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The Neoclassical Theory of Cooperatives: Part II

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This article provides an introduction to the neoclassical theory of cooperatives, which has been useful for generating insights into the behavior of cooperatives in various market structures, helping cooperatives develop business strategies consistent with their objectives, and informing public policy decisions concerning cooperatives. Part I of the article presented the basic elements of the neoclassical theory as it pertains to farm supply cooperatives. Part II focuses on the neoclassical theory as it applies to marketing cooperatives. Topics covered include strategies for raising member raw product prices, open- and restricted-membership policies, and the effects of cooperatives on economic welfare.

Keywords: Cooperatives, marketing cooperatives, processing cooperatives, neoclassical theory, objectives, strategies, economic welfare, competitive yardstick

Introduction

Part I of this article presented a model of a farm supply cooperative. In Part II, we will build on the economic concepts introduced in that model to develop a model of a marketing cooperative. After discussing the theory of marketing cooperatives, we will evaluate the effects of cooperatives on economic welfare, including the effects of cooperatives on the performance of other firms in imperfect markets. Other topics include strategies for raising member raw product prices and open- and restricted-membership policies. Individuals with an understanding of fundamental economic principles should be able to comprehend the material presented in both parts of this article.

Theory of Marketing Cooperatives

Marketing cooperatives are cooperatives that market farm commodities produced by member farmers. In some cases, a marketing cooperative simply purchases a commodity from its members and resells it to food manufacturing or pro-

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This article was originally developed as a chapter for a planned revision of the textbook, Cooperatives in Agriculture*, edited by David W. Cobia (1989). Accordingly, some of the material presented here reflects ideas contained in a chapter of that book written by the late Brian H. Schmiesing, formerly of South Dakota State University and Southwest Minnesota State University.*

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cessing firms after providing some minimal services such as assembling and grading the commodity. After the cooperative sells the commodity to a manufacturer or processor, it distributes any additional revenues, after deducting transportation or handling costs, to members as patronage refunds. In other cases, the cooperative may process the commodity and sell the processed product to consumers or retailers. In those cases, the patronage refunds include any value added to the commodity by the cooperative.

Here we explore the general case of a processing cooperative that purchases a raw product from its members and uses the raw product to produce a processed product it sells to consumers. For simplicity, we assume that one unit of the raw product is used to produce one unit of the processed product (i.e., the processor is subject to a form of *fixed-proportions production technology*). The model can be applied to a cooperative that simply markets the raw product for its members by considering the processing costs as representing the costs of transporting or marketing the raw product.

Analyses of the price and output decisions of a processing firm frequently utilize the net average revenue product and net marginal revenue product curves. Use of these curves is advantageous because it allows revenues and costs at the processing level to be combined, thereby facilitating the graphical exposition of the relationship between the processor and the producers of the raw product. Derivation of the net average revenue product and net marginal revenue product curves begins with the *net revenue product*, which is defined as the total revenue of the processor less the total cost of processing the raw product. The cost of processing the raw product used to compute the net revenue product does not include the cost of the raw product itself.

Net average revenue product (*NARP*) is defined as net revenue product divided by the quantity of product and is equivalent to the price received by the processor less its average processing cost. It represents the amount per unit that is available for raw product payment and profit. *Net marginal revenue product* (*NMRP*) is defined as the change in net revenue product from processing an additional unit of raw product, and it is equivalent to marginal revenue less marginal processing cost.

The relationship of the *NARP* and *NMRP* curves to processing costs and the demand for the processed product is illustrated in figure 1. The average and marginal processing costs are represented by *APC* and *MPC* in the upper panel. The demand and marginal revenue curves for the processed product are represented by *D* and *MR*. The *NARP* curve, which is shown in the lower panel, is derived by subtracting the *APC* curve from the demand curve, which represents the price (*P*) or average revenue (*AR*) for the processed product. Quantities Q_1 and Q_4 correspond to the intersections of the demand and *APC* curves. Wherever the demand

