ascribed by each, let alone the identities. In order to formulate hypotheses concerning market performance a priori, one must choose from among the various cooperative behavioral schemes which were shown in Chapter 2 to be tied to membership policies. For purposes of this study, it is assumed that the top 100 cooperatives have open membership policies.

To substantiate such an assumption, an empirical study by Youde and Helmberger (1966) examining the effects of membership policies on market power found that of 119 regional marketing associations (comprising 60% of those in the U.S.) surveyed in 1964, 14 had restricted membership, about 12 percent. Centralized cooperatives were characteristic of restricted policies while no federated cooperative was found having restricted membership. Within the study, Youde and Helmberger also identified thirty-one leading cooperatives on the basis of sales, market share, marketing a branded item and geographic location, all factors likely to associate them with market power. Among the 31 cooperatives interviewed, 25 percent were restricting membership for purposes of market power compared to less than 4 percent among the 119 regional marketing associations. The more prevalent reasons for a restricted membership were plant capacity constraints and participation in marketing order programs.

The majority of the data for this study came from published Census of Manufactures sources and a Special Tabulation of the Census of Manufactures for 1982. Both were made available through the Department of Commerce, Bureau of Census. The Special Tabulation was updated and modified from the format and scope of that used by Combs and Marion (1984) for 1977 data. Trade sources were used occasionally in estimating missing data as will be discussed in the explanation of variable construction.

4.1 *The Population*

The population from which the data were drawn is comprised of two manufacturing sectors, Food and Kindred Products Manufacturing, Standard Industrial Classification (SIC) 20, and Tobacco Products Manufacturing, SIC 21.

The top 100 agricultural marketing cooperatives were chosen from a master list of the largest agricultural marketing cooperatives provided by the Agricultural Cooperative Service (ACS) of USDA. The 100 largest were selected by their value of shipments (VOS) in SIC 20, Food Manufacturing, SIC 21, Tobacco Manufacturing, SIC 514 (less 5141) Wholesale Trade, Groceries and Related Products, and SIC 515, Wholesale Trade, Farm Product Raw Materials. Based on this list, Census provided data on the number of cooperatives that operated in each SIC, the number of establishments they operated in each SIC and the value of shipments attributed to those establishments.

4.2 *The Sample*

Product class data (5 digit SICs) tend to serve as better approximations to economic markets than found in the more aggregated (2, 3 and 4-digit SICs) data. The Census disclosure requirement for the Special Tabulation required at least six cooperatives participating in a particular SIC before shipments information would be disclosed presented some missing data problems. The number of SICs affected by this disclosure rule increases as the data become more disaggregate.

The sample consists of 136 observations, of which 134 are 5-digit product class SICs (or combined 5-digits) and two are 4-digit industry level observations. The 134 product class observations came from a universe of 161 5-digit SIC's in SICs 20 and 21 and represent 80 percent of the universe. The sample accounts for 90 percent of the universe value of shipments from SICs 20 and 21. Of the total 136 observations, 11 were specially constructed by combining either two related 4 or 5-digit Census SICs. Only two 4-digit SICs (one was also a special SIC) were considered to be the more appropriate economic market. The appendix lists all special SICs and their respective combined Census SICs.

4.3 *The Variables*

This study would not have been possible without the data provided in the Special Tabulation concerning cooperatives. The price-cost margin model developed in Chapter 3 allows testing the cooperative yardstick effect by including a key structural variable, ***%COOP***, which describes the percentage of product class value of shipments attributable to cooperative sales. This variable can be calculated from the Special Tabulation data. A brief discussion of the explanatory variables is provided. All variables calculated as ratios are entered as percentages.

4.3.1 Price-Cost Margin ***(PCM)***

The price-cost margin is related to the degree of oligopoly present in that industry and is analogous to the Lerner-index of monopoly, which can be written as $(p-mc)/p = 1/\eta$, where p is market price, mc is the monopolist's marginal cost and η is the own-price elasticity of demand along the industry demand curve.

The Lerner index of monopoly adapted to oligopoly settings is given by $(p - mc_i)/p = s_i(1 + \lambda)/\eta$, where s_i is the i^{th} firm's share (q_i/Q) of industry output, η is the industry price elasticity of demand and λ measures the conjectural variation present in oligopoly settings (Waterson, 1984).

Ornstein (1975) highlights a number of theoretical and empirical difficulties that arise in using price-cost margins. These are discussed more fully in Petraglia (1989). Measurement of the price-cost margin is another difficult task. Census data are criticized for not including a number of expenses (e.g. taxes and depreciation) and failing to identify the fixed and variable nature of the costs included. Once fixed costs are embedded within the price-cost margin and go uncorrected, the ***PCM*** will have little relation to actual industry profits (Ornstein, p. 108).

However, since the ***PCM*** corresponds to the structural characteristics of the market in which it is generated, it circumvents the need to correct for firm diversification. This aspect and the fact that the data have a well established empirical history recommend their use as a performance criterion.

The price-cost margin was calculated at the 5-digit level using Table 5a of the *Industry Series*. The method of calculation will be discussed in the appendix. For a few observations where SICs were combined, the ***PCM*** was calculated by taking the weighted average (based on ***VOS***) of the combined product classes' ***PCMs***.

4.3.2 Geographic Dispersion (*NL*)

Several studies have incorporated a variable that accounts for differentials in the geographic size of markets (Schrader and Collins, 1960; Weiss, 1974; Parker and Connor, 1979). The purpose of this variable became clear in studies that included both national and local markets. The concentration ratios reported in the Census of Manufactures are difficult to interpret since they presume a national market size. Thus without correcting for geographic differences between markets, reported Census concentration ratios for local markets are likely to be understated. The ***NL*** variable is in a 0-1 dichotomous format, with 0 designating a national market and 1 a local market.

4.3.3 Advertising-to-Sales Ratio (*ADS*)

Mass media advertising, which comprises approximately 50% of all advertising expenditures reported to the IRS, is the main instrument for creating and maintaining food and tobacco product differentiation (Connor *et al.*, 1985). The advertising-to-sales ratio (***ADS***) was chosen as the best available measure of product differentiation (Connor *et al.*, 1985). The numerator was comprised of advertising expenditures in six measured media for network and spot television, network radio, newspaper supplements, magazines and outdoor advertisements. These figures came from *Leading National Advertisers, Inc.* The denominator was the SIC's value of shipments.

Historically, cooperatives have formed in markets that coincide with farmer-member interests. These markets typically do not lend themselves to much product differentiation. Hence, where cooperatives account for a large percentage of a market's VOS, it is expected that an inverse relationship with the degree of product differentiation is likely to result.

4.3.4 Minimum Efficient Scale (*MES*).

The minimum plant size (in terms of output) beyond which the average processing cost cannot be further reduced defines the minimum optimal or efficient scale (***MES***). This characteristic of each industry is dependent on the industry's long-run average cost curve. By dividing the total demand facing a market by the minimum efficient size, the maximum number of efficient firms an industry can accommodate is derived. A large ***MES*** would allow fewer efficient firms in the industry. It may be expected that a high ***MES*** portends a high ***PCM***, which leads to an interpretive debate of collusion or efficiency.

The method of calculating ***MES*** in this study relies on the midpoint-plant size. The midpoint-plant ***MES*** is the plant at the midpoint of the distribution of value added by all plants in the industry. It is expressed relative to industry value added. The midpoint-plant ***MES*** has been shown to be highly correlated with economic engineering estimates, which are superior but limited because of their expense (Weiss, 1976, and Connor *et al.* 1985).

The ***MES*** variable was calculated at the 4-digit industry level, as 5-digit data were unavailable. A sample calculation of ***MES*** is provided in the appendix. By substituting the 4-digit value for product class SIC's, the assumption is made that ***MES*** is constant over an industry's product classes, which is preferred over omitting the variable. For combined SICs the value of the dominant contributing SIC was used.

4.3.5 Concentration (CR_4).

The four-firm concentration ratio serves as a proxy to past barriers to entry. Entry barriers are one dimension of establishing oligopoly and in the extreme, monopoly. While markets that agricultural cooperatives have historically participated in are typically unconcentrated, a highly concentrated, agriculturally-related industry would seem to necessitate cooperative entry into the market. Should an open membership cooperative form and enter a concentrated industry, overcoming its barriers to entry, and survive, then as theory suggests, the cooperative will disturb the current oligopoly position and move the industry towards a more competitive stance. Theory has established that the price-output solution for an open membership cooperative monopolist is equivalent to that under perfect competition. Hence, the sign of the relation between CR_4 and the ***PCM*** is unclear when introducing cooperatives as potential market participants.

