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Cooperative Theory: A Review of Recent Literature

Brian Schmiesing
South Dakota State University

Julie Bleyhl
South Dakota State University

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by

Brian H. Schmiesing
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COOPERATIVE THEORY:
A REVIEW OF RECENT LITERATURE[1]

The purpose of this paper is to review the basic economic models used to analyze cooperative organizations. But more importantly the paper attempts to assist the reader in understanding of how cooperatives are either like or unlike investor-owned businesses. If cooperatives are different, what are the implications of these differences to member-patrons, boards of directors and management?

This paper has three major sections. Contained in the first section is a brief inquiry into why cooperative theory is important and a review of its relatively brief history. The second section is a theoretical analysis of cooperative conduct and performance in various market structures. The basic economic models frequently used to analyze processing and supply cooperatives are discussed. These models are then used to analyze the implications of declining costs and open membership to cooperative conduct and performance. Finally, the third section is an overview of game theory as it has been applied to cooperatives and summarizes the major implications of this branch of economic theory to the organization and maintenance of viable cooperatives.

Cooperate Management and Organizational Issues

Cooperative theory is used in the paper to examine a number of cooperative management and organizational issues. Member-patrons, managers and boards of directors must attempt to

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deal with these issues and implement business strategies. From the perspective of society, an evaluation must be made whether cooperatives result in conduct and performance deemed desirable by society. What are the organizational and management issues that need to be examined?

Are cooperatives "just like" investor-oriented firms (IOF)? If cooperatives are found to be "just like" investor-oriented firms, this conclusion has major implications for all parties involved with or evaluating cooperatives. Cooperative members-patrons, boards of directors and management could use without alteration IFO financial and management criteria. Management could use IFO management decision rules. However, member-patrons may question value of cooperative membership if the expectation is for cooperatives to have the same prices and output levels as IFO. If cooperatives are not different from IFOs, society may question the validity of antitrust, tax and other legal exemption granted to cooperatives.

How do supply cooperatives differ from processing cooperatives? The major difference is that supply cooperatives are concerned with the minimization of product price for their membership, while processing cooperatives are concerned with maximization of product price. Do these two types of organizations differ in their application of decision rules and their performance relative to IFOs in specific market structures?

Cooperatives involve the pursuit of individual objectives through group action. Because the owner is a user of the organization, conflicts develop within cooperatives that do not exist in IFOs. Should a cooperative provide service to its

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memberships or have a high return on investment? Are there incentives for cooperatives to limit membership i.e. not have open membership? Are there incentives to treatment members and nonmembers differently? What are the implications of these incentives?

SECTION I: COOPERATIVE ECONOMIC THEORY: WHY AND WHEN

Why Bother with Theory?

Theory forces discipline into the arguments about what will be the conduct and performance of cooperatives. Frequently issues become clouded with assertions, which are not consistent with the assumptions made by advocates.

For example, cooperative principles represent assertions about how a cooperative "should" operate. Member-patrons, boards of directors and management are concerned about the implications of these principles to the operation and performance of the cooperative. If cooperatives are going to be managed effectively there must be clarity in expectations concerning its operation and performance. Hopefully, theory can assist in providing the needed clarity.

Cooperative theories are used in model building. The computer has brought about a major revolution in the mathematical modeling of firm and industry decisions. To build these models there must be theories of behavior and specification of the objectives being pursued. The lack of a coherent understanding of cooperative theory hampers the development of models that can be used as an aid in decision making. The theories must be understood so model users understand the inherent strengths and

weaknesses of specific models.

For example, cooperatives operate in a legal environment, which stipulates specific restrictions or exemptions different from other legal entities. Cooperatives are required by law to pay 20 percent of their allocated patronage refunds in cash. What would be the implications for cooperatives if the government wanted to increase the percentage to 50 percent? To answer the question adequately some form of cooperative theory would have to be applied. Cobia et. al. in their analysis of equity redemption provide an excellent example of how cooperative theory, cooperative principles and modeling can be combined to provide useful information for management decisions.

A Caveat about Economic Theory

Economic theories have been said to only be as good as what is put into them. Theories are based upon assumptions. Deductive logic is used to derive conclusions from the assumptions made. The derived conclusions are tautological and reflect the assumptions made. The reader is encouraged to identify the crucial assumptions of the models analyzed. By knowing the assumptions of various models, a determination can be made of the weaknesses and strengths of a model, plus its application to actual situations.

A Brief History of Cooperative Theory

Although cooperatives have existed in U.S. agriculture for over a century, formal economic theories of cooperatives have largely been developed since the 1940's (Vitaliano, 1978). The economic models used today are largely based on theoretical developments that happened after World War II. These economists

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considered cooperatives to a be a special case of the theory of the firm. During the 1950's Helmberger and Hoos developed the firm level model that is frequently used to analyze processing cooperatives. In subequent literature, attention was directed to altering the assumptions of the basic models to discuss specific issues such as open versus closed membership (Youde and Helmberger).

As cooperative theory developed, the perception of cooperatives as being an instrument of social reform and having alturistic members was increasingly questioned. Recognition was given to the fact that although cooperatives may be formed to increase the well-being of a group of individuals, individuals will engage in behavior that serves their own self-interest (Lopez and Spreen). How cooperatives coerce or encourage members to achieve group goals became a major consideration in the evaluation of cooperative performance.