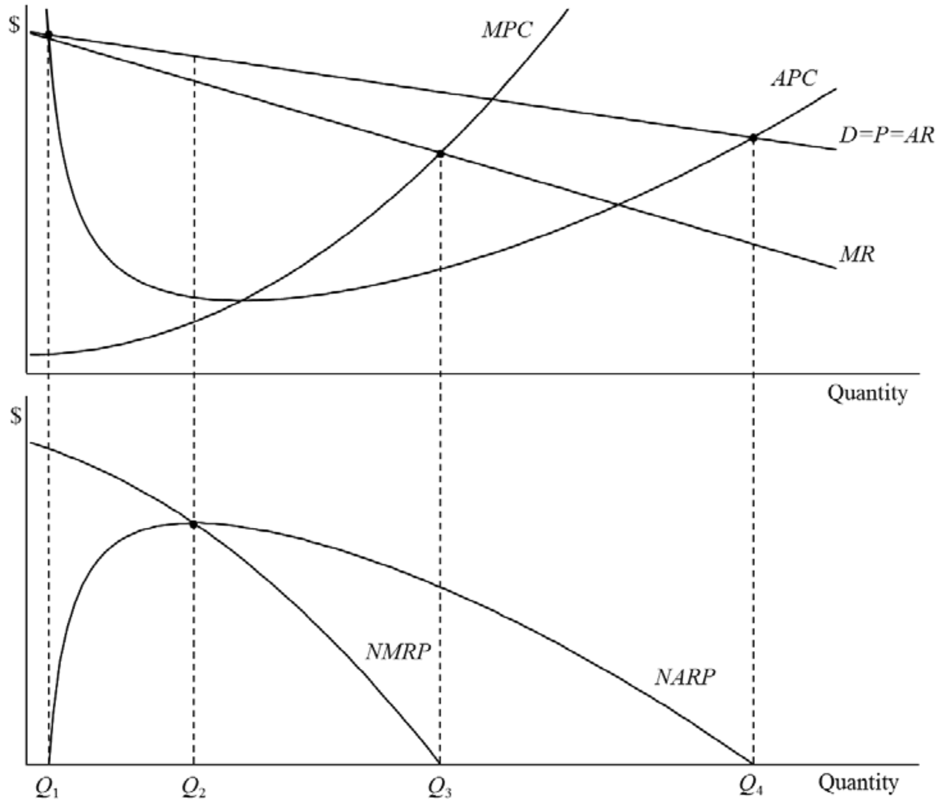

Figure 1. Relationship of the *NARP* and *NMRP* curves to processing costs and processed product demand

curve is above the *APC* curve (i.e., the price is greater than the average processing cost), the *NARP* curve is positive, as it is over the range from Q_1 to Q_4. The maximum of the *NARP* curve corresponds to Q_2, the quantity at which the distance between the demand and *APC* curves is greatest (i.e., where the slopes of the two curves are the same). The *NARP* curve will have a downward-sloping portion if either the demand curve facing the cooperative is downward sloping or if the average processing cost is increasing, as might be expected in the short run.

The *NMRP* curve is derived by subtracting the *MPC* curve from the *MR* curve. It intersects the *NARP* curve through the *NARP* curve's maximum and is positive as long as the *MR* curve is above the *MPC* curve (i.e., marginal revenue is greater than marginal processing cost). The *NMRP* curve intersects the quantity axis at Q_3, which is determined by the intersection of the *MR* and *MPC* curves.

Table 1. Price and output solutions for a marketing cooperative under various objectives

Objective	Criterion	Quantity	Price	Patronage refund	Net price
Maximization of cooperative net earnings	*NMRP = MFC*	Q_1	R_1	$N_1 - R_1$	N_1
Maximization of net price	*NMRP = NARP*	Q_2	R_2	$N_2 - R_2$	N_2
Maximization of member returns (including patronage refunds)	*NMRP = S*	Q_3	R_3	$N_3 - R_3$	N_3
Maximization of quantity	*NARP = S*	Q_4	R_4	0	R_4

Price and Output Solutions for Marketing Cooperatives

Table 1 presents four possible objectives for marketing cooperatives that are analogous to those discussed earlier for farm supply cooperatives.[1] The price and output solutions for these objectives are illustrated in figure 2. In the figure, the *NARP* and *NMRP* curves for a processing cooperative are shown with the raw product supply curve facing the cooperative (*S*). The positive slope of the supply curve reflects that the cooperative cannot purchase whatever quantity of the raw product it chooses at a constant market price. Instead, it must raise the price it pays for the raw product to increase its purchases.

A firm may face an upward-sloping supply curve if it is a *monopsony*, i.e., it is the only processor in the market. In that case, the supply curve facing the firm may be the result of the increasing marginal costs faced by producers. A firm also may face an upward-sloping supply curve if the market is characterized by monopsonistic competition. Under *monopsonistic competition*, there is competition from other processors but each firm has some market power. In those cases, the upward-sloping raw product supply curve facing each processor results in part from the spatial distribution of the processors. If a processor sets a low price for the raw product it purchases, it may receive deliveries only from nearby producers. At higher prices, it may attract additional deliveries from producers who are farther away and relatively closer to competing processors.