The four-firm concentration ratio is one structural measure that partially captures the distribution of product sales within an industry.[1] It measures the leading N firm's (usually $N = 4, 8, 20$) activity as a percentage of the total activity in either sales, employment or assets. It is perhaps more meaningful than the number of firms in an industry, which conveys nothing about relative size across the range of firms. However, the CR_4 reflects only the activity of a few large firms.

The inclusion of the concentration ratio as a factor determining profits has raised an interpretative debate grounded in theory. The distinction needs to be made between concentration, as a

[1] The 1982 Census of Manufactures made available the Herfindahl-Hirschman index (H) for the food manufacturing industries. As an alternative measure of industry concentration, it is believed to be superior to the N-firm concentration ratio because it reflects all firms in an industry and addresses relative size inequalities. Theory suggests that if the firms under consideration differ in their marginal costs but do not collude then the H-index becomes the appropriate distributional measure in modeling.

collusion indicator, and market share since both have simultaneous positive effects on margins. Work by Ravenscraft (1983) and Gale and Branch (1982) in this area has helped to better define the concentration-market share relationship to profits. (For a more detailed presentation see Petraglia, 1989.) Despite the questions raised, the concentration ratio has been widely used in IO models both because of its availability and its interpretive significance for performance as a proxy for oligopoly.

The CR_4 for 5-digit data came from the *1982 Census of Manufactures Concentration Ratios in Manufacturing* subject series. It is expressed as the share of product class value of shipments held by the top 4 firms. Due to disclosure problems, five observations had to be estimated from trade sources, the Special Tabulation data and trends on previous year's four and eight-firm concentration ratios. Estimates of CR_4 for combined SICs were derived by taking the weighted average of the combined Census SICs.

4.3.6 Capital-Output Ratio (***KO***).

It has been argued that differing capital intensities across industries justify some portion of the differences in the price-cost margins earned. PCM differentials are requisite for attaining equal normal rates of profit on the amount of capital employed in the long-run. Also, high capital requirements can be associated with barriers to entry which shield high margins from the diluting competitive effects of new entry.

The ***KO*** ratio was calculated at the 4-digit level because the data are not available at the 5-digit level. It is defined in the appendix. For combined SICs the value of the dominant combining SIC was substituted.

4.3.7 Growth (***G***).

The growth rate of an industry (often expressed in terms of sales) is linked to industry performance by both controlling for short-run changes in demand and by altering barriers to entry. Industries with high growth rates offer easier entry than slow growing industries do. The opportunities provided by rapid growth industries depend to a great extent on the long-run cost curves characteristic of the industry. Incumbent firms, possessing the traditional U-shaped cost curves are likely to be faced with diseconomies of scale when growth opportunities are present, unless the firm has invested in excess capacity. Incumbent firms not already at the minimum of their cost curves enjoy the benefits of achieving economies of scale as demand increases. New entry is likely to have a deconcentrating effect and reduce margins as industries become more competitive. Yet this argument is countered by the fact that industry cost curves are typically flat over a wide range of output and that it is a lack of increased demand responsible for limiting firm expansion.

However, theoretical and empirical models have demonstrated that certain industry conditions lead to a positive effect between industry growth and concentration. Demand-side growth accompanies an upward pressure on finished prices and due to the time required for long-run adjustments to be made, profits can be accrued by incumbent firms. Industry growth exerts two effects by (1) influencing the number of firms in the industry and (2) establishing differential growth rates among small and large firms. Holding the number of firms constant, which may be plausible under slow growth conditions, it is hypothesized by Sawyer (1971) that large diversified firms have inherent advantages over smaller firms for growth opportunities. Hence, concentration is expected to increase. It is possible that growth accompanies a decline in the number of firms through acquisition which would also have a concentrating effect. Entry, in response to growth, by firms not comparable in size to the top 8 firms is likely to have a trivial deconcentrating effect. The food manufacturing product classes have been characteristic of little entry and considerable acquisition, thus an expected positive effect of growth on concentration will enhance the industry's price-cost margin.

The growth variable G measures the value of shipments nominal growth rate between Census years 1977 and 1982. Newly created 5-digit SICs in 1982 had to have their growth rates estimated. Trade sources were used when available (2 observations) otherwise the growth rate for 1982 to 1986 was used (14 observations). Again, combined SICs growth rates were calculated for combined *VOS* figures for 1977 and 1982.

4.3.8 Percentage Cooperative Sales (***%COOP***).

The percent of an industry's sales that are attributable to cooperatives, ***%COOP***, was included in the model based on the hypothesized 'competitive yardstick' effect of cooperatives. In those markets where cooperatives account for a sizable portion of industry *VOS*, it is expected their presence will push economic profit margins close to zero due to cooperative members using their patronage refunds to expand output or the cooperative attracting new members while also increasing output. Thus a negative relationship is hypothesized. Jesse and Johnson (1980) illustrate this effect by considering the open membership cooperative-to-private firm ratio of an industry. The equilibrium finished product price determines the positioning of the firm-level revenue curves which in turn determine the raw product market equilibrium. Thus it is important to understand what determines the equilibrium finished product price. Figure 10 shows the finished product market equilibrium for three different total processor supply curves generated by different OM cooperative-private firm ratios for an industry.

The supply curves $S_F S_F$, $S_F S_F'$, $S_F S_F''$ represent ratios of 0, 50, and 100 percent respectively. At finished price P_{Y1}, identical quantities of finished product, Y_1, are supplied under the various industry compositions. Equilibrium prices above P_{Y1} with cooperative existence would produce a larger quantity of finished output on the market for a lower price. The magnitude of this effect is dependent on the proportion of industry output attributable to OM cooperatives, as $S_F S_F'$ and $S_F S_F''$ illustrate. A similar effect of the industry ratio of OM cooperatives to private firms is operative in the raw product market equilibrium. Here, it is the total demand curve for raw product that varies with different processor ratios.

It is also possible that cooperatives dominate in markets that have low price-cost margins for other reasons, specifically in areas of undifferentiated commodity processing. In the latter case, the yardstick role is difficult to separate from the other factors.

The variable was constructed on the basis of *VOS*. The Special Tabulation cooperative participation tables provided *VOS* data by product classes for the top 100 cooperatives where at least six cooperatives participated. Of the 136 observations, 60 had disclosure problems. For these 60 observations, cooperative ***VOS*** had to be estimated. The general method outlined briefly here is based on Schmalensee's (1977) approach to estimating H-indices for CR_4. Estimates were derived by using the four and eight-firm concentration ratios for an industry (CR_4 and CR_8), along with information on which of the 8 leading positions were held by cooperatives, and information on the number of cooperatives in the SIC (both supplied by the Special Tabulation), their total ***VOS***, and the universe ***VOS***. The easiest case would be if only four cooperatives participated in the product class and held the top 4 leading positions. In this case the ***%COOP*** would equal $(CR_4) * (VOS)$, but rarely is this the case; however, estimates are obtainable with minimal error by combining all the information that is known.

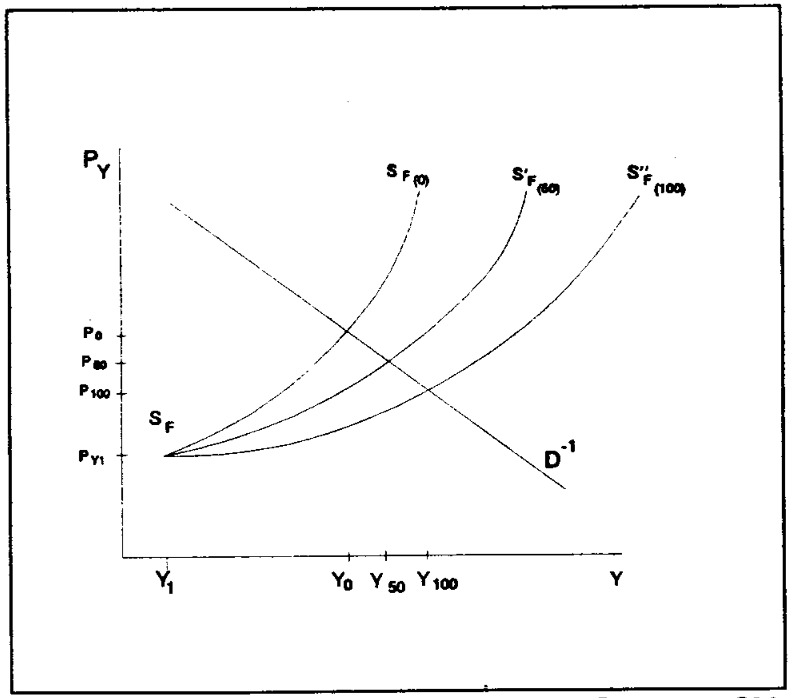

Figure 10 FINISHED MARKET EQUILIBRIA UNDER DIFFERENT OM-COOPERATIVE-TO-IOF PROCESSOR RATIOS

4.4 Summary

This chapter discussed the population, sample and variable construction used in this study. Some of the theoretical arguments that surround the choice of certain economic variables used in examining industry performance were developed. In most cases, there are both advantages and disadvantages associated with the choice of variables and/or the method of calculation used in approximating their economic counterparts. The pluses and minuses have been laid out in part by the empirical studies referenced, with a final justification as to why the variable was included.

