The Economic Role and Limitations of Cooperatives: An Investment Cash Flow Derivation

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The economic role and limitations of cooperatives are derived using an approach based on investment cash flows and net present value. Cooperatives are viewed as an option for member investment as well as an option for member patronage. The investment approach yields results similar to the traditional paradigms that focus on patronage. In addition, the approach makes more explicit the impact of member investment on cooperative existence, valuation, performance measurement, and strategy options.

The purpose of this article is to derive the economic role and limitations of cooperatives from an investment perspective, rather than from the more traditional patronage viewpoint. This alternative approach uses investment cash flows and net present value as its primary analytic tools. The value of such an investment cash flow approach arises from its focus on the cooperative as a investment for members, as well as a means of marketing member products or supplying member inputs.

The Reason for an Investment Approach

Members are not only patrons buying or selling goods through their cooperative. They are also the suppliers of capital as owners of the firm. Yet, cooperatives seldom pay dividends or any other explicit return to capital. It follows then that returns on cooperative capital most often find their way back to the member-owner through patronage dividends and/or cooperative pricing policies. Members should thus treat some of their cash flows from their cooperatives as returns to ownership capital and not merely as results of product pricing. But, do they?

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The potential problem here is that members, directors, and/or managements of cooperatives can become confused about what constitutes legitimate cooperative performance. Take a dairy marketing cooperative as an example. If it processes milk efficiently for retail sale to consumers, it will invest in substantial assets. These assets will produce a return similar to that gained by any other type of firm operating these same assets. Now, if this cooperative rebates these asset returns through a patronage refund, will it have created real benefits for the members? The answer to this question is no. As long as investment is proportional to patronage, the member would have been as well off investing in the stock of a consumer products company selling milk products as investing in the cooperative.[1] Actually, the member would be better off since the stock investment would be more liquid than the cooperative investment. It follows then that cooperatives should create benefits by means other than simply rebating the returns from assets that they operate elsewhere in the market chain from the members' farms.

The value of an approach focused on cooperative investment cash flows arises from keeping the nature of members' investments central to the analysis and not implicit within it. As cooperatives have grown larger and have invested increasingly large sums in operating assets, the issue of investment has taken on greater importance. Members also have an increasing array of alternative investments, e.g., options, futures, to consider for use in managing their portfolio returns. These alternatives may well provide substantial competition for cooperative investment since they too can help enhance farm returns or make farm returns less risky. As a result of these trends, cooperative boards and managements need help in making cooperative-level investment decisions, and boards, managements, and members all need help in properly assessing cooperative performance in the light of all alternatives open to members, both on the investment side *and* on the patronage side of their total portfolios. An investment paradigm for cooperatives would seem well suited to these needs. Of past works, Cotterill comes closest to taking an approach similar to that taken here.

The Unique Character of Cooperatives as Investments

The development of an investment paradigm needs to begin at the most fundamental level. What is unique about cooperative investment that causes it to exist as a separate form of business ownership?

One of the classic "principles" that distinguishes cooperatives from other forms of business is the requirement that equity holders in a cooperative must be patrons of the firm. The decision to become a cooperative member is thus a *joint* decision to both invest in a cooperative's assets *and* patronize the cooperative firm. In contrast, the decision to patronize a noncooperative firm does not require an investment in the firm's assets. The decisions to invest and patronize can be made separately in the latter instance. The bundling or joint nature of investment and patronage cash flows is thus the unique character of cooperative investment.

From the perspective of investment, a cooperative is no more or less a creature of its owners than any other form of investor-owned firm. The only

real difference is that cooperative investors must also patronize the firm they own by either selling to it or buying from it. This may well mean (as will be shown shortly) that cooperative investors will value things differently than investors in other types of firms, but the cooperative itself must be as equally intent as other firms on fulfilling the needs of its own investors. In light of this analysis, the common usage of IOF (investor-oriented firm) to distinguish other types of firms from cooperatives is not helpful. Cooperatives are IOFs with a patronage twist. Further, from a member's point of view as an investor, a cooperative is not an extension of the member's farm assets; it is rather one of many alternative investments in assets other than the farm. Granted, a cooperative's assets may be operated with special concern for the members' farm assets, but the cooperative assets are separate assets nonetheless. For the remainder of this paper, the term "farm assets" will refer to assets invested in the productive capacity of a farm, and the term "cooperative assets" will refer to assets invested jointly by members but at some other point in the market chain either forward or backward from the farm. Firms that do not have the cooperative business form will be referred to as NCFs (noncooperative firms).