The *marginal factor cost* curve represents how much each additional unit of the raw product will cost the processor as it increases the quantity it purchases. If a processor faces an upward-sloping supply curve, as in figure 2, the marginal

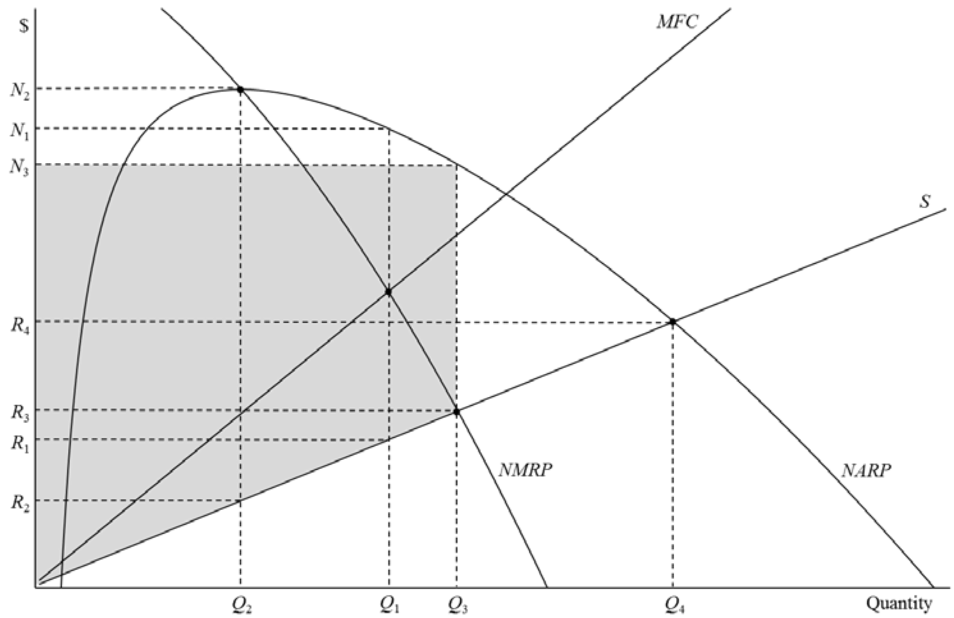

Figure 2. Price and output solutions for a marketing cooperative under various objectives

factor cost curve will lie above the supply curve because to purchase an additional unit of the raw product, the processor must pay a higher price for the other units it purchases.

Like a farm supply cooperative, a marketing cooperative may choose to maximize its net earnings in a manner similar to an investor-owned firm (IOF). To do so, it would set the price it pays for the raw product at R_1 and process Q_1 units, the quantity that corresponds to the intersection of the *NMRP* and *MFC* curves. The cooperative's net earnings would be $(N_1 - R_1) \times Q_1$ where N_1 represents the value of *NARP* at Q_1. Those earnings would be distributed to members in the form of patronage refunds by setting the per-unit patronage refund to $N_1 - R_1$. Adding the per-unit refund to the cash price, the net price paid members would be N_1.

A cooperative that seeks to maximize the net price it pays members would process quantity Q_2, which corresponds to the maximum of the *NARP* curve—the point at which the *NARP* curve is intersected by the *NMRP* curve. The cash price would be R_2, which is relatively low compared to the other solutions. However, after adding the per-unit patronage refund $N_2 – R_2$, the net price is N_2, which represents the maximum price that can be paid.

Maximization of member returns, including the earnings of the cooperative, occurs at Q_3, determined by the intersection of the *NMRP* and supply curves. The cooperative would pay members a cash price of R_3. The net earnings of the cooperative, which are returned to members as patronage refunds, would be $(N_3 - R_3) \times Q_3$. Although these earnings are less than when the cooperative's objective is maximization of net earnings, total member returns are greater than for any other solution.

Member returns consist of two components—the cooperative's net earnings, which are distributed to members as patronage refunds, and the on-farm profits members earn from producing the raw product. The on-farm profits cannot be shown directly in figure 2. However, the figure can be used to illustrate the maximization of member returns if we focus on the producer surplus of members instead of their on-farm profits. As we will see, maximizing the sum of the cooperative's net earnings and producer surplus is equivalent to maximizing member returns.

Producer surplus is the difference between what producers individually must receive to be willing to produce the product, as indicated along the supply curve, and what they actually receive when a single market price is paid for all units. In effect, producer surplus consists of what producers gain because there is a single market price. Graphically, it is equal to the area above the supply curve and below the market price.

In figure 2, producer surplus is represented by the triangular area above the supply curve S and below the raw product price R_3. The area $R_3 \times Q_3$ represents the revenues producers receive from sale of the raw product. If we assume the supply curve represents the marginal cost of producing the raw product, the triangular area below the supply curve represents the total variable cost of production.[2] Thus the triangular area above the supply curve represents producers' on-farm profits and fixed costs.