5. Model Estimation and Empirical Results

Having drawn the additional information from cooperative theory that cooperatives as industry participants do influence market performance, the partial structure-performance model is not only extended but theoretically improved. The empirical results will test this proposition.

5.1 The Basic Model and Its Extensions

The initial proposed model was presented at the end of Chapter 3 along with the expected signs for each estimated coefficient in the linear regression model. Petraglia (1989) covers several nonlinear model specifications[2] as well as a model substituting the Herfindahl index for the four-firm concentration ratio. Not all of these will be reported here. One of the extensions presented includes a model similar to the basic but adds to it a second-order advertising-to-sales ratio variable. This infers the possibility of a nonlinear relationship between product class margins and product differentiation. This inference has both previous

[2]Two nonlinear specifications of the initial model were estimated. The proposed nonlinear effect of concentration on product class margins (of the form CR_4 and CR_4^2) failed to support a nonlinear form and is not reported here but is in Petraglia 1989. The second nonlinear model was specified as Equation 2 above.

theoretical and empirical evidence warranting an examination of this model specification. The model has the form

$$(2)\quad PCM = \beta_0 + \beta_1 NL + \beta_2 ADS + \beta_9[ADS]^2 + \beta_3 MES + \beta_4 CR_4 + \beta_5 KO + \beta_6 G + \beta_7 \%COOP + e$$

where:
$[ADS]^2$ = the squared advertising-to-sales ratio;
all other variables were previously defined (see p. 43).

The expected signs on the coefficients are the same as in Model 1; for β_9 the expected sign is negative.

The expected negative coefficient on $[ADS]^2$ is perhaps intuitive. Firms in oligopoly settings often invest in heavy levels of advertising beyond that associated with profit-maximization as they use advertising as a competitive strategy against their rivals. Therefore an increase in advertising intensity may increase margins but at a decreasing rate, until the expenditure itself begins to decrease margins due to wasteful and conciliatory advertising.

The second extension considered for this research was to estimate Model 2 using two subsets of the original sample. The subsets fall under two concentration groups split at the sample mean of CR_4 = 52.5. This treatment suggests something both qualitatively and quantitatively different about the link between the degree of oligopoly (represented by CR_4) and the level of margins.

Previous IO studies not only have questioned whether a nonlinear specification would be an improvement over the historically prescribed linear form, but whether the relationship was even continuous. What needs to be verified is the existence of a continuous performance spectrum that corresponds to a continuous concentration spectrum including monopolistic competition and tight oligopolies. Collins and Preston (1968) document a study by Bain conducted on a small sample indicating that while profit rates declined as concentration decreased, there was no conclusive indication of a clearly observed linear relationship. As a result, Bain concluded a CR_4 = 70 would meaningfully split the sample into concentrated and unconcentrated industries. This discrete treatment of market concentration is useful when the goal may be to identify one

degree of oligopoly beyond which market performance is markedly different. While Parker and Connor (1979) did not perform separate estimations of their model based on a concentration limit, they did identify workably competitive conditions when $CR_4 < 40$.

5.2 Empirical Results

Due to the manner in which the percentage price-cost margin was constructed, the possible values are bounded between zero and one hundred, as no observation had a negative margin. Table 4 reports descriptive statistics generated from the sample of 136 product classes for all variables in the model.

Table 5 presents the correlation matrix of variables. The first column shows how the dependent variable, ***PCM***, is correlated with each of the explanatory variables. ***PCM*** has a significant (α = .01) positive correlation with ***ADS*** and CR_4. Geographic dispersion has an insignificant correlation with ***PCM***, while ***%COOP*** has a significant negative correlation with ***PCM***. Growth had an insignificant positive correlation with ***PCM***.

Table 5 also provides information on the relationships between the independent variables. The negative correlation of the geographical dispersion variable (***NL***) with CR_4 is consistent with the view that concentration ratios constructed within a national market framework tend to understate the concentration effect in a local market setting. ***ADS*** has a positive correlation with CR_4 as was theoretically expected, and ***MES*** also has a significant positive correlation with CR_4 of similar magnitude. CR_4 had an insignificant negative correlation with growth. Last, as expected

Table 4 SELECTED DESCRIPTIVE STATISTICS

VARIABLE	MIN	MAX	MEAN	ST.DEV.
PCM	2.37	57.57	25.06	13.66
ADS	0.00	13.60	1.51	2.45
MES	0.10	23.40	2.63	4.06
CR_4	17.00	100.00	52.55	19.79
KO	4.20	86.60	25.43	14.39
G	-42.40	157.30	37.13	29.95
%COOP	0.00	64.10	8.66	12.79

N = 136

Table 5 CORRELATION MATRIX OF VARIABLES

PCM	1.0								
NL	-0.075	1.0							
ADS	0.573	-0.192	1.0						
MES	0.185	-0.278	0.171	1.0					
CR_4	0.440	-0.414	0.418	0.414	1.0				
KO	0.204	-0.045	0.110	0.352	0.189	1.0			
G	0.233	-0.021	0.105	0.004	-0.069	0.101	1.0		
%COOP	-0.392	0.120	-0.274	-0.089	-0.276	-0.200	0.073	1.0	
H	0.303	-0.208	0.193	0.184	0.681	0.064	-0.062	-0.145	1.0
	PCM	***NL***	***ADS***	***MES***	CR_4	***KO***	***G***	***%COOP***	***H***

from the literature, the H-index has a strong positive correlation with CR_4.

5.2.1 Model 1

The results of the simple pairwise correlations between the dependent variable and the independent variables are supported by the multiple regression results of Model 1 reported in Table 6[3]. The signs of the estimated coefficients coincide with the simple correlations established for all variables except *NL* and

[3] The sample size of the models reported in Table 7 consists of 134 product classes. Model 1 was initially estimated using 136 observations. A plot of the residuals included one outlier, SIC 20119-Hides, Skins and Pelts. This model had an adjusted R^2=0.46 and an F-statistic = 17.61. The signs were consistent with expectations and *MES* and *KO* were insignificant at the 5 percent level. SIC 20119 was removed from the sample because it represented a weakly defined economic market. The result of the estimation with 135 observations produced an adjusted R^2=0.51 and an F-statistic = 21.1. The signs, magnitudes and level of significance of the coefficients did not change. A plot of the residuals showed another outlier, SIC 20872-Liquid Beverage Bases. This observation was omitted provided it did not trigger a further incremental sequence of outliers and the model exhibited stability. The results are indicated by Model 1 in Table 7 and no further outliers were encounterd.

KO. All parameter estimates except those for *MES* and *KO* are significant at the 5 percent level.

This cross-sectional model explained 54 percent of the variation in *PCM* for 1982 data. The test for the significance of the complete regression led to a calculated *F-statistic*=23.58 which exceeds the critical $F_{(7,126)}$=5.75 at the 1 percent level.

The significant, positive effect of the geographic dispersion dummy variable on the price-cost margin is as expected from previous studies. This indicates that product classes confined to local markets (*NL* = 1) have higher margins than those that are in national markets with similar values of CR_4.

The level of product class advertising relative to its sales has a positive effect on the product class's price-cost margin. A 1 percentage point increase in the advertising-to-sales ratio would cause the *PCM* to increase by approximately 2.3 percentage points. The *PCM* is not calculated net of advertising expenditures, thus advertising appears on both sides of the equation. In order to test for the significance of the advertising effect (which is a test of the product differentiation hypothesis), the relevant t-test becomes whether the coefficient is greater than unity. For Models 1 and 2, the revised t-statistics were calculated and reported in Table 6.