During the last part of the 1960's and much of the 1970's cooperative theory did not receive much attention by professional economists (Carson). But during the 1980's attention to cooperative theory again increased (Caves and Peterson; LeVay; Lopez and Spreen; Sexton; Staatz; Vitaliano; Zusman). Although the stimulus for this recent effort was partially the need for clarification of previously developed models, the theoretical developments in game theory, public choice and the theory of clubs provided new approaches for analyzing cooperatives. Internal group decision processes rather than the conduct and performance of cooperatives in a specified market structure

became the major area of inquiry. The internal "politics" of cooperatives was no longer assumed away.

SECTION II: BASIC ECONOMIC MODELS OF COOPERATIVES

Basic Economic Model of a Processing Cooperative

Processing cooperatives have been used extensively by farmers to vertically integrate forward into the marketing channel. The justifications for the formation of cooperatives range from the active abuse of market power by other agribusinesses to the farmer's desire to reduce risk and uncertainty in the farming operation. Although justifications may exist for organizing a processing cooperative, attention must be directed towards determining whether a cooperative can accomplish the organizational objectives established by the member-patrons. For example, how much will a cooperative pay for member-patron production relative to that paid by an investor-owned business? The following sections draws heavily from recently published research by Lopez and Spreen.

Assumptions of the Model

Assume the processing cooperative being analyzed is a sugar beet cooperative. The price paid to farmers is in dollars per ton. All farmers belonging to the cooperative have identical farming operations and managment skills. Also, these producers are attempting to maximize net returns to their farming operation.

For the farming operation, the traditional microeconomic theory of the firm will apply in the analysis. The individual producer's supply curve is equal to the proportion of the marginal cost curve above the minimum of the average variable

cost curve. The aggregate supply curve for sugar beets to the cooperative equals the horizontal summation of the individual supply curves and is indicated by the "S" on Figure 1.

The cooperative sells sugar and by-products to generate the total revenues for the business. The "cooperative surplus" available for the distribution to the cooperative members equals total revenues minus total variable and total fixed costs. All the members market the identical quality of sugar beets to the cooperative and all producers receive the same price for their product. This price equals the average net revenue product (ARNP), which equals the cooperative surplus divided by the total number of tons marketed.

What to Maximize?

At this juncture, a critical assumption must be made about the cooperative's membership. Does the membership assume the price received is a given or does the membership recognize the interdependence between the production level of each member and the price received for their product?

Assume the cooperative's membership perceives the price received as being a given. This type of membership could be described as being "price takers", they do not feel there is any way to influence the price paid by the cooperative. Each point along the ANRP curve indicates the average price the producers would receive for their sugar beets for a specified output level. Therefore, the ANRP can be viewed as the cooperative's demand curve for sugar beet production.

The equilibrium point for the cooperative and its member

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FIGURE 1: A CLOSED MEMBERSHIP PROCESSING COOPERATIVE WITH ANALYSIS OF A PRICE-TAKING VERSUS A COORDINATED MEMBERSHIP.

DOLLARS PER TON

P_c
P_t
P_p

P_s

d

a

b   t

c

S

ANRP

MRP

0   Q_c Q_t Tons of Sugar Beets

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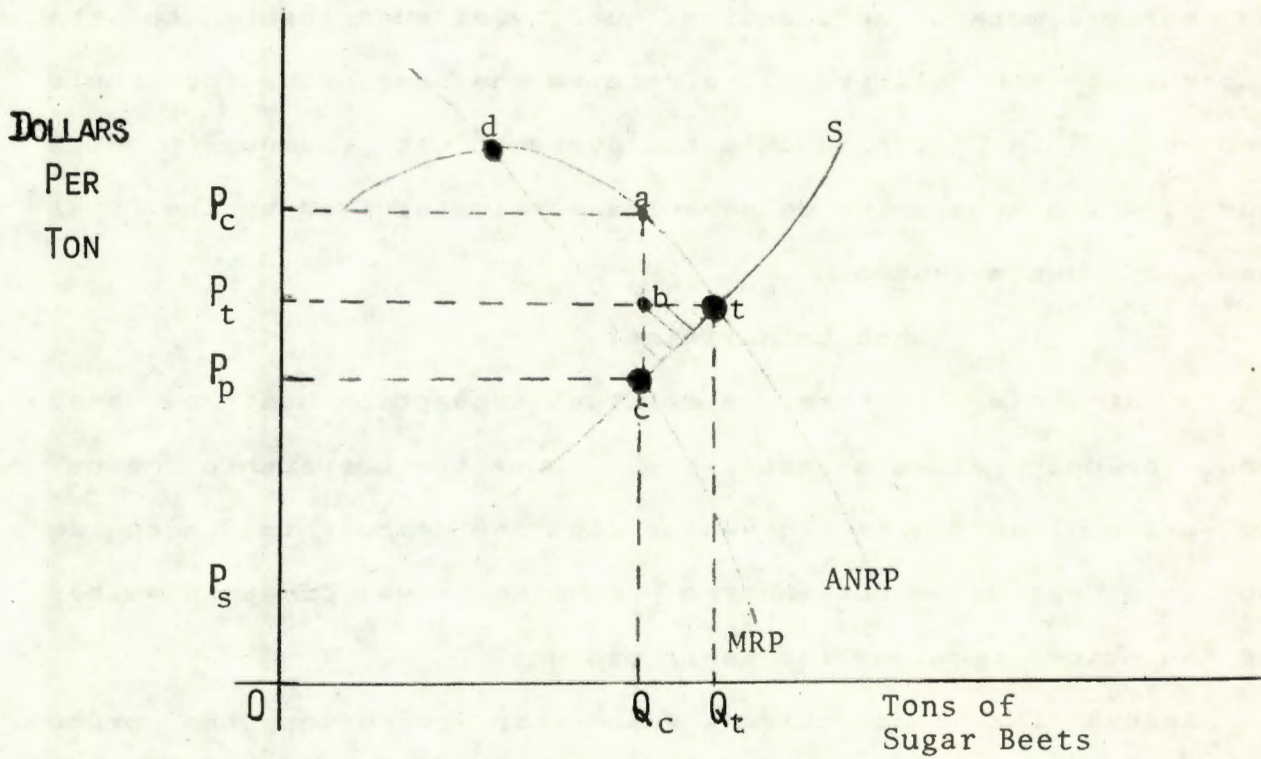
patrons is where the producers' aggregate supply curve intersects the cooperative's demand curve. This equilibrium occurs at point t. Producers would lack an economic incentive to alter their output level from Qt. At levels of production beyond Qt, the marginal cost of producing the additional output would exceed the price received. At production levels below Qt, the price would exceed the marginal cost of producing additional output and the individual producers can increase their net incomes by increasing their output.