This view of cooperatives as investments is not intended to replace or refute the more traditional patronage view with its focus on pricing and membership association issues. It is designed instead to provide a companion view that complements the traditional one. In a sense, the investment approach is a form of dual to the classic patronage paradigm. It produces similar results but from a different perspective.

Conditions for Cooperative Existence

Under what circumstances would a producer find the joint decision to invest and patronize beneficial and thus be motivated to join a cooperative? To answer this question, assumptions must be made about the economic environment and the nature of investment decision making among potential members. Assume the following rather simple environment:

ASSUMPTION 1 *All cash flows are perpetual and certain.*

ASSUMPTION 2 *Agricultural producers are rational; they seek to maximize their wealth; and, they evaluate investment opportunities in a manner consistent with net-present-value techniques.*

ASSUMPTION 3 *Agricultural producers can choose to patronize a cooperative or an NCF.*

ASSUMPTION 4 *Agricultural producers can invest in financial assets offered through an efficient capital market.*

Assumptions 1 and 2 are not very realistic, but they produce a clearly understandable set of results. When they are lifted later, the impact will be shown to be only one of degree rather than one of kind.

Given these assumptions, a potential member would decide to join a cooperative only if joining produced more wealth for the member than investing in some alternative asset and patronizing an NCF. Comparing the

Table 1.—Notation Definitions

Symbol	*Definition*
Ac	Periodic *ownership* cash flows generated by a cooperative's *assets*
CE(.)	The certainty equivalent operator (The uncertain values within the parentheses are replaced with equivalent certain values based an individual's risk aversion.)
Fc	Periodic ownership cash flows generated by a potential *member's farm* assets if a *cooperative* is patronized
Fn	Periodic ownership cash flows generated by a potential *member's farm* assets if a *noncooperative firm* is patronized
r	The riskless rate of return
s_j	A specific cooperative business strategy
{*S*}	The set of all feasible cooperative business strategies
Vc	The equity value of the cooperative
Vn	The equity value of a noncooperative investment
X	A member's required proportion of investment to join the cooperative
Y	A proportion of investment that forces $X \times Vc = Y \times Vn$

cash flows from cooperative membership to cash flows from the alternative investment and patronage option is thus essential to the analysis.

Consider the cash flows faced by a producer if cooperative membership is selected. First, the producer must invest in an appropriate share, *X*, of the cooperative's equity value, *Vc*. (All notation is defined in table 1 and in the text.) This investment, $X \times Vc$, will entitle the producer to two different cash flows: (1) an appropriate share, the same *X* as above, of the cooperative's asset returns, *Ac*, or $X \times Ac$ in total[2], and (2) the producer's farm asset returns resulting from patronizing the cooperative. Designate these second returns *Fc*. If these second cash flows were not important in some way, patronizing a cooperative rather than an NCF would not be an issue. *Fc* reflects all farm-level impacts of cooperative patronage including prices offered and the value of any special services rendered by the cooperative. The present value of the two sets of cash flows can be represented as follows:

$$\left(\frac{X \times Ac}{r} - X \times Vc\right) + \frac{Fc}{r} \qquad (1)$$

where r = the riskless rate of return. The terms in parentheses represent the present value of the member's share in the cooperative's assets, and Fc/r represents the present value of future farm cash flows if a cooperative is patronized.

If the producer does not choose the cooperative, then the producer's farm asset returns can be designated, *Fn*, and result from patronizing an NCF. However, to complete the comparison to the cooperative option, the pro-

ducer must invest a sum equivalent to $X \times Vc$ in some other asset. (If the producer had this sum to invest in the cooperative, then it must also be available for investment if the cooperative is not chosen.) Assume that Y is a share of investment in the equity of some other asset, Vn, such that the investment in this other asset becomes equal to what would have been invested in the cooperative, i.e., select Y to make:

$$X \times Vc = Y \times Vn$$

The producer will expect an appropriate share of the returns, $Y \times An$, created by the investment, $Y \times Vn$. The present value from the cash flows associated with the alternative to cooperative membership is thus:

$$\left(\frac{Y \times An}{r} - Y \times Vn\right) + \frac{Fn}{r} \tag{2}$$

Since equation (1) represents the present value of cash flows associated with cooperative membership and equation (2) represents the present value of the alternative to membership, the producer will select cooperative membership only if equation (1) is greater than equation (2):

$$\left(\frac{X \times Ac}{r} - X \times Vc\right) + \frac{Fc}{r} > \left(\frac{Y \times An}{r} - Y \times Vn\right) + \frac{Fn}{r} \tag{3}$$

Equation (3) is thus a necessary condition for cooperative investment and thus for cooperative membership.