Returning to Model 1, the minimum efficient scale variable had a positive effect on the price-cost margin; however, its coefficient was not significant. This is consistent with the findings of Rogers' (1985) study of price-cost margins in food manufacturing for Census years within the period 1954 to 1977. Rogers identifies a trend that shows *MES* becoming less important in determining *PCM* and while CR_4 becomes increasingly important.

The four-firm concentration ratio had a positive effect on product class *PCM* and its estimated coefficient was strongly significant[4]. A 10 percentage point increase in market concentration would result in a 2 percentage point increase in margins.

[4] A model testing the curvilinear concentration effect revealed the joint t-test insignificant at the 5 percent level. The signs of the estimates for CR_4 and CR_4^2 were not in accordance with theoretical expectations. The separate effects were also insignificant and likely due to a high degree of multicollinearity. This unrestricted model when compared to Model 1 did not significantly improve the prediction of *PCM*.

This may confirm the hypothesis that high margins are more easily maintained in highly concentrated industries due to collusive activities by its largest members. Alternatively, the largest firms may be the most efficient in lowering their costs. Empirical studies indicate that it is likely to be a combination of both factors.

The capital-output variable, included to control for differing capital intensities across the food manufacturing sector, has a positive effect on the ***PCM***. The estimated coefficient was not significant at the 5 percent level.

The results of Model 1 indicate a positive and strongly significant coefficient on nominal sales growth. A 10 percentage point increase in product class sales between 1977 and 1982 would bring about a 1.2 percentage point increase in margins.

Table 6. REGRESSION RESULTS EXPLAINING PRODUCT CLASS PRICE-COST MARGINS IN THE FOOD MANUFACTURING SECTOR FOR 1982

	MODEL 1 n = 134	MODEL 2 n = 134
Dependent Variable	***PCM***	***PCM***
Constant	4.54	4.57
NL	6.49* (2.85)	7.04* (3.23)
ADS	2.27(*) (3.51)	5.07(*) (4.73)
ADS²	--	-0.29* (-3.56)
MES	0.042 (0.18)	0.22 (0.99)
CR₄	0.20* (4.02)	0.17* (3.42)
KO	0.08 (1.31)	0.07 (1.28)
G	0.12* (4.62)	0.10* (3.96)
%COOP	-0.22* (-3.36)	-0.19* (-3.03)
$\bar{R}^2$	0.54 (23.5)	0.58 (24.1)

( ) beneath coefficients are t-statistics
( ) beneath $\bar{R}^2$ are F-statistics taken from the mean
(*) coefficient significantly > 1 at the 5 percent level
* coefficient significantly different than 0 at the 5 percent level

Cooperatives being present in a product class had a negative effect on the price-cost margin. A 10 percentage point increase in product class sales attributable to cooperatives would result in a decline in the price-cost margin of approximately 2 percentage points. This result, generated from 134 food manufacturing product classes, implies that as cooperatives account for an increasing share of industry sales, price-cost margins decline. Whether these margins are declining toward the zero-surplus solution of perfect competition is difficult to determine from a cross-sectional analysis.

It is also difficult to interpret whether the model captures the hypothesized, long-run adjustments in an industry where cooperatives are prominent competitors that were discussed in Chapter 4. This is the cooperative effect purported by the yardstick theory and emphasized by proponents of cooperative organization. To see the difficulty, consider the case where the ***PCM*** of an industry with a high ***%COOP*** reasonably approximates the long-run perfectly competitive solution. Here, we must decide whether this observation represents a point in time in which the long-run adjustment has been completed or whether, for other reasons, the cooperative simply entered a low-margin industry to begin with. In the latter situation, the competitive yardstick effect is not meaningful. However, the other independent variables should control for much of this 'low-margin' product class status and allow the ***%COOP*** variable to address the competitive yardstick effect. Without ignoring that cooperatives operate in mainly low-margin industries, the thrust of cooperative organization theory is that farmers have incentives to form cooperatives in those industries where profits are present and the current structure does not serve their interests.

Yet the conclusion remains clear, for this model and sample the effect of increased market shares by cooperatives within an industry results in better performance as measured by ***PCM***[5].

[5]The results of a model similar to Model 1 but substituting the H-index for CR_4 when available (n = 117) did not confirm the hypothesized superiority of the H-index over CR_4. While the H-index had a comparable t-statistic in place of CR_4, and the model remained stable in its estimates and significance, the overall prediction of ***PCM*** was unchanged.

5.2.2 Model 2.

The hypothesis that excessive levels of advertising become less productive in earning profits was tested by including a squared advertising-to-sales ratio term (Table 6). This model explains 58 percent of the variation in ***PCM***. The null hypothesis that the model fails to explain the variation in the dependent variable is rejected at the 1 percent level. All variables, except ***ADS*** and ***[ADS]***^{2}, remained consistent in sign with Model 1 and maintained their levels of significance. The magnitudes of the estimated coefficients did not change dramatically. The estimated coefficient of ***ADS*** effect doubles from 2.27 in Model 1 to 5.07 in Model 2. The squared ***ADS*** variable had the expected negative effect on margins and its estimated coefficient was significantly different from zero at the 5 percent level. Once the estimates are obtained from the model, it is possible to calculate the maximum level of ***ADS*** variable beyond which ***PCM*** cannot be increased by further increases in ***ADS***. Taking the partial derivative of ***PCM*** with respect to ***ADS*** and setting it equal to zero yields a value of ***ADS* = 8.74**. This value is within the***ADS*** range for the sample but far beyond the mean value of 1.5% and is exceeded by only 4 observations.

Model 2 improves the prediction of ***PCM*** significantly over Model 1. For the estimates of this OLS model to be efficient, a homoskedastic error term must be confirmed. Previous IO studies have indicated that industry size (measured as ***VOS***) might be a possible source of uneven variation of the disturbance terms. A Goldfeld-Quandt test (on ***VOS***) revealed that the null hypothesis of equal variance could be rejected.

5.2.3 Model 2 and the CR_4 Split Sample.

Subsets of the sample of 134 product classes were created using the mean value of CR_4 **= 52.5** to make the distinction between unconcentrated (**n = 70**) and concentrated (**n = 64**) product classes. Two separate estimations of Model 2 were obtained. The results are reported in Table 7. Before discussing the results of each model, it is necessary to see if these separate estimations can be statistically justified; if not, then the results of the pooled sample (Model 2) are relevant. A Chow test comparing the residual sum of squares upon estimation of the constrained model (Model 2) and the unconstrained models (Models 3a and 3b) yielded a calculated **F = 2.79** which exceeded the critical $F_{9,116}$ **= 2.57** at the 1 percent level. This indicates that the null hypothesis of no structural change between the two subsets is rejected, and the separate models are justified.

Model 3a, representing unconcentrated product classes, explained 58.3 percent of the variation in PCM. The local market effect on PCM was significant and positive, however its estimated coefficient fell by 41 percent relative to Model 2. ***ADS*** had an increased, positive, significant effect on PCM of 19 percent. The squared ***ADS*** effect maintained its expected negative effect on margins and was also significant and increased in size by 34 percent. The increased positive effect of ***ADS*** on ***PCM*** might possibly indicate that a given level of advertising expenditure among the less concentrated industries makes a more dramatic, positive impact on margins rather than cancelling the advertising efforts of rivals in concentrated markets. Also, those able to create a recognizable degree of product differentiation among many competitors with similar market share will earn profits above the industry norm. This enhanced positive contribution of***ADS*** to ***PCM*** also means the ***PCM*** has a heightened negative response to levels of ***ADS*** in excess of 7.9%, the maximum level of beneficial advertising.

The estimated coefficient of ***MES*** remains insignificant. The four-firm concentration ratio is no longer a significant factor in determining ***PCM*** when estimated among a cross-section of less concentrated product classes. This may reinforce the notion that of greater relevance is a critical degree of oligopoly. Capital intensities (***KO***) across these product classes have a significant, positive effect on ***PCM***. A 10 percentage point increase in the level of ***KO*** will bring about a 2.4 percentage point increase in ***PCM***. This result is consistent with Ornstein's (1975) premise that differences in margins across industries are explained predominately by capital-sales ratios, not concentration ratios, however, here we are only dealing with low concentration industries. Collins and Preston (1968) also justify interindustry margin differentials as necessary for attaining equal normal rates of profit on the capital employed in the long run. Growth in sales had a negative insignificant effect on ***PCM***. Cooperative sales participation in a product class had an inverse, significant effect on its margins, however, the size of the estimated coefficient was reduced by 37 percent. Cooperatives may not be as strongly needed to exert the competitive yardstick effect in less concentrated industries where margins may be low to begin with.