A Coordinated Membership

Assume producers understand that changes in total production alter the price received. Because all producers are identical, the maximization of cooperative surplus will also maximize the per unit returns to the individual member. To maximize the cooperative surplus, the marginal cost of producing an additional ton of sugar beets must be equal to the marginal revenues generated from the sale of sugar and by-products. The marginal revenue product curve, MRP, indicates the additional cooperative surplus generated resulting from proccessing one additional ton of surgar beets.

Equilibrium under these conditions implies the cooperative would process Qc and the price received would be Pc. This production level would be similar to that of the investor-owned business, but producers selling to an investor-owned business would receive a price of only Pp. Such a production level would maximize the quasi-rents for the cooperative membership. Quasi-rents equal the cooperative's net savings plus the contribution

to member-patrons' fixed costs. The area underneath the supply curve is the total variable costs for the cooperative's membership. The area above the supply curve indicated by caPcPa represents the quasi-rent to the membership.

This quasi-rent is larger than what would happen if producers were price takers. The price-taker quasi-rent is only tPtPa. The restriction of output will result in the loss of quasi-rent equal to the area tbc and a gain of abPcPt. Because abPcPt is greater than tbc, the member-patrons would be a net gainer if total tonnage was restricted to Qc.

However, such output level is not stable. At Qc the marginal cost of producing an addditional ton of sugar beets is only Pp, while the price received is Pc. Producers have the incentive to increase output because a profit can be made by expanding output. If only one producer increases output and the cooperative accepts the additional output, ANRP will decline only slightly so it is a profitable decision for the individual to overproduce. However, if all the member-patrons expand production they will eventually end up expanding production to the price-taker level.

This points to the major difference between cooperatives and investor-owned businesses. The investor-owned business will maximize the value of the firm and restrict the production level to Qc by paying a price of Pp. However, a cooperative business can limit output because members have an incentive to increase production individually even though as a group they may be better off to restrict production. Thus, one of agruments in favor of

cooperatives is that, if the members act as price takers, processing cooperatives will expand production and reduce excess profits in an industry.

Enforcement of Coordination

Enforcement of output coordination can be accomplished by two approaches. One approach is to have the government restrict production through regulation. Government regulation of production can be accomplished through marketing quotas, marketing orders, grading systems and other forms of government intervention. The second alternative is to coordinate production through production restrictions, education or specific pricing schemes (Lopez and Spreen). How can a cooperative use the private sector alternative to coordinate output?

For a processing cooperative with a closed membership, the most direct way of controlling production is issuing production quotas to each member. If all producers were identical the quota would be equal for all members. For heterogeneous memberships the marketing quotas could be based on marketing certificates issued by the cooperative or the number of acres planted. To obtain the desired level of output the total number of certificates or acres would be fixed. The membership could then be allowed to buy and sell the limited number of certificates or acres of land.

However, the marketable certificate approach causes a dilemma for new cooperative members. The market certificates will have a price determined by competitive bidding. If the cooperative is profitable and does raise member patron prices, the certificates will have a positive price. As producers bid

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for certificates the benefit of marketing to the cooperative will be capitalized into the certificate price. The benefactors of such supply control would be the initial owners of the certificates, while for new members the certificate price would represent a cost for marketing with the cooperative. A similar situation would develop if a fixed acreage base was used by the cooperative. The benefits of cooperative membership would be incorporated into the land price.

A second strategy for keeping producers from overexpanding production is to have the cooperative institute pentalties for overproduction. The monetary pentalties would have to exceed or equal the quasi-rents gained from overproduction so as to ensure that such production would be unprofitable.

A third strategy is to educate members about the need for cooperation to achieve specific goals. However, education does not eliminate the economic incentives for cheating by the member-patrons. The cooperative must have methods for enforcing discipline upon the production practices of the "enlightened" cooperative membership.

A final strategy is marginal cost pricing where the price is set at P_p and the cooperative allocates the surplus under some arbitary criteria. The P_p price results in producers not having any incentive to overproduce. But the cooperative will have to distribute the excess based on some criteria. The problem is establishing the criteria and having the membership approve the criteria (Zusman). If the criteria is based on some linkage to production, the producers will again have an incentive to over

produce.

Industry Level Implications

If excess profits exist in a competitive market structure, cooperatives and investor-owned businesses will enter the industry and expand its capacity. Competitive equilibrium in the industry will be achieved when ANRP = MRP = Pe (Figure 2). The cooperative and investor-owned business will produce the same level of output and pay the same price for the producer output. Both types of firms would be earning a normal profit and recovering total variable and fixed costs. There exists no incentive to exit or enter the industry.