Because fixed costs are constant with respect to changes in quantity, maximization of the cooperative's net earnings and producer surplus is equivalent to maximization of member returns—the sum of the cooperative's net earnings and the on-farm profits of members. Both are maximized at Q_3. Maximum member returns from the cooperative purchasing and processing the raw product are represented by the shaded area in figure 2, which consists of the rectangular area $(N_3 - R_3) \times Q_3$ that represents the cooperative's net earnings and the triangular area above the supply curve that represents producer surplus.

The quantity of raw product processed by the cooperative is maximized at Q_4, determined by the intersection of the *NARP* and supply curves. As in the case of a farm supply cooperative, the maximization of output may represent the only equilibrium solution. In the solutions for the other three objectives listed in table 1, members will have an incentive to increase their deliveries to the cooperative if they take patronage refunds into account in making their marketing decisions.

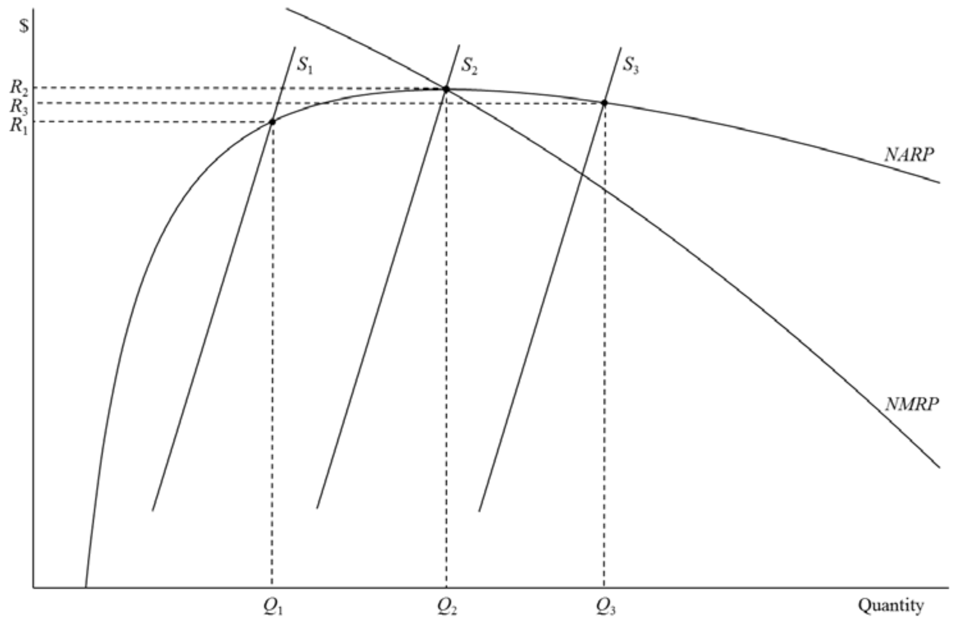

Figure 3. Strategies for raising the raw product price

The supply of the raw product will increase until it reaches Q_4. At that level, the price of the processed product equals the sum of the raw product price and the per-unit cost of processing the raw product. The patronage refund is zero, so members no longer have an incentive to increase supply. A cooperative that pursues an objective other than the maximization of quantity may need to resort to a nonprice instrument such as delivery or supply quotas to restrict output.[3]

Strategies for Raising the Raw Product Price

Just as farm supply cooperatives may be interested in strategies for reducing the cost of providing a farm input to members, marketing cooperatives may be interested in ways they can raise the price they pay members for the raw product. So we can focus on the raw product price, assume the cooperative sets the price equal to *NARP*. In other words, it pays a raw product price equal to the difference between the processed product price and the average processing cost so it just covers its costs.

Consider the marketing cooperative represented in figure 3. Assume the raw product supply curve facing the cooperative is S_1. The cooperative would process Q_1 units of the raw product and pay members a net price of R_1. A cooperative such as this, which is operating along the upward-sloping portion of its *NARP* curve, might benefit from shifting the supply curve to the right. For example, if this cooperative could shift the supply curve it faces to S_2, where it intersects the *NARP* curve at the maximum, the cooperative would be able to raise the net price to R_2. It might be able to accomplish this by accepting new members or encouraging existing members to expand their production.

A cooperative that is operating along the downward-sloping portion of its *NARP* curve may be able to raise the raw product price it pays by shifting the supply curve to the left. Assume the supply curve facing the cooperative is S_3. If the cooperative could shift the supply curve from S_3 to S_2, it would be able to raise the net price from R_3 to R_2. It might be able to accomplish this by implementing delivery quotas or some other nonprice instrument.