Considerable differences are found for the concentrated product classes (Model 3b). The local market effect on ***PCM*** is no longer significant. ***NL*** was included to correct for CR_4 understatement in local market product classes. Its insignificance points towards the fact that only 2 out of 64 observations in the subset of highly concentrated industries have a local market orientation.

Both ***ADS*** and $[ADS]^2$ are significant, positive and negative effects respectively, with ***ADS*** significantly different than unity. Among this set of concentrated product classes, the estimated coefficient on the second-order advertising term is smaller than among the subset of less concentrated product classes. The maximum level of beneficial advertising is reached at 9.7 percent with only one sample observation exceeding this level.

Again, the estimated coefficient on ***MES*** remains insignificant. CR_4 has a positive, significant effect. A 10 percentage point increase in CR_4 would bring about a 2.5 percentage point increase in ***PCM***. High margins are more easily maintained in concentrated settings. Similar to Model 2, ***KO*** has an insignificant effect, perhaps resulting from CR_4 having more predictive power on ***PCM***. Growth has a positive, significant effect on ***PCM*** such that an increase in sales between census years of 10 percentage points would lead to an increase of 2 percentage points in the ***PCM***.

The percentage of sales attributable to cooperatives has an enhanced, significant, inverse effect on ***PCM***. An increase in cooperative sales share by 10 percentage points will reduce product class margins by 3.5 percentage points. It appears that cooperatives are able to exert their beneficial yardstick effect, in the concentrated food manufacturing industries.

5.3 Summary

This chapter presents the empirical results for a linear regression model explaining 1982 product class price-cost margins in the food manufacturing sector as a function of traditional market structure variables plus the addition of a new variable, the extent of cooperative participation in the market. Both market concentration, measured by CR_4 and product differentiation, as

Table 7 REGRESSION RESULTS FOR THE SPLIT SAMPLE

	Model 3a n = 70 (CR_4 < 52.5)	Model 3b n = 64 ($CR_4 \geq 52.5$)
Dependent Variable	***PCM***	***PCM***
Constant	7.06	1.29
NL	4.60* (2.34)	5.84 (.97)
ADS	6.02(*) (4.29)	4.08(*) (2.61)
ADS^2	-0.38* (-3.34)	-0.21* (-1.94)
MES	0.13 (0.42)	0.40 (1.31)
CR_4	0.11 (1.18)	0.25* (2.15)
KO	0.24* (3.82)	0.08 (-.87)
G	-0.01 (-.38)	0.19* (4.57)
%COOP	-0.12* (-2.14)	-0.35* (-2.18)
R^2	.58 (13.1)	.58 (12.8)

( ) beneath coefficients are t-statistics

( ) beneath $\overline{R}^2$ are F-statistics taken from the mean

(*) coefficient significantly > 1 at the 5 percent level

* coefficient significantly different than 0 at the 5 percent level

measured by ***ADS***, were positively related to higher price-cost margins. The extent of cooperative participation, as measured by ***%COOP***, was negatively related to the price-cost margin and hence was associated with improved market performance as predicted by cooperative theory.

Model 1 revealed a positive and significant effect on product class price-cost margins (***PCM***) from the level of advertising-to-sales, the four-firm concentration ratio, and product class nominal sales growth and local market settings all at the 5 percent level. The advertising effect was significant at the 0.5 percent level even after adjusting for its inclusion in the computation of PCM. The minimum efficient scale and capital intensity effects were not significant. The cooperative participation variable had the expected negative impact on product class margins.

Two extensions of this model were examined. One based on the possible curvilinear relationship of ***ADS*** with ***PCM***, and the other stemming from a possible discontinuous concentration effect on performance. The model including a nonlinear advertising-to-sales relationship, Model 2, provided a better fit for this sample than Model 1. The squared ***ADS*** variable had the expected negative effect on margins, confirming the diminishing returns of heavy advertising.

A Chow test validated estimating Model 2 using two subsets of the sample based on high ($CR_4 \geq 52.5$) and low ($CR_4 < 52.5$) concentration product classes. This treatment of the sample based on market concentration causes changes in the magnitude of the estimated effect and significance of several variables. However, cooperative-sales-share remains inversely related to the level of margins and significant in both subsets but increases in magnitude in the more concentrated subset. Thus, the competitive yardstick effect is most strongly demonstrated in concentrated product classes.

6. Summary and Conclusions

The purpose of this research was to determine the role of agricultural marketing cooperatives in the performance of the U.S. food manufacturing industries. This was made possible by merging industrial organization theory with cooperative performance theory. The model used provides a unique empirical test of the relationship between cooperative presence in a market and the market's performance as measured by the price-cost margin. This test relies on a structure-performance model that builds on the previous 30 years of industrial organization models by adding a variable showing the extent of participation by cooperatives in the market. Since the study dealt with a single sector, food and tobacco manufacturing, it allowed a test of the 'competitive yardstick' effect of cooperatives in a cross-sectional study of 134 product classes from that sector. The results help answer renewed concerns over special public policy that is extended to cooperatives.

6.1 Theoretical Expectations of the Cooperative Impact

A separate theory of cooperative organization is necessary for examining the cooperative market performance impact because investor-owned firms (IOFs) and cooperatives are different market entities. Cooperative performance cannot be extrapolated from the neoclassical theory of the firm in its most rigid application. An understanding of those behavioral and organizational characteristics of IOFs that failed to serve farmers' interests equitably helped to shape and guide cooperative organization. The normative theory of cooperatives offers an understanding of how the deliberate structuring of the cooperative provided an improved channel through which the farmer could transact business and benefit society as well.

Nourse pioneered this work by formulating the competitive yardstick theory of cooperatives that showed their impact in markets in which they participated. Basically, a cooperative which did not deny membership to any primary agricultural producer could not restrict input processing levels or finished output supply. Thus there could be no undue price enhancement due to supply restriction. On the contrary, the cooperative has a built-in behavioral objective of maximizing per-unit returns to members which serves as a mechanism that encourages the expansion of agricultural output. This expansion continues through to the finished output supply at higher levels than achieved by IOFs and ultimately, to levels that approach perfectly competitive prices and output. This mechanism is triggered by the patronage-refund, which is operative whenever cooperative profits are positive. Due to the refunding of cooperative surplus, members receive a higher price for their output than offered by an IOF whenever any positive profits are available to the processor.

It is this signal that causes current membership to increase output and, at the same time, attracts new members. The effect of cooperatives' presence in a market is the establishment of a competitive yardstick, which competitors must choose to follow or else risk losing their supply of the primary agricultural input. While an IOF may still choose to restrict output in the finished market, the presence of cooperative processors will increase aggregate supply and thus push the equilibrium price of the finished product down.

The Helmberger-Hoos model presents an analytic, static framework which adds rigor to the normative theory. It builds from neoclassical marginal analysis and takes into account the departure from the profit-maximizing outcome that results from the yardstick effect. Theory leads to the expectation that cooperatives enhance market performance.

This theorized cooperative effect was used here to expand and improve the structure-performance model constructed from industrial organization theory. The cooperative yardstick effect on product class performance was estimated using a linear regression model that also included the market structure variables that have long been substantiated in theory and empirical applications as determining the level of market performance, measured here by the industry price-cost margin.

6.2 *Summary of the Prominent Factors Determining Price-Cost Margins*

The price-cost margin (***PCM***) model was hypothesized to be explained by eight independent variables. The capital-output ratio (***KO***) and the minimum efficient scale variable (***MES***) were not significant factors for this cross-section. Only when the sample was split into high and low concentration categories and with the second model did the estimated coefficient for ***KO*** have a significant, positive effect on the ***PCM*** of low concentration product classes. Of the remaining six variables, all were significant at the 5 percent level. Two of these were control variables, geographical dispersion (***NL***) and growth (***G***). A summary is presented of the significant effects of the four main variables.

6.2.1 Advertising-to-Sales Ratio (***ADS***).

As a proxy for the degree of product differentiation within the industry, the estimated coefficient for ***ADS*** had the largest positive effect on ***PCM***. Model 2, where ***ADS*** had a nonlinear specification, predicts that a 1 percentage point increase in the level of advertising relative to sales will cause a 4.8 percentage point increase in margins, all else constant. The results of the nonlinear model were consistent with the findings of a study by Parker and Connor (1979) which specified a curvilinear advertising effect on the price-cost margin. Inclusion of the second-order term significantly improves the prediction of ***PCM*** relative to the model including a linear advertising effect (Model 1). The maximum beneficial level of advertising (defined where the ***PCM*** cannot increase any further with additional advertising) for Model 2 was ***ADS*** = 8.74 percent. This value is included in the ***ADS*** data, which ranges from 0 to 13.6 percent and has a mean of 1.51 percent. Four observations exceeded the optimal profit-enhancing level of ***ADS***.