In a competitive industry structure the excessive profits will eventually disappear. Therefore, the incentives for cooperative membership would be expected to dissipate in the long-run. But as previously discussed, the justifications for cooperatives are much more extensive than simply the price paid for a product. Agriculture is a spatially dependent industry and therefore the markets for products are regionalized. Markets that appear to be competitive on a national basis may actually have local markets with considerable market concentration. Also, entry barriers into the industry or product differentiation may result in the excess profits not being dissipated in the long-run.

Basic Economic Model of Supply Cooperatives

Farm supply cooperatives, rural electric cooperatives, rural water cooperatives, and the Farm Credit System are all examples of supply cooperatives with which farmers do business. For this chapter the term "supply cooperatives" will be used to define a

broad range of cooperatives where member-patrons purchase goods and services.

Assume the supply cooperative operates in a fertilizer market where the demand curve is downward sloping. The cooperatives average total cost curve is at its minimum to the left of the demand curve. The downward sloping demand curve represents the average revenue curve, AR, for the cooperative. The marginal revenue curve, MR, represents the addition to total revenue resulting from the sale of one additional ton of fertilizer.

The profit maximizing investor-owned business would equate marginal cost and marginal revenue. The price charged would be Pm and quantity demanded Qm. The economic profit for the firm equals to difference between the firm's average revenue and average total cost curve multiplied by the quantity marketed.

Possible Cooperative Objectives

A number of alternative objectives for supply cooperatives have been proposed. The cooperative can attempt to maximize consumer surplus without having a loss, maximize the total surplus (consumer surplus plus cooperative surplus) or minimize the net price paid by the member-patrons for the product (Vitaliano, 1983).

If the cooperative attempts to maximize consumer surplus without a loss, the cooperative decision rule is to equate ATC with AR. The Patc represents a major reduction in the fertilizer price and Qatc a major increase in the quantity demanded.

However, this output and price level decreases the total

surplus. Beyond the quantity Qmc the marginal cost of providing the product exceeds the gain in consumer surplus. This causes the cooperative's surplus to decline at a greater rate than what consumer surplus increases. The member-patrons would incur a lower average total cost of fertilizer at this lower level of output where marginal cost equals average revenue (Qmc).

This equilibrium level is stable if the member-patrons do not anticipate receiving a patronage refund from the cooperative. Then the marginal cost of obtaining the additional ton of fertilizer will be equated with additional consumer surplus that would be gained from purchasing the additional fertilizer. However, if a patronage refund is anticipated by the member-patrons the quantity demanded will depend upon the anticipated net price. This would result in the cooperative's actual sales to move toward the maximization of consumer surplus without having a loss.

An Unstable Equilibrium

But what if the cooperative's objective is to minimize the net price being charged? Assume the patron receives a cash patronage refund equal to the difference between the AR and ATC. The net price received would equal the price paid minus the patronage refund. The minimum net price occurs when ATC is at a minimum. This is an unstable equilibrium for the cooperative because the marginal cost of selling the additional fertilizer to the patron is less than the additional willingness of the membership to pay. The member-patron has an incentive to overbuy.

What will member-patrons do if their objective is pricing

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the product at the minimum ATC and the cooperative is operating at a production level greater than minimum ATC. The economic incentive exists for a subset of the cooperative's membership to form a closed membership cooperative. By excluding part of the membership, the cooperative can shift the demand curve to the left. Stability would be achieved when the demand curve intersects the minimum of the ATC curve (Figure 4). Marginal cost and average cost pricing will give identical results. There is no incentive for the patrons to shift to other businesses since the cooperative is achieving the minimum purchase price for the product.

An alternative solution may exist. The cooperative may be able expand its physical capacity and move the cost curves to the left. Assume the larger level of physical capacity results in the cooperative achieving additional positive economies of scale. The cooperative would then be able to provide a lower net price than would be achieved operating at the minimum of ATC for the lower level of physical capacity. cooperative would be able to achieve a lower net price.

The formation of coalitions will be discussed in the game theory section of the chapter. The underlying assumption of this analysis was that there were TOO MANY individuals wanting to do business with the cooperative. Sexton and other economists have argued that cooperatives are frequently confronting the opposite problem -- insufficient demand to achieve the minimum point on the ATC curve (Sexton 1983; Cotterill).

Declining Cost Industries

Sexton has agrued that cooperatives sometimes have not achieved the economies of scale required to be operating in the decreasing returns region of the business. Rather, cooperatives are operating in the increasing returns to scale region. What pricing strategies can the cooperative use to operate in the increasing returns to scale region?

Processing Cooperative

Assume a processing cooperative as previously discussed, where the supply curve of the membership intersects the ANRP curve to the left of its maximum (Figure 5). If producers are price takers, their output level will result in S = ANRP or point t. At production levels below this point producers will have an incentive to expand production (price > marginal costs), while above this point the price received from the cooperative will be below marginal costs. The coordinated equilibrium is at c with the average price being received by the producers being Pc and the quantity produced Qc.

Where would the investor-owned business operate? If the investor-owned business attempts to equate S and MRP, the price that can be offered to producers is only Pc.

If the investor-owned firm offers a price of Pc, what happens? Producers will supply only Qi rather than Qc. The investor-owned firm will then only have an ANRP of Pi. This implies a loss to the investor-owned firm because the per unit price for the product Pc was greater than Pi. Where will the investor-owner price the product? At the point where S = ANRP the processor can obtain the necessary supply for the price offered and recover all costs.