Equation (3) can be simplified in two useful ways. First, since $X \times Vc = Y \times Vn$, these two terms can be deleted from both sides of the equation and the r removed from the remainder. This leaves:

$$X \times Ac - Fc > Y \times An - Fn \tag{4}$$

Equation (4) states that a producer will become a member if the sum of the cooperative's asset returns, $X \times Ac$, and the farm asset returns from cooperative patronage, Fc, is greater than the sum of alternative asset returns, $Y \times Vn$, and the farm asset returns from NCF patronage, Fn. This relationship implies that a cooperative can pursue a number of different strategies in the process of attracting producers to become members.

For example, equation (4) is satisfied if a cooperative can produce efficient asset returns, i.e., keep $X \times Ac = Y \times An$, by operating its assets as a competitive NCF would and, at the same time, improve member farm asset returns, i.e., make $Fc > Fn$. This is precisely the classic competitive yardstick strategy (Nourse) that underlies the analyses of Enke; Helmberger and Hoos; and others. (This will be shown to be true later.)

Alternatively, equation (4) is satisfied if a cooperative can maintain member asset returns, i.e., keep $Fc = Fn$, by matching the prices of NCFs and, at the same time, improve on cooperative asset returns, i.e., make $X \times Ac > Y \times An$. Strategies with this result would be based on cooperatives finding special investment opportunities, e.g., serving missing or incomplete markets (Schrader; Sexton and Iskow), due to their unique relationship to members. Strategies that reduce transaction costs (Staatz 1987b; Shaffer) would also fit this situation since a cooperative would be able to produce

more return than other firms using the same assets. (If transaction costs are lowered on both the cooperative and producer sides of a transaction, such strategies might result in improvement both at the farm level, $Fc > Fn$, and at the cooperative level, $X \times Ac > Y \times An$.)

Finally, equation (4) can be satisfied even when $X \times Ac < X \times An$ if Fc is sufficiently larger than Fn. Balancing plants may represent such a strategy. In this case, the cooperative maintains an asset, a balancing plant, which an efficient NCF would probably not maintain since it generates returns for producers and not for the NCF. Having excess assets would thus depress the cooperative's asset returns. However, the gain in farm level returns may more than offset this loss and thus make it rational for the cooperative to pursue such a strategy even when an NCF would not. The same may also be true when a cooperative takes over the assets of a failed NCF in order to maintain member markets.

The real advantage gained from understanding equation (4) is that cooperatives can make trade-offs between cooperative asset returns and member farm asset returns. They are not constrained to follow only one set of strategies focused narrowly on improving only member farm returns. Cooperatives can make real asset decisions at their own level in the market chain and thereby create benefits for members.

A second useful way to reduce equation (3) arises from recalling that in an efficient market:

$$\frac{Y \times An}{r} - Y \times Vn = 0$$

In other words, investments in an efficient capital market are zero net-present-value transactions since the value of any asset must be equal to the present value of its future cash flows. By invoking this fact and rearranging the terms in equation (3), equation (5) is produced:

$$\frac{X \times Ac + (Fc - Fn)}{r} > X \times Vc \qquad (5)$$

Equation (5) states that a producer will join a cooperative if the present value of the sum of (1) the member's share of the cooperative asset cash flows, $X \times Ac$, and (2) the quantity, $Fc - Fn$, is greater than the initial investment needed to become a member, $X \times Vc$. The quantity, $Fc - Fn$, represents the differential in farm asset cash flows created by switching patronage from an NCF to a cooperative. Call this quantity the **differential patronage cash flow**. Most traditional theory focuses on this cash flow while keeping the asset cash flow implicitly in the background. The differential patronage cash flow can be thought of as including all cash flow differences, based on price and service, between the two patronage options open to producers.

The left-hand side of equation (5) also yields a useful valuation equation for the member's investment in cooperative equity. This quantity represents what the cooperative is worth to the member. This valuation equation clearly suggests that cooperative investors value their cooperatives differently from investors in NCFs. NCF investors have no specific access to differential patronage cash flows, but cooperative investors do. The left-

hand side of equation (5) is comparable to Cotterill's global value for a cooperative, while the first half of the expression, $X \times Ac/r$, is similar to what Cotterill calls the core value of a cooperative.

Any of the three equivalent forms, equations (3), (4), or (5), state a necessary condition for the desirability of a producer's investing in a cooperative and thus becoming a member. Since a cooperative could not exist without members, this condition is not only a condition for membership but also a necessary condition for the very existence of a cooperative. Further, the condition must be true for enough potential members that the total capital they are willing to invest is sufficient to make the cooperative feasible, i.e., of sufficient size to reach necessary scale economies.