The estimation of Model 2 for low concentration product classes (Model 3a) resulted in a stronger, positive, significant ***ADS*** effect on ***PCM***, wherein a 1 percentage point increase in the level of ***ADS***, all else constant, would cause an increase in margins of 5.6 percentage points. The higher concentration group (Model 3b) resulted in a weaker, positive, significant effect on ***PCM*** compared to Models 2 and 3a, where an identical increase in ***ADS*** would cause a 3.9 percentage point increase in the price-cost margin. The maximum level of beneficial ***ADS*** for the low and high concentration product class subsets was 7.9 and 9.6 percent respectively. These values are contained within their respective ranges of ***ADS***, with 3 observations exceeding the maximum beneficial value in the low concentration group and 1 observation exceeding for the high concentration category.

Models 2, 3a and 3b each confirm that product differentiation is an effective strategy for earning higher margins to varying degrees. Model 2 indicates that within the range of the ***ADS*** data, the ***PCM-ADS*** relation is one exhibiting diminishing marginal returns beyond the ***ADS*** value of 8.74 percent. All else constant, ***ADS*** would generate negative margins starting at a value of 17.5 percent, which is outside the ***ADS*** range for this study. Thus the data represent a range of ***ADS*** over which the advertising effect on ***PCM*** is increasing, attaining its maximum around 8 or 9 percent and then declining due to the increasing cost of advertising relative to its profit generating potential but never reaching a net negative effect over the range of the data.

Advertising also acts as an investment that builds a barrier to entry for the purposes of safeguarding higher margins that can be eroded through new entry. In order to be successful in gaining a portion of the market, prospective entrants must be able to finance an advertising campaign, the level of which is set by incumbents. Often the level of advertising expenditures prevents entry and is therefore a partial explanation of the link between industries with high advertising requirements and higher maintained margins.

6.2.2 Four-Firm Concentration (***CR_4***).

Four-firm concentration is positively related to the level of product class margins when modeled in the continuous format of Model 1 or 2. A high level of seller concentration implies either a greater collusive tendency among the top 4 firms and hence, the ability to earn and maintain a higher ***PCM*** or the greater efficiencies associated with larger firms. Model 2 suggests an increase in ***CR_4*** of 30 percentage points and increases ***PCM*** by 5 percentage points. Regressions were also estimated with two subsets created to distinguish high from low ***CR_4*** product classes. The estimated coefficient on ***CR_4*** was not a significant factor in the low concentration category, yet ***KO*** became a significant positive factor there and ***CR_4*** remained significant in the high concentration group.

CR_4 is a measure of concentration for industries with a national market orientation and is likely to understate the concentration effect for industries with local markets. A variable to control for differences in the geographical dispersion of markets (***NL***) was used in this study. The estimate on the dummy variable ***NL*** contributes 7 percentage points to the ***PCM*** for a given level of ***CR_4*** when the observation represents a local market. In the low concentration group where ***CR_4*** was not significant (Model 3a), ***NL*** did have a significant geographic dispersion effect on ***PCM***, while in the high concentration group where ***CR_4*** was significant (Model 3b) ***NL*** was not significant, yet few of the observations were local markets.

6.2.3 Nominal Growth Rate, 1977-to-1982 (***G***).

The growth variable controls for market growth over the 1977 to 1982 period. If demand growth is rapid and supply expansion slow the upward pressure on prices and profits should exist. In Models 1 and 2 growth had a positive effect on margins. When examined over low concentration product classes, ***G*** is insignificant, while the higher concentration category yielded a significant positive estimate for ***G***. This result may be in agreement with the line of industrial organization theory that suggests growth, under certain conditions, can have a concentrating effect on an industry. In particular, a slow growth rate in an industry with barriers to entry will further concentrate the industry in the hands of incumbents. There is no evidence in the food manufacturing sector of an increased number of firms as a result of the sector's growth. Rather, the growth rates have been typically slow, barriers to entry are present and acquisitions and mergers are much more prevalent than new large scale entry.

The evidence supplied by the positive relationship between ***PCM*** and ***G*** does not support the other line of IO theory that suggests industry growth has a deconcentrating effect by providing the opportunity for new entry (Rogers, 1982), which would eventually reduce margins.

6.2.4 Cooperative Sales as a Percentage of the Industry (***%COOP***).

The percentage of industry sales attributable to cooperatives has a significant negative effect on margins in all models. This study is the first to construct a continuous empirical measure of cooperative participation for a wide cross-section of food industries to test the theoretical competitive yardstick effect of cooperatives exposed by Nourse in 1922.

Cooperative theory predicts that the performance impact of cooperatives depends on their membership policies. A cooperative can choose to pursue an open or restricted membership policy. Open membership implies the cooperative will accept additional members and serve as quantity-taker with respect to member output. A restricted membership (RM) policy implies membership is determined by cooperative management, such that it achieves the management's goal. The RM cooperative sets the level of member output it will process. The inverse relationship found between ***PCM*** and ***%COOP*** in these models suggests that the competitive yardstick effect that results from open membership policies is at work in the 134 food industries studied as a whole, but more so within the subset of concentrated industries. The results indicate that cooperatives are pushing market performance towards perfect competition which is consistent with theoretical expectations. This result is due to fundamental behavioral and organizational differences between the cooperative and investor-owned firm.

6.3 Conclusions

In addressing the public policy question of whether cooperatives' partial antitrust exemption under the Capper-Volstead Act should be continued, this study indicates that in the food manufacturing sector, cooperatives have benefitted society. In fact, cooperatives are associated with improved market performance. Consistent with theoretical predictions, in markets with cooperative participation consumers pay lower prices for finished goods and all farmers gain access to receipt of higher prices for their agricultural output. Given open membership, it is difficult for cooperatives to acquire market power, let alone use it.

What does the future hold for cooperatives? To a large extent, this will be determined by how well cooperative management structures the organization to compete in the future while serving present needs. It also depends, however, on their legal environment. The results of this study suggest that allegations against cooperatives based on the exercise of market power need to be reexamined. Any public policy efforts to address market power abuses should start with IOFs rather than cooperatives. Any change in the Capper-Volstead Act's partial antitrust exemption should be based on a more thorough understanding of the role of cooperatives in determining market performance. This research contributes to this reexamination. A more thorough understanding depends on the development of more comprehensive models that probe beyond the simplifying assumptions used here. In addition, new studies that devise better measures of performance rather than the price-cost margin calculated from Census data that was used in this study must find similar results to insure confidence in these conclusions.

Current work is embellishing the theory of cooperative performance by examining the implications of the cooperative in its expanded marketing environment. For example, government supported institutional arrangements such as marketing orders may allow an OM cooperative to price discriminate. A potential public policy issue is reconciling legislation with conflicting institutional arrangements.

Game theory is being applied in situations where the assumption of homogeneity in membership is replaced by the realization that coalitions form within cooperatives due to conflict of member interests (Staatz, 1983). More complex dimensions of cooperative

organization, such as revenue pooling and the financial requirements of remaining solvent and poised for future growth, are likely to affect the role of cooperatives in determining market performance.

The same holds true for comparisons of the production efficiency of cooperatives relative to IOFs. Differences in managerial efficiency will also impact the analysis. For example, any squandering of cooperative surplus implies a diminished patronage refund and hence, a reduction in the supply expansion that results in the cooperative's performance appeal. As farmers continue to face a present and future struggle for survival in a marketing environment that is becoming more complex and increasingly concentrated in the hands of large, diversified investor-owned firms, cooperatives will be faced with and expected to meet the challenge.

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APPENDIX: Variable Construction, Basic Data and Comments

This appendix contains the construction of specific variables, the descriptive statistics for the independent variables, a list of the data used and some explanatory comments on the data.

I. Calculation of Variables

A. Dependent Variable

The calculation of the percentage price-cost margin (***PCM***) for SIC 20610, Sugar Cane Mill Products, was as follows:

VOS	CM	PR	VOS		PCM
:	:	:	:		:
[(113.9 -	755.8 -	133.8) /	113.9]	* 100 =	20.13

where ***VOS*** is the value of shipments, ***CM*** is the cost of materials, ***PR*** is the payroll. Figures are in millions of dollars.