FIRGURE 5: A CLOSED MEMBERSHIP PROCESSING COOPERATIVE OPERATING IN THE DECLINING
COST REGION OF ITS COST FUNCTION.
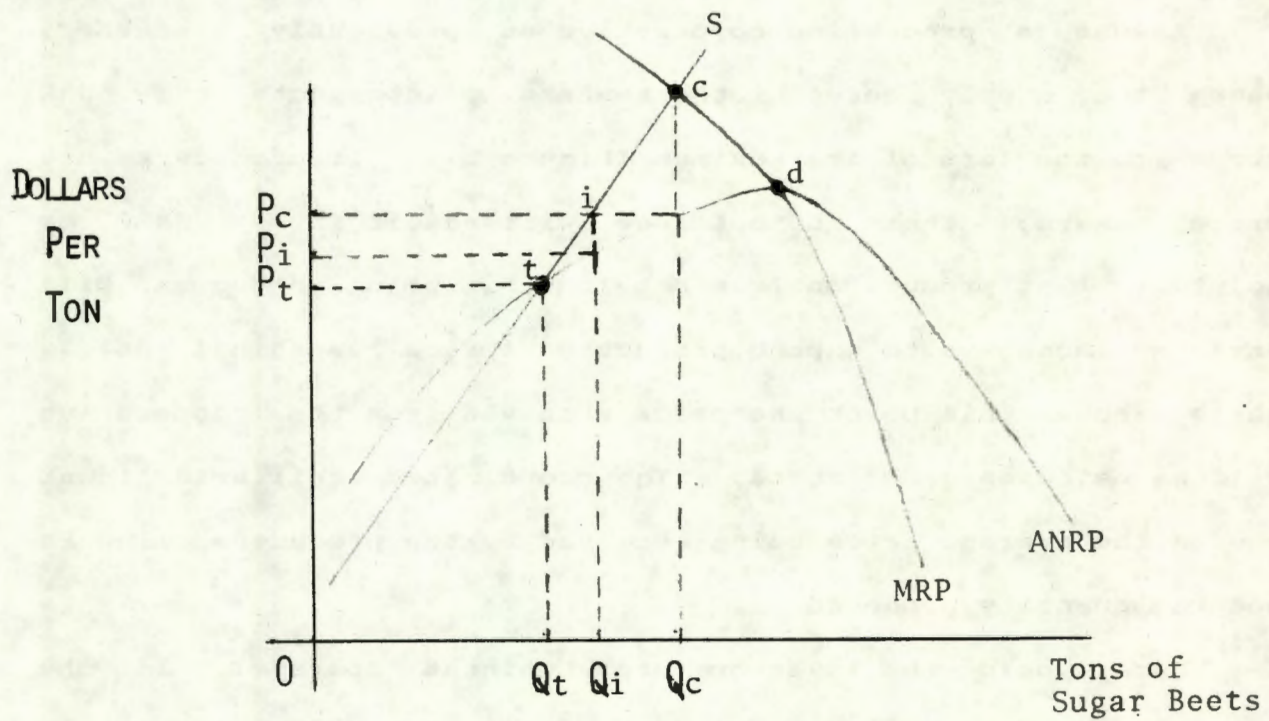
Coordinated Equilibrium

Again the coordinated equilibrium by the cooperative membership at point c is unstable. The marginal costs of producing the additional output is greater than price received for the product. The cooperative must again resort to some form of internal control or motivation techniques. This is necessary to obtain the production required to achieve the higher price offered through coordination. The cooperative could have supply quotas to insure that there is not under production or have monetary penalties for underdeliveries by producers. Again educational activities could be undertaken but some form of disciplinary action must exist for underproduction (Lopez and Spreen).

Another alternative is to attempt to increase membership and therefore shift the supply curve to the right. Youde and Helmberger have argued that membership would be expanded to the point where MRP = ANRP = S. This would be a stable equilibrium for the cooperative and prices would be at their maximum for the producer if S does not continue to shift to the right.

Therefore, a coordinated cooperative processor will result in producers increasing their ouput level and price for their commodity. From society's viewpoint economic efficiency is improved because the marginal value product and marginal costs are equated in the system.

Supply Cooperative and Declining Costs

The supply cooperatives can also have underutilized capacity. The excess capacity in the farming and agribusiness

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sectors in the 1980's implied that the physical plants of investor-owned and cooperative businesses were not being fully utilized.

Assume the cost structure and demand structure indicated by Figure 6. The cost structure for the firm is such that the point of minimum average total cost is not achieved at any demand level. Marginal cost is below average cost at all levels of sales. The two basic cooperative pricing strategies are average cost or marginal cost pricing.

The investor-owned firm will maximize profit by producing where marginal cost equals marginal revenue. The price charged will be Pm with Qm being merchandised. A feature of this analyis is that the investor-owned firm results in the restriction of output and high prices. The exercising of market power reduces the welfare of consumers.

If the cooperative requires that ATC = AR, The cooperative will be following an average cost pricing strategy of charging Pa and selling Qa. The cooperative will reduce the dead weight loss to consumers equal to abde. Dead weight loss refers to the additional consumer surplus above marginal costs that would have been lost if the additional output had not been produced. The price reduction will also result in a major direct transfer, edPmPatc, from the firm to the member-patron.

However, Sexton has agrued that marginal cost pricing is superior to average cost pricing (Sexton 1983). The cooperative can increase its benefits by increasing output to the point where the. MC curve intersects the demand curve at c. The area under the demand curve represents the willingness to pay for the

additional output, while the area under the marginal cost curve indicates the additional cost of producing that output. The net result is a further reduction in deadweight loss of abc.

This recommendation has the problem that if the cooperative charges only Pmc for the product, that average revenues will be less than average total costs. This implies the cooperative will operate at a loss and will eventually have to exit the industry. Alternative funding must be found. This loss has to be made up with some form of membership fee or fixed fee based on expected patronage. However, the appropriate allocation method must not cause the members to stop patronizing the cooperative. For example, high transaction costs may cause this difficulty.