Another way a cooperative might be able to increase the price it pays members is to adjust the capacity of its processing plant in the same manner as a farm supply cooperative might adjust the capacity of the plant it uses to manufacture a farm input. Remember that the *NARP* curve is derived by subtracting average processing cost from the processed product price. Consequently, if the cooperative can lower its processing costs by building a new processing plant or adjusting the size of its existing plant, it can shift its *NARP* curve upward, thereby increasing the price it is able to pay.

Open- and Restricted-Membership Cooperatives

To avoid operating along the downward-sloping portion of its *NARP* curve, a cooperative might adopt a *restricted-membership* policy (also called a *closed-membership* policy). Under a restricted-membership policy, a cooperative limits its membership so it can maximize the raw product price it pays current members. Under an *open-membership* policy, a cooperative accepts any producer who applies for membership. As a consequence, it may not be able to limit raw product deliveries.

Assume the raw product supplied by all producers in a cooperative's trade area is represented by the supply curve S_3 in figure 3. A restricted-membership cooperative would fix its membership so the member supply curve is S_2. Consequently, it would process Q_2 units and pay its members a price of R_2. If the cooperative were to follow an open-membership policy, member supply might eventually shift to S_3, expanding the raw product processed by the cooperative to Q_3. As a result, the raw product price would fall to R_3.

Note that if the cooperative were operating along the upward-sloping portion of its *NARP* curve, it might choose to accept new members so it could shift the raw product supply curve to the right. Some marketing cooperatives have alternately adopted open- and restricted-membership policies to balance member supply with changing market conditions over time.

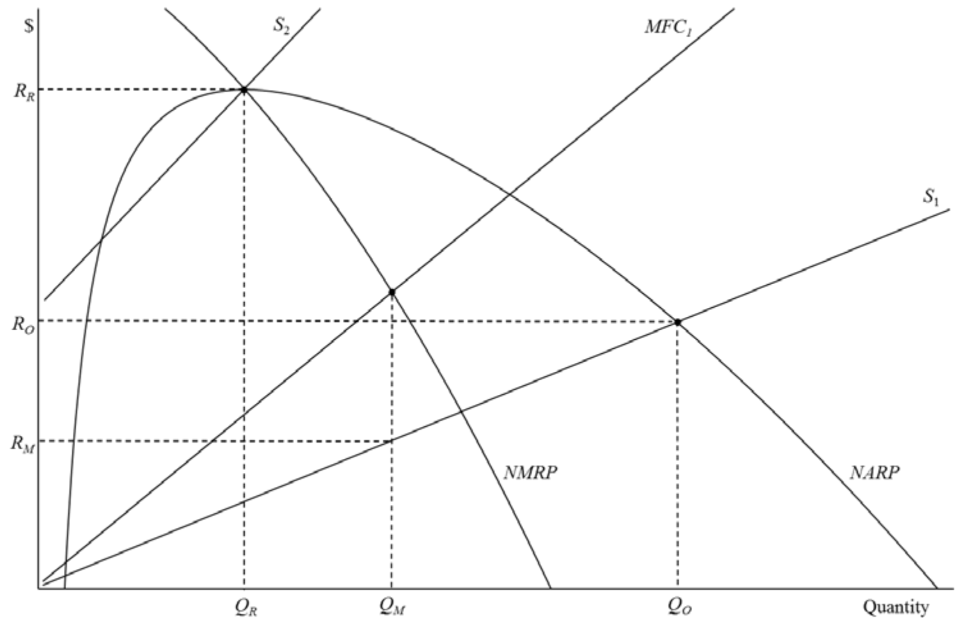

Figure 4. Long-run equilibria for IOFs and cooperatives given barriers to entry

Long-Run Equilibria for Marketing Cooperatives

In the long run, a processor may be able to increase its profits or improve its efficiency by adjusting the scale of its processing plant. Meanwhile, the raw product supply curve and the processed product demand curve facing the processor can shift, and its costs can change over time.

Figure 4 shows a processor's long-run *NARP* and *NMRP* curves as well as the long-run supply (S_1) and marginal factor cost (MFC_1) curves it faces. At first, assume there are barriers to entry to prevent new processors from entering the market. In other words, the shape and position of the long-run supply curve are unaffected by the entry of other firms.

An IOF that seeks to maximize profits (a monopsony) would set output so $NMRP = MFC_1$. It would pay producers a raw product price of R_M and process Q_M units of output. An open-membership cooperative with the same *NARP* and *NMRP* curves would process Q_O units, determined by the intersection of the supply and *NARP* curves. The cooperative would pay members a price of R_O. Consumers would benefit from greater output and a lower processed product price, and producers would benefit from a higher raw product price.