In closing this discussion, two final points should be made. First, this existence condition has a strong intuitive foundation. If a cooperative simply rebates asset returns, it has no reason to exist. Any potential member could duplicate what the cooperative does (or do better) by investing in an alternative asset and patronizing an NCF. There would be no incentive to bundle the asset and patronage cash flows as required by cooperative membership—no incentive to make the joint decision to invest and patronize. **The cooperative must offer the potential member either higher revenues or lower costs than competing NCFs on the patronage side or higher asset returns on the nonfarm asset side of the member's portfolio.** Traditional theory tends to emphasize only the patronage side.

The second point is that the above analysis is based on all the cash flows being real as opposed to illusionary. For example, if Fn is based on the noncooperative firm having some form of patronage refund policy, e.g., a volume discount, then Fc must exceed Fn based on that policy. Net real prices are presumed in the cash flow analysis. This also presumes that members are not deceived by distribution methods on the part of the cooperative. For example, if some of the cooperative asset cash flows are returned through price, members will not confuse this with a differential patronage cash flow.

The Objective of a Cooperative

To this point, the discussion has centered on only one member. How are the individual member effects aggregated for the cooperative as a whole?

Given the preceding analysis, cooperative boards and managements are faced with the task of producing cooperative asset cash flows, Ac, and differential patronage cash flows, $Fc - Fn$. These decision makers must also set the value of total cooperative equity, Vc, by equating it with the equity investment needed to own the necessary assets to operate the cooperative. Vc is not set in an efficient capital market as was assumed for the alternative investment, Vn. By assumption, members wish to maximize their wealth. Therefore, the cooperative firm should have as its objective to maximize its cash flow contribution to member wealth. More precisely, **the cooperative should maximize the *net* present value of the sum of: (1) its asset cash flows and (2) the total of its members' individual differential patronage cash flows.** In other words, it must maximize the difference arising from subtracting Vc (the initial investment) from the summation over all members of the left-hand side of equation (5).

But finding a precise expression for this objective requires two additional pieces of analysis. First, the differential patronage cash flows are potentially different for every member because each Fc is based, in part, on differing farm management practices among members and each Fn is based, in part, on differing possible trading relationships with NCFs. For an n-member cooperative, there is thus a series of differential patronage cash flows of the form:

$$(Fc_1 - Fn_1), \ldots, (Fc_i - Fn_i), \ldots, (Fc_n - Fn_n),$$

where i = an individual cooperative member (i = 1 to n).

Second, the decision variable or variables open to control by cooperative decision makers must be determined. The argument has already been made that the cooperative may affect Ac or the individual Fc_i's through strategy selection. Three possible strategies were suggested earlier. In effect, what cooperative decision makers select in the process of maximization is a feasible business strategy that includes a full set of investment, financing, and operating decisions. These decisions fully specify Vc, Ac, and the Fc_i's that arise from any given strategy. Stated more precisely, any strategy, s_j, in the set of all feasible strategies, $\{S\}$, is thus associated with a set of cash flows made up of $Ac(s_j)$, $Vc(s_j)$, and a series of $Fc_i(s_j)$'s arising from the strategy. Based on the earlier analysis of cooperative existence, a strategy, s_j, is in the feasible set if its cash flows cause equations (3), (4), or (5) to hold for enough members that their collective equity contributions equal $Vc(s_j)$.

Using the notation just defined, the objective for a cooperative can be stated as:

$$\max_{s_j \in \{S\}} \frac{Ac(s_j) + \sum_{i=1}^{n} (Fc_i(s_j) - Fn_i)}{r} - Vc(s_j)$$

In effect, cooperative decision makers examine all the feasible strategies available to them and select that strategy whose cash flows maximize the net-present-value expression presented above.

This objective would maximize the addition to members' wealth and thus maximize the value of the cooperative firm to the members. In an investment sense, this statement of a cooperative's objective corresponds to Ladd's maximization of present value of total net revenue of all members. Interestingly, value maximization is the same objective frequently cited in financial economics for a noncooperative firm. The two types of firms share this in common. Both types seek to maximize owner wealth through value maximization; only the sources of the cash flows are different. Noncooperative firms seek only to maximize asset cash flows for investors, while cooperative firms seek to maximize both asset and differential patronage cash flows for their investor-patrons.

This objective does present some difficult challenges for cooperative decision makers. First, the real complexity of the objective arises from the individual differential patronage cash flows. With each member represented by a different term, the cooperative is potentially faced with numer-

ous trade-off analyses among members as it attempts to maximize the sum of all returns to the cooperative system. Member heterogeneity would thus make the task of optimization very difficult. Emelianoff noted this many years ago. Analysis of this situation thus demands tools such as game theory as suggested by Staatz (1987a) and Sexton (1986a).