Nonmember Business

Another approach for handling decreasing returns is for processing and supply cooperatives to deal with nonmembers (Lopez and Spreen). By increasing the processing and sales volumes, the cooperatives can lower the average total cost for members. The major question is how much output should be obtained from nonmembers versus members?

Again assume the processing cooperative is operating in the decreasing cost region (Figure 7). The open market price for nonmember product is Po and assume the cooperative is not large enough to influence the open market price for the commodity. At Qm the cooperative's member-patrons become a more expensive source than the open market. The cooperative can add to the cooperative surplus by purchasing from nonmembers because MRP > Po. The cooperative would purchase nonmember production until

FIGURE 7: A PROCESSING COOPERATIVE OPERATING IN THE DECLINING COST REGION OF ITS COST FUNCTION AND NONMEMBER SUPPLY IS AVAILABLE.
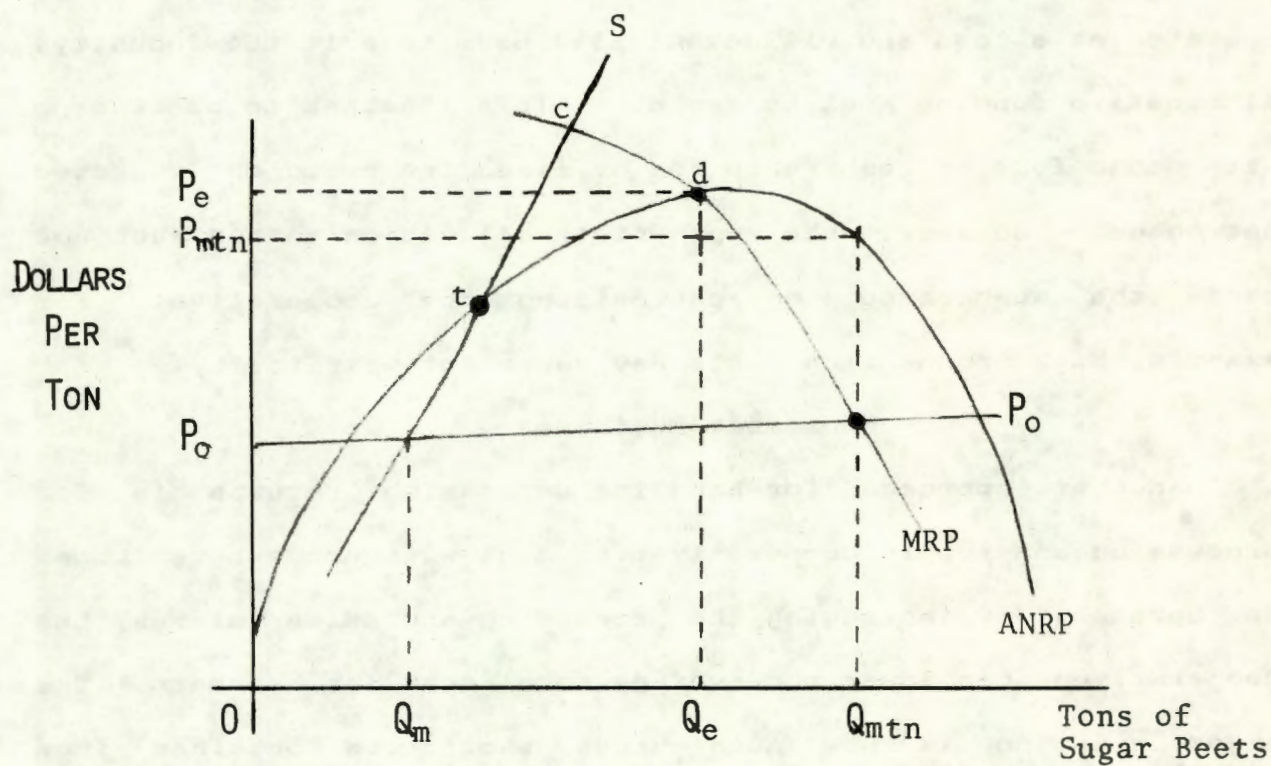
MRP = Po.   The quantity of nonmember business purchased would equal Qmtn minus Qm.

Treatment of Nonmembers

The analysis assumes that the cooperative will distribute the additional cooperative surplus back to the membership only. Therefore, the revenue the member receives per unit of production will be higher than indicated by the ANRP curve. The maximum average revenue for the member-patron in this situation will occur at the point when the cooperative surplus is at a maximum. Even if the cooperative has to pay an income tax on nonmember business, this optimal level will not be altered.

If the cooperatve distributes patronage refunds to nonmembers as well as to members, what would be the decision rule of the cooperative?   No doubt the board of directors would be interested in maximizing the benefits of the cooperative to its members not nonmembers. The membership will be interested in receiving the maximum ANRP per unit marketed.   Purchasing additional output beyond Qe only results in decreasing the ANRP received by the cooperative member-patrons.

Nonmembers and Supply Cooperatives

Supply cooperatives operating in the declining cost proportion of their cost function also have a cost incentive to expand the nonmember purchases. The expansion of purchases by nonmembers increases the total quantity sold and reduces the average total cost and marginal cost of providing the product to members.   If the cooperative's organizational objective is obtaining the minimum net price for member, nonmember business will be expanded to the point, where average total cost achieves

its minimum. The average cost pricing strategy and marginal cost strategy would provide the same equilibrium (Figure 8).