B. Independent Variables

1. The minimum efficient scale variable (***MES***) was calculated as the percentage of total industry value-added (***VA***) attributed to the plant size estimated to be at the mid-point of the value-added distribution, expressed as value-added per employee. For SIC 20610 the calculation was as follows:

A	A/2	B	C	D	E	MES
Total VA	Mid-pt Plant VA	Mid-pt Emplymt Interval	Actual Employees Mid-pt Plant	VA_B/ Total $Employ_B$	(C*D)	E as % of A
:	:	:		:	:	:
297.7	148.8	100-249	215	.047	10.27	3.45

2. The percentage capital-output ratio (***KO***) for SIC 2061 was calculated as follows:

VFA	VOS		KO
:	:		:
(945.5 /	1091.2)	* 100 =	86.5

where VFA is the value of fixed assets.

3. For the calculation of the other variables see Chapter 4.

Table 1A Basic Data for 1982 Price-Cost Margin Study

SIC	PCM	NL	S*PEC	ADS	MES	CR4	KO	CODE	G	%COOP	H
20111	4.44	0	0	0.0	0.5	44	7.2	0	46.19	4.00'	709
20112	6.30	0	0	0.0	0.5	55	7.2	0	13.09	0.00	1071
20113	2.37	0	0	0.0	0.5	59	7.2	0	-17.80	0.00	1101
20114	10.07	0	0	0.0	0.5	39	7.2	0	42.93	7.00'	597
20115	7.26	0	0	0.0	0.5	40	7.2	0	11.91	2.92'	608
2011A	6.73	0	0	0.0	0.5	37	7.2	0	14.64	8.88'	505
20131	10.54	0	2	0.0	0.3	22	15.9	11	40.81	3.01'	0
20132	14.96	0	2	0.8	0.3	26	15.9	11	39.06	2.00'	0
20133	18.30	0	2	1.1	0.3	53	15.9	11	23.27	8.01'	0
20151	8.70	0	2	0.3	0.4	32	28.1	11	51.91	10.00'	0
20152	22.77	0	2	0.3	0.4	69	28.1	11	-23.50	9.11'	0
20153	10.03	0	2	0.3	0.4	40	28.1	11	37.22	2.99'	0
20154	16.24	0	2	0.4	0.4	74	28.1	11	1.73	0.00	0
20155	17.85	0	2	0.6	0.4	37	28.1	11	157.30	0.00	0
20179	14.12	0	0	0.0	2.5	33	8.6	0	5.44	6.98'	0
20210	5.37	0	0	0.1	2.7	29	4.2	0	77.99	64.10	377
20223	11.24	0	0	0.6	0.6	31	12.3	12	106.30	29.00	344
20224	13.19	0	0	0.9	0.6	64	12.3	12	26.83	27.60	1592
20225	14.98	0	0	1.0	0.6	85	12.3	14	12.72	2.92'	2702
20235	15.51	0	0	0.1	2.1	33	14.9	13	39.76	60.70	400
20236	39.51	0	0	0.5	2.1	74	14.9	13	78.33	13.00'	2114
20237	4.60	0	0	0.0	2.1	35	14.9	13	40.39	50.70	519
20238	11.89	0	0	0.0	2.1	21	14.9	0	81.11	28.40	229
20239	45.27	0	0	0.9	2.1	66	14.9	14	40.50	3.11'	1522
20240	20.76	1	0	0.8	0.6	22	21.1	0	47.17	8.26	214
20261	12.20	1	0	0.0	0.2	28	16.6	0	43.03	56.80	308
20262	13.69	1	0	0.0	0.2	18	16.6	0	24.09	16.50	179
20263	14.90	1	0	0.3	0.2	29	16.6	0	25.22	16.50	352

Table 1A (CONTINUED)

SIC	PCM	NL	S*PEC	ADS	MES	CR4	KO	CODE	G	%COOP	H
20265	38.08	1	0	3.7	0.2	63	16.6	14	61.83	11.11	593
20266	13.86	1	1	0.0	0.2	31	16.6	14	14.01	16.20	392
20321	37.80	0	0	0.6	3.2	100	27.7	0	48.62	0.00	5400
20322	38.00	0	0	3.4	3.2	92	27.7	15	50.82	2.00'	6650
20323	22.15	0	0	0.8	3.2	48	27.7	0	35.36	3.05'	847
20324	36.24	0	0	3.5	3.2	66	27.7	16	30.73	7.03'	0
20331	22.69	0	0	1.1	0.4	44	26.8	0	23.37	42.60	644
20332	25.52	0	0	0.4	0.4	35	26.8	0	24.01	6.99'	511
20333	21.89	0	0	0.5	0.4	69	26.8	0	-7.21	5.76'	1671
20335	19.20	0	0	1.9	0.4	73	26.8	0	7.35	15.90'	2814
20336	30.49	0	0	3.2	0.4	48	26.8	0	61.07	12.00'	743
20338	30.80	0	0	1.2	0.4	47	26.8	0	51.93	14.90	904
2033A	27.40	0	0	0.9	0.4	33	26.8	14	28.00	22.50	439
2033B	22.07	1	0	0.9	0.4	45	26.8	14	39.43	16.60	957
20341	26.97	0	1	0.5	3.9	48	31.3	0	47.40	26.00	799
20342	50.16	0	0	5.7	3.9	76	31.3	0	48.11	0.00	2391
20352	28.33	0	0	1.0	3.6	43	25.8	0	25.54	0.00	764
20353	50.76	0	1	5.9	3.6	52	25.8	0	106.40	0.93'	871
20354	30.10	0	1	2.8	3.6	61	25.8	0	40.48	0.99'	1626
20371	27.91	0	0	1.0	0.9	40	31.4	0	61.28	13.50	790
20372	36.21	0	0	0.8	0.9	36	31.4	0	71.85	3.01'	494
20381	31.80	0	0	2.0	1.0	52	27.9	0	67.79	0.00	948
20382	24.86	0	0	2.9	1.0	44	27.9	0	81.56	1.99'	678
20383	36.77	0	0	5.4	1.0	44	27.9	0	-13.10	0.96'	792
20411	12.74	0	0	0.0	0.9	48	18.2	0	40.45	3.00'	813
20412	20.54	0	0	0.1	0.9	50	18.2	0	5.07	2.09'	839
20413	21.30	0	0	0.1	0.9	57	18.2	0	33.99	5.06'	1001
20416	24.90	0	0	0.0	0.9	75	18.2	0	68.98	27.20'	1641
20419	32.91	0	3	3.2	0.9	59	18.2	11	39.07	0.00	0
20430	54.03	0	0	9.4	5.9	81	37.4	0	69.76	0.00	2058
20440	17.58	0	0	0.9	5.2	44	22.7	0	52.73	40.10'	795
20461	28.92	0	1	0.0	12.9	84	75.9	14	36.80	0.00'	1930
20462	23.89	0	0	0.1	12.9	62	75.9	14	24.81	0.00	1277
20463	27.92	0	1	4.2	12.9	83	75.9	14	29.46	0.00	0
20464	27.92	0	0	0.0	12.9	77	75.9	14	35.93	0.00	1643
20473	42.93	0	0	4.3	2.9	57	24.1	17	26.15	0.90	1129
20474	51.29	0	0	6.9	2.9	84	24.1	17	35.70	0.39	2222
20481	8.42	1	0	0.0	0.1	25	15.9	0	32.01	11.20	301

Table 1A (CONTINUED)