The implications of a restricted-membership policy are much different. A restricted-membership cooperative would act to limit its membership so the supply curve it faces would intersect the *NARP* curve at the maximum, as S_2 does. The cooperative would process Q_R units and pay members a price of R_R. Although producers would benefit from a higher raw product price, consumers would be faced with reduced output and a higher processed product price. In this case, the cooperative restricts output to a level even lower than the monopsony, a result first reported by Helmberger (1964).

If there are no barriers to entry, the entry of new processors into the market could shift the supply curve facing an individual firm to the left as more firms compete for delivery of the raw product. Ultimately, the supply curve could shift leftward until it is tangent to the *NARP* curve and processor profits are zero, an outcome analogous to the long-run equilibrium for monopolistic competition described in Part I. However, the costs of constructing new processing plants may present a barrier to entry, especially in markets that are sparse relative to the size of plant necessary for efficient operation. As a result, many raw product markets may be characterized by monopsony instead of monopsonistic competition. Indeed, there have been numerous instances when agricultural producers have been forced to organize a cooperative to provide a market for their output after the exit of the area's only processor.

Effects of Cooperatives on Economic Welfare

Public policy concerning cooperatives generally has been supportive. Cooperatives have benefited from favorable treatment with respect to tax status, credit access, technical assistance, and limited immunity from antitrust laws. This support is based largely on the notion that cooperatives are procompetitive forces that improve the performance of imperfect markets and increase general economic welfare.

Economic welfare consists of the sum of the consumer surplus and producer surplus received by market participants. It is maximized when the cost of producing the last unit of a product, as represented by the marginal cost, equals the value of that last unit to buyers, as represented by the market price. A firm or market can be said to allocate resources efficiently if it uses them in such a way that economic welfare is maximized.

The benchmark for market comparisons is perfect competition because perfectly competitive firms are characterized by *allocative efficiency* in that they produce the quantity at which price equals marginal cost. In analyzing cooperative market performance, we will be interested in determining those cases in which cooperatives can be expected to behave in the same manner as perfectly competitive firms, i.e., the cooperatives are characterized by allocative efficiency.

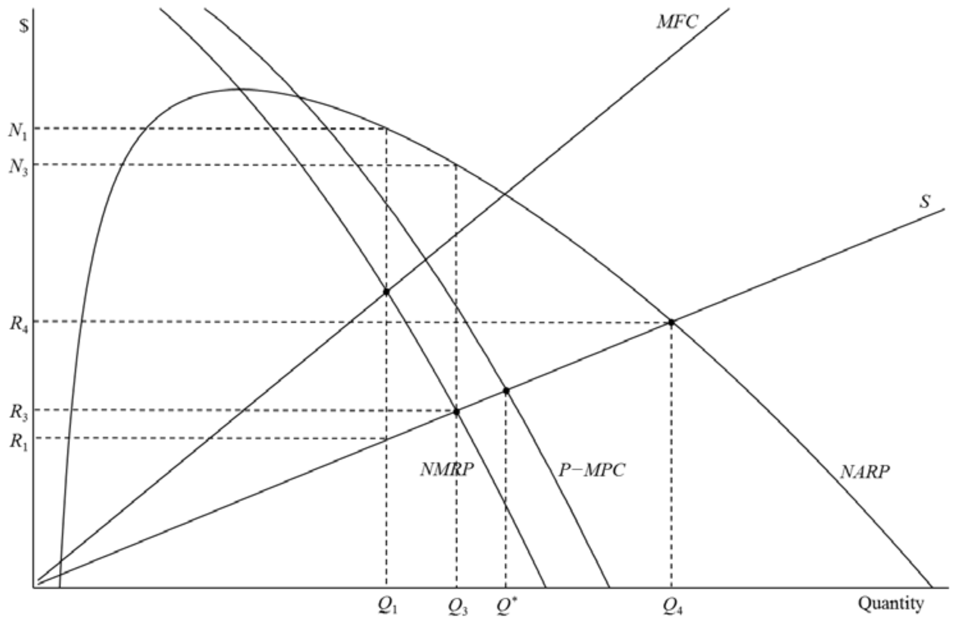

Figure 5. Comparison of three price and output solutions to the welfare-maximizing solution

Even when cooperatives are not efficient in an allocative sense, they may be preferred to profit-maximizing firms if they create a greater level of economic welfare.