However, this assumes that the cooperative is not operated in a manner, where potential profits associated with nonmember business are not transferred back to the membership. This discrimination between members and nonmembers will alter the incentive system within the cooperative. The larger the proportion of business done with nonmembers, the greater the incentive of the members to use the nonmember business as a profit center. Increasingly, the cooperative will operate like a profit maximizing firm as the nonmember business become a more significant proportion of total revenues. Eisenstat and Masson provide additional insights in processing cooperative conduct and performance by examining the implications of price discrimination and additional market structures.

Consider the case where a supply cooperative is operating in the declining portion of the average total cost curve. The nonmembership demand for the product is not large enough for the cooperative to achieve the minimum of the average total cost curve. If the average cost pricing is followed the price charged by the cooperative will decline to Pac'.

The marginal cost pricing proposal would imply a lowering of the price to Pmc'. The deadweight loss gain for the member-patrons would be offset by increases in total costs. However, the cost of providing the service to the nonmembers above the price paid for the service is cde. The board of directors and membership are not going to be concerned about the gains in

nonmember consumer surplus, ceg. In this example, the average losses per unit that would have to be compensated for by the members would actually increase with the expanded membership.

The actual pricing strategy of the cooperative members would probably require that the expansion in nonmember business at least does not increase the net price paid by the members. In fact, the membership will probably desire that the cooperative price the additional product sold to maximize net returns, this would ensure the lowest possible net price for members. The actual pricing decision is dependent upon the cooperative's cost, and member and nonmember demand characteristics.

Nonmember business motivates a cooperative to act increasingly like an investor-owned business in its pricing policies. Therefore, the asserted societal welfare gains in terms of increased output and lower prices for consumers are mitigated. The cooperative membership policies must be evaluated carefully (Youde; Youde and Helmberger).

Conclusions About the Cooperative Management Puzzle

The decision rules that govern the management decisions of investor-owned businesses are rather consistent. The maximization of profit and the value of the firm are generally accepted as being the primary organizational goals. This leads to basic decision rules such as "marginal costs equaling marginal revenues."

Cooperatives have considerable more management uncertainty in terms of organizational objectives and decisions rules. Open versus closed membership, marginal cost versus average cost pricing, and service versus profits are some of the causes of

management uncertainty.   How do the board of directors,
managers, and patron-owners establish performance criteria for a
cooperative organization.   The temptation frequently is to
compare the financial performance of cooperative agribusiness to
the financial performance of investor-owned businesses.   Does
theory give us any guidance on this issue?

In a competitive industry the expectation would be for
cooperatives and investor-owned businesses to achieve essentially
the same level of financial performance in the long-run.   Both
types of firms should be earning a normal rate of return on
investment.   In long-run equilibrium the investor-owned and
cooperative will both be operating at the point where
MR=P=ATC=MC.   The expectation would be for similar performance
from the organizations. Comparisions between cooperatives and
investor-owned businesses in established competitive industries
may be a justifiable practice.

Where the issue becomes much more confused is in the short-
run disequilibrium conditions and other aberrations that develop
in the market place.   For example, supply cooperatives in
industries with downward sloping demand curves and increasing
average total cost structure will merchandise products at a lower
price levels and greater levels of output than the investor-owned
firm.   This implies a lower rate of financial return for a supply
cooperative than competing investor-owned businesses.

A processing cooperative operating in the increasing average
total cost region and having a coordinated equilibrium would
establish   the same production level as an   investor-owned

business.   Yet management and the board of directors may receive pressures to limit membership to achieve the maximum ANRP,   A pressure that will actually lower the financial performance below the investor-owned firm.

The desired performance characteristics of a cooperative are as varied as the business environments that exist. Member-patrons, boards of directors and managers should not expect cooperatives to have a simple prescriptive set of rules for operation. The industrial organization considerations have major implications on what should be expected of a cooperative in terms of performance.

SECTION III: IMPLICATIONS OF GAME THEORY FOR ANALYSIS OF COOPERATIVE FIRMS

Game Theory and Cooperatives

The previously discussed economic models did not attempt to analyze the internal choice process of cooperatives.   The results of the internal decision process were assumed to exist-- the results being specific cooperative objectives. However, group choice issues are receiving increased attention by cooperative management, boards of directors and member-patrons. As the size distribution of farmers becomes more asymmetric, cooperatives are under increasing pressure from large farmers to institute price discount schedules for large volumes. Also, farms are becoming increasingly specialized in specific commodity complexes with little diversification.   Large diversified cooperatives have intensified infighting among commodity groups because the member-patrons' self-interests have become less homogeneous.

Game theory involves the study of situations where two or

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more members of a group are at least partially conflicting (Chiang). The two major game categories are games of chance and games of strategy. A game of chance are games where no skill is involved in the game. Games of strategy involve deliberate choice or a course of action which implies specific outcomes. The application of game theory to cooperatives involves games of strategy. A comprehensive discussion of game theory and its application to cooperatives is not undertaken but rather a review of the basic insights that have developed from recent research conducted by Sexton and Staatz. Those interested in more specific applications of game theory to cooperatives should read the referenced articles by Staatz and Sexton.

Cooperative Games

Many cooperative group choice decisions can be conceptualized as being "n-person cooperative game."

> "In the parlance of game theory, cooperative games are
> games in which players are allowed to communicate and
> make binding commitments with one another. The theory
> of cooperative games is usually used to model situations
> in which there are gains from joint action by a potential
> coalition of players, but where the players must
> bargain among themselves about how the net benefits
> of the joint action are to be shared. Failure to
> to agree on an allocation of net benefits among players
> prevents the coalition from forming (Roth)."
> (Staatz, p. 1085).

It is important to note that as the "players" change in the game, the traditional coalitions may fail. Given the rapid change in the structure of agriculture, a major concern to many cooperatives is whether they can maintain the traditional coalitions.