Second, this objective also suggests some profound difficulties in measuring cooperative performance. The presence of the farm asset cash flows means that cooperative performance cannot be measured at the cooperative level alone. **The differential patronage cash flows can be measured only at the member level.** This is entirely consistent with Parliament, Lerman, and Fulton except that they suggest that measuring this quantity "could be" appropriate while this analysis says it is absolutely necessary (p. 12). The issue is even further complicated by the alternative forms in which cash flow payment can be made. For example, higher prices may be used by a marketing cooperative to pay out both asset and patronage cash flows. This will inflate a cooperative's cost of goods purchased and lower its profits even though members benefit. As a result, cooperative financial statements by themselves are rather dubious performance indicators. Performance can be measured only by examining the sum of cash flows at the cooperative *and* member levels in the market chain.

A General Economic Role

The objective defined in the prior section shows that cooperatives must focus on both asset cash flows and differential patronage cash flows. Since noncooperative firms create economic advantage by maximizing asset cash flows, **the economic role for cooperatives is the added optimization of differential patronage cash flows in combination with asset cash flows.** However, this role has no real meaning if there are no economic circumstances in which these special cash flows can be produced or strategies that can produce them. Several strategies were suggested earlier, but more analysis is now needed to substantiate the claim that any of these strategies is feasible.

Basic Market Conditions and Cooperative Existence

At a very general level, the distinction between efficient and inefficient markets helps define the economic conditions in which cooperatives could create value for members. This distinction and its relevance to cooperative role is certainly not unique to this paper (see, for example, Schrader; Sexton and Iskow; Sexton 1986b; Staatz 1987b; Shaffer). The following simply translates this traditional distinction into the investment framework.

Consider first the case of efficient markets in which actors are competitive, information is available and known by all, entry and exit are free, and transactions costs are insignificant. The virtue of efficient or competitive markets is that all factors of production receive their fair return or wage. In such a market, there could not be any source of differential patronage cash flows—Fc would have to equal Fn—nor could there be advantages in asset cash flows from equivalent investments—$X \times Ac$ would have to equal $Y \times Vn$. Equation (4) (and, by extension, equations [3] and [5]) could not

hold. Cooperatives would not exist. Farm firms investing in assets at another stage in the marketing chain could hope only to get the asset returns at that next stage. The farm cash flows would not depend upon which other firms were patronized because all firms would treat the agricultural producer in the same way. Farm firms might wish to purchase assets at another stage in order to extract cartel profits, i.e., produce member benefits by creating an inefficiency, but this strategy would be as socially undesirable for a cooperative to pursue as for the classic monopolist. Therefore, no legitimate cooperative role can arise in the face of efficient markets. As already cited, this is entirely consistent with what many authors have concluded in the past.

A cooperative role might exist, however, in the face of inefficient markets. Inefficient markets result in measurable economic losses in comparison with efficient markets. If cooperatives can counter market power, if they can improve missing or uncertain information, or if they can reduce excessive transaction costs, then they will create economic value by recouping inefficiency losses. The elimination or reduction of the losses due to inefficiency would be a legitimate source of differential patronage cash flows or improved cooperative asset cash flows. Cooperatives might then exist in inefficient markets.

A Classic Example Revisited

Consider the case of inefficiency arising from market power. This case is the classic one used often to support Nourse's "competitive yardstick." Assume farm firms face competitive markets for their output but must deal with a monopoly input supplier (which buys its inputs in a competitive market). The farm firms will face higher input prices, lower input availability, and lower profits in their own operations than in the competitive situation since the monopolist will increase price, which will restrict input sales. Call the farm asset returns in this monopoly situation, F_{mon}, and those in the competitive situation, F_{com}. Clearly, classic economic analysis says that $F_{com} > F_{mon}$.

Presume that the farm firms have the option to form a supply cooperative. Enke showed that a cooperative will pursue the best interests of its members by maximizing the sum of producer and consumer surpluses, or, in other words, maximizing the sum of the joint profits available to the supplier and its producer customers. This maximization occurs at the competitive equilibrium. As a result, the cooperative will charge competitive prices and deliver competitive quantities of inputs.[3] In other words, $Fc = F_{com}$ for any producer joining the cooperative, and $F_n = F_{mon}$ for any producer who stays with the monopolist supplier. The cash flow options on the patronage side of the producer's decision are thus defined.

On the investment side, the cooperative will produce a competitive return on its assets. This is presumed in the classic analysis. The only alternative for the producer is to invest in some other competitive asset that will yield only a fair return. The producer might invest in the monopolist supplier's stock, if it is available, but the monopoly rents would be capitalized into the stock price and only a fair return could be earned. Therefore, $X \times Ac$ will

equal the return, $Y \times Vn$, from other competitive investments since initial investments are the same.