In figure 5, we compare the short-run price and output solutions for processors maximizing profits, member returns, and quantity to the welfare-maximizing solution. To facilitate the comparison, we assume the raw product supply curve (*S*) represents the marginal cost to farmers of producing the raw product. We also add a curve labeled *P – MPC* to the figure. This curve represents the difference between the market price for the processed product and the marginal processing cost. It is derived by subtracting marginal processing cost from *D*, the demand curve for the processed product as shown in figure 1.

Economic welfare is maximized when the processed product price equals the sum of the marginal production and processing costs, as at Q^* in figure 5. A profit-maximizing processor would set *NMRP* equal to *MFC* at Q_1. The firm would restrict output to less than Q^* by acting as a monopoly in the processed product market and a monopsony in the raw product market. More output would be socially desirable because the marginal cost of producing the last unit, which consists of the sum of the marginal cost of producing the raw product represented by *S* and the marginal processing cost *MPC*, would be less than its value to consumers, as represented by the processed product price *P*. The firm would produce the efficient level of output only if it were a price taker in both markets, i.e., both the processed product demand curve and the raw product supply curve were horizontal.

A cooperative that maximizes member returns would set *NMRP* equal to the marginal cost of producing the raw product. The cooperative's output Q_3 would be greater than that of a profit-maximizing firm but less than the efficient level of output. Like a profit-maximizing firm, it would act as a monopoly in the processed product market if it faced a downward-sloping demand curve, but it would behave like a perfectly competitive firm if it faced a horizontal demand curve. Regardless of the slope of the demand curve, the cooperative would act like a perfectly competitive firm in the raw product market because it returns its earnings to members. Because marketing cooperatives are often price takers in the markets in which they sell, cooperatives that seek to maximize member returns can be expected to result in an efficient allocation of resources in those markets.

A cooperative that maximizes quantity would generally overproduce relative to the efficient level. It would produce Q_4, the quantity at which *NARP* equals the marginal cost of producing the raw product. Production exceeds what is socially desirable because the marginal cost of producing the last unit, i.e., the sum of the marginal cost of producing the raw product and the marginal processing cost, exceeds its value to consumers. There is a misallocation of resources because the resources used in producing the last unit could have been used better in the production of some other good. The cooperative would produce the efficient level of output only if the marginal processing cost is equal to the average processing cost as it is at the minimum of the average processing cost curve or under a cost structure characterized by constant marginal processing costs.

Similar conclusions can be drawn for farm supply firms. For a farm supply firm, welfare maximization requires that the firm produce the quantity of farm input for which price equals marginal cost. A profit-maximizing firm would produce this quantity if it were a price taker. However, if it faces a downward-sloping demand curve, it would act like a monopoly by restricting output so marginal revenue and marginal cost are equal. Regardless of the slope of the demand curve, a cooperative that maximizes member returns will produce the efficient level of output by setting price equal to marginal cost. It will not restrict output, as a monopoly would, when facing its members' demand. A cooperative that maximizes quantity generally will overproduce by operating where price equals average cost. It will produce at the efficient level only if average cost equals marginal cost.

Effects on Other Firms

An important dimension of the economic performance of cooperatives concerns the effects they can be expected to have on other firms in imperfect markets. According to the *competitive yardstick* concept, the presence of a cooperative in a market will force profit-maximizing firms to behave more competitively. The logic behind the competitive yardstick is that the cooperative will offer farmers more favorable prices because of its practice of providing members service at cost. Competing firms must match the cooperative's price to avoid losing customers to it. Consequently, the market will move toward competitive equilibrium. Beneficiaries of the cooperative's presence in the market include both its members, who receive service at cost, and farmers who continue to patronize other firms but receive a better price. Consumers also benefit from greater output and a lower price.

Helmberger (1964) contended that an important factor in determining the existence of the yardstick effect is the cooperative's membership policy. If faced with a downward-sloping demand curve or increasing average processing costs, only an open-membership cooperative could be expected to exert a positive effect on competition. LeVay (1983) challenged Helmberger's conclusion by arguing that an open-membership cooperative will produce beyond the socially desirable level by accepting whatever quantity of raw product members choose to deliver. LeVay conceded that economic welfare still could be enhanced by the stimulating effect an open-membership cooperative would have on competing firms but insisted that this role might also be filled by a cooperative that restricts output to maximize member returns.

Cotterill (1997) has constructed a graphical presentation to describe how the competitive yardstick effect might work in a food processing industry. In his model, farmers produce a raw product that is purchased by processing firms that process the product and sell it to consumers. The processing industry is a *duopoly*, i.e., it consists of two firms—an IOF and a cooperative in this case. The firms compete in prices, and there are barriers to entry. Both firms maximize profits, but the cooperative distributes its profits to members in proportion to patronage. The cooperative also maintains an open-membership policy, which is essential to the results.