Considerations in Cost Allocation

Cost allocation is particularity important to cooperatives

as they attempt to implement price discount schedules based volume or deal with conflicts between commodity groups within the cooperative. What are the basic insights gained from game theory that can assist in understanding how cooperatives must deal with these issues?

Assume a supply cooperative is attempting to allocate the costs of providing a specific service to member-patrons. The cooperative's member-patrons are heterogenous in their cost and size characteristics. Also, assume the following:

(1) The total costs of any coalition of producers attempting to produce the service is less than or equal costs of producing the service individually.

(2) The farmers have three choices: (a) purchasing the cooperative's service, (b) purchasing the service from a competing firm or (c) forming a coalition of dissatisfied producers to leave the cooperative.

(3) The demand for the service by one member-patron does not affect another member-patron's demand for the service.

(4) Some of the costs in producing the service are joint costs, costs that cannot be allocated to serving a specific member-patron.

Given these assumptions the board of directors and management must determine how to allocate the costs among the membership. The feasable allocation schemes may include all the cooperatives current member-patrons or smaller coalitions (Staatz). The possibility exists that no feasable allocation scheme exists. If this is the case the cooperative will be disolved.

Factors Affecting Cost Allocation

What are some of the factors that affect the allocation scheme selected by a board of directors and management? Because bargaining involves uncertainty, coalitions of members and single members attempt influence the cost allocation by threats and counterthreats. In evaluating the validity of this posturing by

the membership, attention must be directed towards identification of: (1) How the costs of the other members are affected if a coalition or single member exits from the cooperative? and (2) What are the costs to the coalition or single member if they attempt to obtain the service outside the cooperative?

Consider the price discount issue and assume large farmers represent a major proportion of the business volume of a local cooperative. The withdrawal of their business implies a major reduction in business volume. If the cooperative is operating in the increasing average total cost region, the cooperative may actually move closer to minimum average total cost. The threat of withdrawal is not a major concern to the smaller members. But if the cooperative is operating in the declining cost region of the average total cost curve, the loss of a major proportion of the business volume represents a major threat to smaller producers in terms of higher average total costs.

Another feature of the larger farmer or a coalition of larger farmers is the ability to achieve the economies of scale in the provision of the service. Also, their business volume will be attractive to other agribusinesses. The expectation would be for the larger farmers to have relatively lower costs if they exit from the cooperative. Because of their abilities to affect the costs of other members and establish lower cost coalitions, larger farmers have a relatively strong bargaining position.

The asymmetry of farm size also increases the uncertainties involving the bargaining process. If a cooperative has a

relatively homogeneous membership, the strength of specific coalitions will be better known. Board members and management will have a fairly realistic perspective of the estimated costs of members exiting from the cooperative. With a heterogeneous membership, the actual strength of the bargaining position of a specific coalition probably is more difficult to discern. The board members and management are less likely to be knowledgeable of the actual strength of a specific coalition.

Cooperative Instability

As was discussed earlier in the paper, cooperatives operating beyond minimum average total cost can be politically unstable. Why? The basic reason is that a coalition of membership can lower their costs below that of having the cooperative operate at higher levels of production. If cooperatives are operating in regions beyond minimum ATC, the instability will develop.

This problem also confronts diversified cooperatives, if some divisions are profitable and others are not. If the members patronizing the profitable divisions are not patron of the unprofitable divisions, internal conflicts will develop. Advocacy of getting rid of the unprofitable divisions or forming a new more profitable cooperative may develop. However, offsetting the strategy is the fact that there may be cost savings assocated with the diversified cooperative in business function areas such as finance or marketing.

Fairness of Allocation

With the industrial organization models, there existed the ability to identify specific points of equilibrium. Within the

game theory models, recognition is given to the fact that a large number of feasible cost allocations may exist. The board of director and management decisions on cost allocation will involve a degree of arbitariness. Concepts of fairness, self-interest or cooperative principles may provide guidance to decision makers in the selection of the cost allocation.

Changing the Game

Cooperative management, boards of directors, and member-patrons all have the potential for changing the institution rules governing the cooperatives. Management can change operating procedures and policies. Boards of directors can alter board policies governing managment. Member-patrons can alter by-laws and articles of incorporation.

Cooperative laws can be altered so to affect the bargaining power of specific coalitions. For example, in the past many states required a two-thirds vote of the membership to have a cooperative merger approved. Because of the difficulties involved in developing membership coalitions in favor of the mergers, a number of states have recently passed laws enabling cooperative mergers to be approved by one-half of the membership. Alterations in voting systems affect the relative bargaining power of specific coalitions within cooperatives.

The cooperative can also direct attention towards altering member perceptions of the pay-offs associated with a specific action or change the actual context of the game. An alteration of payoffs would be educational efforts directed toward the nonprecuniary benefits of cooperative membership or changing the

perceptions about the relative importance of short-run gains versus long-run gains. The game context can be changed by tying various services and activities into a package.

Dynamic Markets and Future Theories

The models presented implicitly assume stable markets with fixed technology. The cooperative theory discussed was the comparative statics of cooperatives and investor-owned businesses in stable business environment. The models presented implicitly assume stable markets with fixed technology. Not discussed was the ability of cooperatives to compete in markets with rapid rates of technological change or global competition. A major frontier of cooperative theory will be analysis of potential decisions rules for cooperatives in unstable and global markets. Accelerating rates of technological change make coalitions more unstable and require shorter investment payback periods. The future role of cooperatives will be highly dependent upon their ability to develop business strategies to effectively compete in markets where technology will be a significant competitive strategy.

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