Combining the patronage and investment options from above yields:

$$X \times Ac + F_{com} > Y \times Vn + F_{mon}$$

Equation (4) derived in the earlier analysis thus holds and the cooperative would come into existence, assuming that it holds for enough members to make the cooperative viable.

The key conclusion to be drawn from the example is that, within the framework of at least one type of inefficient market, a cooperative pursuing its objective on behalf of members does have a legitimate source of differential patronage cash flows. The feasibility of a cooperative actually attaining these differential cash flows depends in no small part on the response of the monopolist (Sexton 1986b; Sexton and Sexton; Sexton 1990). For example, the monopolist might respond to the threat of cooperative entry by offering potential members farm prices that ensure that the existence condition would *not* hold. The cooperative would thus not be feasible. However, even this movement in price would make the farmers better off. The monopolist could also respond by acting competitively once the cooperative enters the market. This case will be considered in the discussion of the free-rider problem presented later.

A General Role

The above "competitive yardstick" example is intended to imply a broader conclusion: **The general economic role for cooperatives is creating differential patronage cash flows and/or improving cooperative asset cash flows by reducing certain types of market inefficiencies**. As already noted, justifying cooperatives' economic role as a response to inefficiency is entirely consistent with what past writers have claimed, and thus it continues a long intellectual tradition. The explicit treatment of *differential patronage cash flows in combination with cooperative asset cash flows* is the special contribution of this investment cash flow derivation.

Inherent Limits to the Role

An economic role stated in terms of counteracting market inefficiency would seem to be quite widely applicable. In the real environment, most markets exhibit some form of inefficiency. Cooperatives then ought to exist quite widely. Yet, outside of agriculture, cooperatives do not exist widely. It would appear then that the general result on cooperative role must be limited in applicability.

There are two significant limits to a cooperative role in reducing market inefficiencies. First, there are *external limits* created by the inherent weakness of the cooperative business form in its ability to compete with market self-correction and integration mechanisms. Second, *internal limits* exist because of inherent weaknesses within the cooperative form itself that limit its stability and effectiveness across time.

External Limits

Cooperatives are fundamentally an alternative form of market coordination. Shaffer speaks of three different types of economic coordination: (1) market coordination, (2) internal coordination (true integration within a single firm), and (3) cooperative coordination. Similar to integration, joint decision making is pursued in cooperatives; but, unlike integration, no economic entities lose their identity or ultimate right to act independently. Similar to markets, negotiation between economic actors is ongoing within a cooperative; but, unlike markets, the arms-length nature of negotiation is not maintained. A cooperative is a form of economic coordination that falls in between the two extremes.

As a third type of economic coordination, cooperatives will be limited by the extent to which these other two forms are more effective at correcting imperfections. On the one hand, markets do have self-correction mechanisms, e.g., entry by new firms can lessen market power inefficiencies whether they are cooperatives or not. Market mechanisms do not rely on explicit efforts at coordination even if self-correction is involved, e.g., a single entrepreneur can decide on market entry. In this sense, market self-correction is a priori superior to a coordination form, such as a cooperative, that requires the explicit, simultaneous coordination of many separate decision units. On the other hand, integration has been argued to be an effective means of counteracting certain market imperfections, e.g., excessive transaction costs and externalities (Williamson). Integration can rely on all the tactics of internal control, most especially authority relationships, to accomplish its ends. Cooperatives cannot resort to internal control since all actors maintain their independence. In this sense, integration is also a priori superior to cooperative coordination as a means of counteracting imperfections. **Cooperatives are thus limited to economic circumstances where the transaction costs of cooperative coordination are less than the transaction costs of market self-correction *and* the transaction costs of integration.**

Internal Limits—The Free-Rider Problem

A cooperative's role in eliminating inefficiencies is also limited by any internal weaknesses inherent in this business form. One weakness of major concern to many analysts of cooperatives is the presence of a significant free-rider problem—a problem cited by many writers (e.g., Shaffer; Staatz 1987b).

The traditional argument concerning free riders can be made by continuing the monopoly supplier example from above. When the cooperative is formed, the monopolist need not be driven from the market. The monopolist's simplest response to cooperative entry is to counter with competitive prices and quantities. This strategy would eliminate all monopoly rents, but it would still ensure a fair return to the monopolist's capital. The assumption of a noncooperative firm being willing to respond competitively is thus reasonable. This is in fact the heart of Nourse's competitive yardstick argument.