SIC	PCM	NL	S*PEC	ADS	MES	CR4	KO	CODE	G	%COOP	H
20482	12.05	1	0	0.0	0.1	29	15.9	0	28.61	22.20	349
20483	14.20	1	0	0.0	0.1	39	15.9	0	76.15	18.70	529
20484	14.47	1	0	0.0	0.1	32	15.9	0	1.72	19.80	420
20485	25.21	1	0	0.0	0.1	43	15.9	0	24.85	13.10	675
20486	17.05	1	0	0.0	0.1	33	15.9	0	39.35	10.20	559
20487	15.18	1	0	0.0	0.1	41	15.9	0	0.61	12.30	565
20488	14.17	1	0	0.0	0.1	36	15.9	0	18.52	14.20	539
20489	15.09	1	0	0.0	0.1	19	15.9	0	6.86	19.40	194
20511	34.50	1	0	0.8	0.2	37	30.5	0	34.20	0.00	478
20512	36.27	1	0	0.8	0.2	26	30.5	0	45.10	0.00	283
20513	30.09	1	1	1.1	0.2	38	30.5	0	18.79	0.00	586
20514	42.90	1	1	0.4	0.2	50	30.5	0	29.60	0.00	1057
20515	31.30	1	1	0.1	0.2	53	30.5	0	32.83	0.00	1178
20517	36.81	1	1	0.3	0.2	65	30.5	0	92.95	0.00	1428
20521	43.96	0	1	1.3	2.1	74	26.2	0	56.37	0.00	2147
20522	41.98	0	1	1.0	2.1	54	26.2	0	57.17	0.00	1195
20610	20.14	0	0	0.0	3.4	41	86.6	0	54.21	13.00'	626
20623	14.53	0	2	0.1	7.9	66	18.6	18	35.16	25.00'	1404
20653	38.44	0	0	4.0	0.7	40	27.9	0	28.32	1.00'	551
20657	22.17	0	1	1.1	0.7	50	27.9	14	4.63	12.00'	1033
20656	39.00	0	2	3.4	0.7	60	27.9	11	65.28	1.99'	0
20659	33.85	0	1	10.1	0.7	81	27.9	14	12.40	0.00	1869
20661	15.72	0	0	0.1	10.6	64	21.0	0	3.46	0.00	1280
20669	38.30	0	2	1.5	10.6	69	21.0	11	10.44	0.00	0
20670	55.29	0	0	13.6	15.5	87	35.8	0	25.86	0.00	0
20741	10.00	0	0	0.0	4.0	59	40.3	0	2.46	7.32'	1128
20742	17.30	0	0	0.0	4.0	60	40.3	0	-7.10	11.80'	1183
20743	15.23	0	0	0.0	4.0	47	40.3	0	60.92	11.40'	787
20744	12.50	0	0	0.0	4.0	52	40.3	0	11.18	11.90'	835
20751	6.02	0	0	0.0	1.6	59	19.1	0	14.75	12.60	1147
20752	6.09	0	0	0.0	1.6	56	19.1	0	20.40	16.70	1029
20761	19.98	0	0	0.0	10.3	98	21.4	0	15.21	26.20'	2759
20762	9.16	0	0	0.0	10.3	56	21.4	0	76.52	12.10'	933
20763	12.14	0	0	0.0	10.3	72	21.4	0	-2.42	33.00'	1457
20771	22.62	0	0	0.0	0.5	31	29.1	0	-5.20	0.96'	388
20772	18.77	0	0	0.0	0.5	27	29.1	0	45.05	6.04'	300
20773	10.24	0	0	0.0	0.5	53	29.1	0	-18.00	0.00	976
20791	20.83	0	0	1.5	1.7	47	16.7	0	27.23	0.00	721

Table 1A (Continued)

SIC	PCM	NL	SPEC	ADS	MES	CR_4	KO	CODE	G	%COOP	H
20792	16.61	0	0	2.6	1.7	55	16.7	0	14.45	3.02'	988
20820	28.66	0	4	3.7	4.2	78	58.3	0	67.94	1.00'	2106
20830	20.95	0	0	0.0	4.4	61	54.8	0	33.91	17.00'	1175
20840	27.89	0	0	6.7	1.4	52	34.8	0	99.60	5.99'	1108
20851	9.11	0	0	0.0	2.9	60	24.9	0	67.91	0.00	1155
20853	39.00	0	0	11.7	2.9	49	24.9	0	41.57	0.00	774
20861	27.76	1	1	2.4	0.1	19	33.7	14	44.12	2.00'	180
20862	26.08	0	0	2.1	0.1	49	33.7	14	65.65	32.00	805
20871	27.56	0	0	0.0	1.2	30	12.0	0	53.05	2.02'	407
20874	45.80	0	1	2.3	1.2	70	12.0	0	65.46	3.01'	2125
20910	22.65	0	0	0.7	21.9	44	23.1	0	23.55	1.03'	582
20922	10.61	0	0	0.0	0.3	17	17.8	0	25.44	0.00	153
20923	14.40	0	0	0.7	0.3	29	17.8	0	38.89	0.00	353
20924	13.55	0	0	0.0	0.3	23	17.8	0	57.38	0.00	248
20951	30.06	0	0	2.2	4.5	62	16.6	0	2.69	1.01'	1407
20952	31.10	0	0	8.5	4.5	95	16.6	0	-9.91	0.00	3150
20970	37.21	1	0	0.0	0.2	17	79.9	0	61.74	0.00	123
20981	36.62	0	0	0.8	2.8	44	31.3	14	10.14	0.00	648
20982	38.07	0	0	5.0	2.8	77	31.3	14	58.81	0.00	2082
20991	38.50	0	0	5.7	0.3	81	20.8	0	-2.74	0.00	0
20992	46.46	0	0	2.5	0.3	62	20.8	0	84.81	0.99'	2669
20993	17.46	0	0	3.3	0.3	58	20.8	0	21.56	0.00	986
20994	53.94	0	1	0.6	0.3	81	20.8	0	60.52	0.00	2267
20995	54.16	0	1	3.2	0.3	86	20.8	0	47.91	0.00	0
20996	32.25	0	1	0.1	0.3	58	20.8	0	52.93	3.19'	1009
21110	57.57	0	0	5.3	7.1	90	24.3	0	87.49	0.00	2609
21210	29.44	0	0	1.0	7.4	58	22.4	0	13.19	0.00	998
21310	55.15	0	0	2.2	23.4	75	21.9	0	82.14	0.00	1839
21411	7.14	0	0	0.0	3.8	76	20.7	0	-42.40	0.00	1775
21412	6.85	0	0	0.0	0.0	71	20.7	0	78.43	0.00	1610

where: ***SIC*** = Standard Industrial Classification number
PCM = Price-Cost Margin
NL = National-Level dummy variable
SPEC = 2 designates special 5-digit SIC created from standard 5-digit Census data (see details below)
ADS = Advertising-to-Sales Ratio
MES = Minimum Efficient Scale
CR_4 = Concentration Ratio

Table 1A (Continued)

KO = Capital-Output Ratio
CODE = Applicable footnote (see details below)
G = Growth
%COOP = Cooperative's Combined Market Share (' = estimated)
H = Herfindahl-Hirschman index.

II. Definitions of *SPEC* and *CODE* Used in the Data for the 1982 Price-Cost Margin Study

SPEC

0 No problems or changes made to Census of Manufactures data.
1 A standard SIC which can be improved upon by either combining one or more product classes or by using more detailed data (usually 7-digit).
2 A nonstandard SIC formed either as a combination of one or more standard SICs or as a single 7-digit SIC or a combination of 7-digit SICs (see code = 1).
3 SIC 20149, which is the combination of standard SICs 20415 and 20450. SIC 20149 is further disaggregated into several 7-digit combinations, which would all have a code of 2.
4 A standard product class 4-digit SIC.

CODE

0 No problems.
11 Use Table 7 of the 1982 Concentration Ratios in Manufacturing which combines 2 product classes.
12 Cheese substitutes were separated out for the first time in 1982, but since they are a small percent of the total, 1977 data will be considered comparable with 1982 data.
13 Dairy substitutes were separated out for the first time in 1982, however, 1977 data will be used with the 1982 data.
14 A new SIC in 1982. Nominal growth calculated from value of shipments data from 1982 to 1986 (from the Annual Survey of Manufactures).
15 Value of shipments for 1982 (and 1977) were estimated. In 1982, the top 500 food and tobacco companies had a

VOS of $1,104.6 million, thus the total product class estimate was $1,150.0 million.

16 Value of shipments for 1982 was estimated. The top 500 food and tobacco companies had VOS of $745.6 million, thus the total product class estimate was $800.0 million.

17 Value of shipments estimated from trade sources, e.g. Advertising Age.

18 SIC 20623 represents a special 4-digit product class SIC.

III. List of Special SICs and the Combined Standard Product Classes

1. Combine 20116 and 20136 to form 20131 (pork, processed or cured).
2. Combine 20117 and 20137 to form 20132 (sausage and similar products).
3. Combine 20118 and 20138 to form 20133 (canned meats).
4. Combine 20161 and 20171 to form 20151 (broilers).
5. Combine 20162 and 20172 to form 20152 (hens and/or fowl).
6. Combine 20163 and 20173 to form 20153 (turkeys, including frozen).
7. Combine 20164 and 20174 to form 20154 (other poultry and small game).
8. Combine 20165 and 20175 to form 20155 (processed poultry and small game).
9. Combine 20620 and 20630 to form 20623 (refined cane and beet sugar).
10. Combine 20652 and 20662 to form 20656 (chocolate candy).
11. Combine 20668 and 20998 to form 20669 (chocolate syrups).

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