Members respond to the receipt of patronage refunds by increasing their output of the raw product. Thus the cooperative must sell a greater quantity of the processed product, and to do so, it must lower its price. In response to the lower price, consumers switch to the cooperative, and the demand curve facing the IOF shifts to the left. As a result, the IOF must lower its price as well. Through this movement of prices, both firms tend toward equilibrium. At equilibrium, the cooperative's price is just sufficient to cover its long-run average cost. The IOF sells a smaller quantity at a higher price and still makes a profit. However, its equilibrium price is lower than if the cooperative had been another IOF.[4]

Several other models, including that developed by Tennbakk (1995), have used a mathematical approach to show that in a duopoly consisting of profit-maximizing firms, the replacement of one of the firms by a cooperative that maximizes member returns will result in greater industry output and economic welfare. However, those models are not based on the dynamics of the competitive yardstick model. Instead, the profit-maximizing firm and the cooperative make their output decisions simultaneously.[5]

Conclusions

An analysis of the short-run price and output solutions for marketing cooperatives suggests they may differ substantially from those of IOFs, as was the case for farm supply cooperatives. Likewise, because marketing cooperatives may have objectives other than profit maximization, strategies used by IOFs may not be appropriate for them. Strategies for raising the raw product price a cooperative pays members are described here.

In the long run, the quantity of raw product processed by a marketing cooperative depends on its membership policy. A cooperative with an open-membership policy may process a greater quantity than a profit-maximizing firm. However, a cooperative with a restricted-membership policy may limit output to a level lower than a monopsony to pay members the highest possible raw product price.

Public policy concerning cooperatives generally has been supportive because of the notion that cooperatives are procompetitive forces that improve the performance of markets and increase general economic welfare. In the case of a single processor, a cooperative that maximizes member returns may process a greater level of output than if it were a profit-maximizing IOF. On the other hand, a cooperative that maximizes quantity may process more than a competitive market or what is socially desirable. Similar conclusions can be drawn for farm supply cooperatives.

An important dimension of the economic performance of cooperatives concerns the effects they can be expected to have on other firms in imperfect markets. According to the competitive yardstick concept, the presence of a cooperative in a market will force profit-maximizing firms to behave more competitively by offering farmers more favorable prices to avoid losing customers. It has been argued that the existence of the yardstick effect depends on the cooperative's membership policy because only an open-membership cooperative can be expected to exert a positive effect on competition. However, economic models have demonstrated that a cooperative that maximizes member returns can result in greater industry output and economic welfare as well.

Notes

1. Empirical investigations on which objectives cooperatives choose to pursue have yielded mixed results. In a study of California cotton ginning cooperatives, Sexton, Wilson, and Wann (1989) concluded that their data indicated that the cooperatives operated near the maximum of the *NARP* curve, a result consistent with the Helmberger and Hoos (1962) objective of maximizing the raw product price for whatever quantity members choose to supply. Featherstone and Rahman (1996) conducted a study of Midwestern farm supply and marketing cooperatives in which they concluded that there was strong support for the minimization of average costs and little support for profit maximization as the objective of the cooperatives. More recently, Boyle (2004), in a study of Irish dairy processing cooperatives, concluded that the rule those cooperatives used to price milk was based on the *NMRP* curve rather than the *NARP* curve, a finding consistent with an objective of maximizing either processor or producer profits.

2. Transportation costs can be included in variable costs when there is a spatial dimension to the raw product market. Because average transportation costs can be expected to rise as the distance between the processor and producers increases, the supply curve will have a steeper slope.

3. Lopez and Spreen (1985) have also referred to processing rights, penalty schemes, and allocating cooperative earnings to members according a criterion unrelated to patronage. Sexton, Wilson, and Wann (1989) have mentioned multipart pricing schemes.

4. Cotterill (1997) has also presented a model of how the competitive yardstick effect might work in a food processing industry characterized by monopolistic competition and consisting of several IOFs and a single cooperative. In that model, both the IOFs and cooperative maximize profits. The firms may engage in either price or nonprice competition, but initially they are involved in nonprice competition through the creation of brands. Again, the cooperative must lower its price to sell the greater output due to its members' response to the receipt of patronage refunds. Consequently, the IOFs are forced to compete in price, and the inefficiency associated with excessive brand creation is eliminated.

5. The Tennbakk model consists of a Cournot duopoly in which both firms simultaneously set quantities while assuming the other firm will not vary its output in response. The model also assumes constant marginal costs and a downward-sloping linear demand curve. The increase in output associated with the replacement of one of the profit-maximizing firms with a cooperative is due to the cooperative's output rather than an increase in the output of the remaining profit-maximizing firm, which actually decreases.

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