If there are opportunity costs to cooperative membership, e.g, the value of diverted time from operating farm assets to help govern the cooperative,

and if the monopolist responds competitively, producers would face a situation in which the cooperative and the former monopolist offer the same cash flows except for the opportunity cost of membership. Members could leave the cooperative, keep all its advantages, and avoid its opportunity costs. A classic free-rider problem exists!

Under the classic assumptions, including no sunk costs, the problem is quite severe. Cooperatives would be a very unstable type of business. The cooperative forms; the monopolist responds competitively; members defect; the cooperative becomes nonviable and dissolves; having no incentive to remain competitive, the monopolist returns to monopoly behavior; and the cycle begins again.

Under the more realistic assumptions of a dynamic, uncertain environment, the free-rider problem may not be as severe as is normally assumed. Considered from an investment perspective, only those members who have superior investment opportunities to the asset returns of the cooperative would defect. Some members' risk preferences would even play a role in whether or not defection (and reinvestment in some other asset) makes sense.

It is also true that cooperatives rarely allow members free exit. They create sunk costs by restricting the immediate return of invested capital upon a member's defection. In a free-rider environment, the policy of not returning capital immediately is one means of weakening the incentive to defect. This may not be the best solution given the other problems it creates, i.e., keeping an individual farmer from realizing better short-term gains, but it is a solution.

Another free-rider solution with problematic elements is closing cooperative membership. If closing membership and pursuing market differentiation strategies can ensure that the monopolist cannot match a cooperative on the patronage side, i.e., that the monopolist can never offer $Fn > Fc$, then benefits are captured internally for members and the free-rider problem does not arise in the first place. The downside of this solution is the potential anticompetitive behavior that a closed cooperative may pursue (Youde and Helmberger; Sexton 1990).

The significant conclusions here are that free-rider problems are real and most realistic solutions are problematic in one way or another. Therefore, the probability that the existence condition will hold across time declines and with it the chances for cooperative viability. Free riders limit the applicability of cooperative coordination.

Internal Limits—Horizon Problems and Heterogeneity Revisited

There are other internal limits to the cooperative business form. The consideration of two such critical limits allows the lifting of some of the unrealistic assumptions used in the analysis to this point.

First, the cash flows evaluated by members are **not** perpetual as assumed above. Any member's life as a patron is limited. Therefore, each patron has an investment horizon, and these horizons will differ among members. As a member's life as a patron shortens year by year, the chances that the membership condition of equations (3), (4), and (5) will hold decline and

with this decline the probability of a viable cooperative also declines. This horizon problem has been noted by others, e.g., Staatz (1987b).

Second, cash flows are uncertain and members are risk averse. The earlier analysis presumed certainty and risk neutrality. Introducing the more realistic assumptions into the analysis is rather simple in one respect. If all the cash flows under consideration are expressed in their certainty equivalent form, all the relationships presented earlier for the individual cooperative member are only slightly altered. Allow the operator, $CE(.)$, to represent the process of replacing an uncertain cash flow with a particular individual's certainty equivalent for that cash flow. (A certainty equivalent is simply the certain cash flow the individual would be willing to receive instead of having to receive the uncertain cash flow. The certainty equivalent is dependent upon the individual's risk aversion.) Equations (4) and (5) now become, respectively:

$$X \times CE(Ac) - CE(Fc) > Y \times CE(An) - CE(Fn) \tag{6}$$

$$\frac{X \times CE(Ac) + [CE(Fc) - CE(Fn)]}{r} > X \times Vc \tag{7}$$

The difficulty presented by equations (6) and (7) is determining what cooperative strategies would cause these conditions to hold. It is not an impossible task (see Peterson for the strategies that arise when *E-V* preference assumptions are imposed), but it is beyond the scope of this paper to address this issue.

Of even more concern is what happens to a cooperative's objective function upon aggregation of the cash flow expectations of individual members. The cooperative's objective becomes:

$$\max_{s_j \in \{S\}} \frac{\sum_{i=1}^{n} CE(Ac_i(s_j)) + \sum_{i=1}^{n} [CE(Fc_i(s_j)) - CE(Fn_i)]}{r} - Vc(s_j),$$

where all variables are as defined earlier.

The heterogeneity problem cited earlier is now made far more complex. Besides having to take into account differing member conditions in individual farm operations and in possible individual trading relationships with NCFs, cooperative boards and managers must somehow assess the risk preferences of individual members. In this more realistic environment, investment decision making at the cooperative level will be very difficult and performance appraisal would appear to be highly subjective based on individual utility functions. Trying to resolve pragmatically the issues of investment decision making and performance appraisal is worthy of further research but beyond the scope of this paper. The conclusion for now is that cooperative viability is certainly an open question given a multitude of sources for member heterogeneity.

Conclusion on Limits

Between external weaknesses (limited ability to compete with market self-correction and integration) and internal weaknesses (free-rider, hori-

zon, and heterogeneity problems), cooperatives would seem likely to exist only in a narrow set of economic circumstances. Although these weaknesses might be managed by careful structuring of the members' investment, returns, and/or exit options, the question of cooperative viability still remains a relevant one that cooperative decision makers must continually entertain.

The prevalence of cooperatives in agriculture suggests that at least some of these limits are not particularly strong in this sector. First, the presence and longstanding nature of significant market inefficiencies in agriculture suggest that market self-correction mechanisms have not worked. Farm firms, themselves atomistic, face market concentration in both input and output markets. (See Sexton and Iskow for relatively recent statistics.) Even when the absolute number of processors or suppliers appears adequate to foster more competitive conditions, the combination of transportation costs and perishability tends to make many agricultural markets local in scope and producers subject to opportunistic behavior (Sexton 1990). The maturity of agricultural markets and their ongoing consolidation result in the short-term advantages of opportunism not being counterbalanced by long-term disadvantages to contentious trading relations. The vagaries of weather and biologic function as well as the presence of high sunk costs and information asymmetries all combine to heighten the inefficiencies in agricultural markets.

In addition to the failure of market self-correction, integration does not appear feasible in many agricultural markets (Staatz 1987b). Farm firms are rarely of a size necessary to integrate individually either forward or backward in the market chain. Empirically, very few suppliers or processors integrate farm operations into their corporate enterprises. This is at least a priori evidence that economic incentives to do so are relatively weak. Poultry appears to be one of the few exceptions to this result, and most poultry cooperatives did not in fact survive competition from integrated operations.

Summary and Managerial Implications

The economic role of agricultural cooperatives has been shown to be the creation of differential patronage cash flows in combination with cooperative asset cash flows through the reduction of market inefficiencies. As cited above, this role is very consistent with what others have concluded by other means. The advantage in deriving this role using investment cash flows is that the critical nature of invested capital in a cooperative is kept always in the foreground of the analysis. Cooperatives are not merely patronage creatures. They are investments too. As cooperative assets grow larger and member options for alternative investments expand, cooperative decision makers must be ever mindful of this investment perspective. Cooperatives compete with investment alternatives as well as with patronage alternatives.

Also in the analysis, the role for cooperatives in reducing market inefficiency was narrowed by two specific sets of limits. External limits to the applicability of the role were based on certain competitive weaknesses of

cooperative coordination when compared with market self-correction mechanisms and internal coordination. Internal limits to the cooperative role were also considered in the form of the free-rider, horizon, and heterogeneity problems.

Three managerial implications can be drawn from these theoretical findings. **First, the measurement of cooperative performance is more complex than that for noncooperative firms.** Cooperatives must produce efficient asset cash flows *and* differential patronage cash flows. Therefore, part of the returns generated and the value of a cooperative can be measured only at the farm level. Looking at returns at the cooperative level alone is insufficient and may well be misleading.

Second, cooperative viability is more precarious than that of noncooperative firms. Noncooperative firms may engage in true integration. In addition, their more limited objective focused on asset returns alone means that capital markets allow them to manage heterogeneity and horizon problems more easily. Cooperative existence is continually threatened by free-rider, member heterogeneity, and horizon problems. Cooperative managers and boards must continually struggle with these issues if a cooperative is to survive.

Finally, as the first two implications are considered together, **better performance measurement and reporting to members is essential to cooperatives' long-term survival.** The complexity of performance measurement and the ongoing threats to viability combine to make the managerial tasks within a cooperative very difficult. If managers and boards do not make a concerted effort to measure returns for the whole cooperative system—at the cooperative and member levels—they will have little evidence to combat free-rider and related problems or to evaluate the effectiveness of cooperative strategies to reduce market inefficiencies.

Notes

1. If member investment is not proportional to patronage, then one set of members (those underinvested) is gaining at the expense of another set (those overinvested). This situation will create its own set of problems and is beyond the scope of this article.

2. $X \times Ac$ is the member's fair share of the asset cash flows given an investment share of X. Even if the cash flows are returned to the member on a patronage basis (as is normal for cooperatives) rather than a direct return on capital, e.g., a dividend, a rational member will still expect this share and not be deceived by the method of payment.

3. A critical assumption necessary to attain this result is that the cooperative be an open-membership cooperative, i.e., the cooperative has no incentive to extract excess returns from one group of farm firms to pay to another group (Youde and Helmberger). Also recall from the assumptions of the example that the cooperative would face competitive input markets as had the original monopolist and that the members sell their output in competitive markets. Collectively, these assumptions ensure that the cooperative has no incentive to restrict its output as the monopolist had.

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