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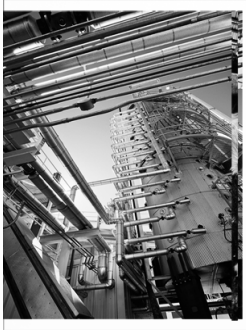
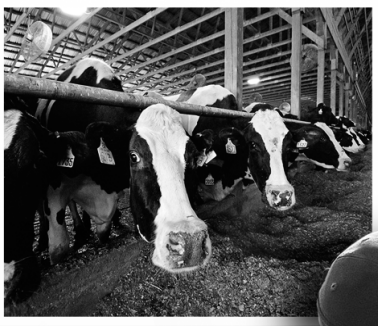
Research Report 224

The Nature of the Cooperative

A Dairy Cooperative Case Study



Abstract

The nature of the cooperative is viewed as a composite picture of three facets: (1) the unique structure, organization, governance, equity financing, and operation of cooperatives; (2) the market performance of cooperatives; and (3) the relations of cooperatives to other market participants through their roles in transaction governance. The third facet is the focus of this study, through the lens of transaction cost economics. The results complement the first two facets to present a clearer picture of the nature of the cooperative. Cooperatives adapt to transaction governance structures for economizing on transaction costs, just as other types of businesses do. The unique nature of the cooperative is also reaffirmed. Dairy cooperatives are used as an example. Other kinds of cooperatives are briefly assessed as "variations on a theme."

Key Words: Cooperatives, transaction cost economics, governance, milk, dairy, cooperative theory.

The Nature of the Cooperative: A Dairy Cooperative Case Study

K. Charles Ling
Agricultural Economist
USDA Rural Development

Research Report 224

April 2012

Preface

A review of landmark economic literature on cooperatives (*Emelianoff; Nourse*) was recently completed to explain the economic structure of cooperatives and their market performance. This work offered a set of cooperative basics that were shown to be still very relevant today in a dairy cooperative case study (*Ling, 2011*).

The inspiration for this current study is found in Oliver Williamson's attempt to explain the nature of the firm through the development of transaction cost economics. His "simple contractual schema" is adopted to shed new light on cooperatives. The findings complement the earlier work and push the envelope of our understanding of the nature of the cooperative.

A clear view of the nature of the cooperative would: (1) help the public better understand the cooperative form of business; (2) help policymakers reach informed decisions relating to cooperatives; and (3) contribute to research on cooperatives by helping to ensure the work stays relevant to cooperatives.

The report uses dairy cooperatives as a case example of transaction cost economics analysis. All dairy cooperative statistics cited in this report are 2007 data, the year of USDA's latest dairy cooperative survey (*Ling, 2009; Liebrand*).

Comments by Ronald Cotterill, Eldon Eversull, Carolyn Liebrand, Bruce Reynolds, Randall Torgerson, James Wadsworth, and John Wells are gratefully acknowledged and appreciated.

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Highlights

The nature of the cooperative is viewed as a composite picture of three facets:

1. The economic structure of cooperatives—their unique structure, organization, governance, equity financing, and operation.
2. Market performance of cooperatives, i.e., cooperatives' place in the market economy.
3. Cooperatives' relations to other market participants through their roles in transaction governance (or "in aligning incentives and crafting governance structures that are better attuned to their exchange needs" (*Williamson, 2002,* p. 172)).

Cooperative organizations represent the aggregates of economic units, as defined by Emelianoff. In the agricultural sector, cooperative associations are aggregates of member-farms and have the following attributes:

- A cooperative is an agency owned and controlled by members through which they conduct their business.
- Each member-farm fully retains its economic individuality and independence.
- The board of directors is elected from among member-farmers.
- Proportionality and service at-cost are two basic operating principles.
- Members provide advances (i.e., equity capital) for financing the cooperative.
- The surplus or deficit of a cooperative is the account payable to, or receivable from, the member-patrons.
- Patronage refunds are the money returned to members who have been under paid or overcharged.
- Dividend on capital, if any, is interest payment for using members' capital.
- Being an aggregate of member-farms, the cooperative is neither a horizontal integration of its members nor a vertical integration between the members and the cooperative. The cooperative is a third mode of organizing coordination.

Farmers organize cooperatives to perform various functions jointly in various market situations — functions that cannot be satisfactorily carried out alone by individual farmers. Based on Nourse's postulations, market performance of cooperatives may be described by the following:

- Cooperatives make it feasible for farmers who otherwise may not have out lets for their products to join together to gain greater market access.
- Cooperatives can be of any size and are organized for carrying out specific business functions for member-producers.
- Cooperatives afford farmers the organizational sizes that are necessary for exercising countervailing power to effectively deal with other market partici pants.
- Cooperatives are pro-market; they let the market supply-and-demand price be the guidance for producers.
- Cooperatives are a means for farmers to promote and maintain competition; they serve as a "competitive yardstick."

The nature of the cooperative as it relates to transaction governance is explored by following Williamson's explanation of the nature of the firm that constitutes the core of transaction cost economics. His simple contractual schema is useful for explaining the essence of transaction cost economics (figure 1 and table 1, respectively, pages 21 and 6).

The starting point is Node A (unassisted market). This is the mode where transactions between numerous suppliers and buyers are for an undifferentiated product. The product is made with a general-purpose technology and does not require assets that are specific for its production (asset specificity is zero, or k=0). Transaction governance is accomplished through competition.

If the product uses special-purpose technology that requires specific assets for its production, then asset specificity is greater than zero (k>0). Asset specificity causes uncertainty and poses hazards to the investments of the suppliers and the buyers as they haggle for transactions. Contracts that spell out the terms of trade as legal rules may be formulated in an effort to relieve the hazard. However, it is impossible to foresee and encompass all contingencies in the contract due to human limitations, and relying on courts for relief is time-consuming and costly. This is the Node B (unrelieved hazard) mode in the schema that denotes the situation where the transaction does not have safeguards (s=0) to relieve the hazard and protect the investment.

Over time, some firms will seek out reputable and trustworthy counterparts to reduce the hazard. Such transactions give rise to bilateral dependencies and the parties have incentives to promote a continuous long-term relationship and thus safeguard specific investments. At Node C (hybrid) in the schema, transactions are supported by interfirm contractual safeguards (s>0). Instead of a set of legal rules with court enforcement, the contract here is a framework or a set of guidelines for interactions between the firms. Discrepancies in performance are resolved through amicable consultation or negotiations or by arbitration. The court is only used as a last-resort remedy.

If costly breakdowns and transaction hazards continue despite the safeguards at Node C, the supplier and the buyer may be brought under unified ownership and vertically integrated and controlled. This Node D (hierarchy) mode occurs when a higher degree of asset specificity and added uncertainty pose greater needs for cooperation in mutual adaptation.

Each node in the simple contractual schema represents a generic mode of governance. And each generic mode of governance embodies its own internally consistent attributes of incentive intensity (reward for effort), administrative control, and contract law regime and therefore has its own strengths and weaknesses. At Node A, the governance structure is the unassisted market. The governance structure at Node B is also the market, where asset specificity exposes transacting parties to uncertainties and, without safeguards, to unrelieved hazards to their investments. Node C is where the market is assisted with credible contracting. All successive production stages are integrated under hierarchical control at Node D. The attributes of a market mode are high incentive intensity, little administrative control, and a legal rules contract regime. On the other hand, attributes of hierarchy are low incentive intensity (where pricing for the successive stages is cost-plus), considerable administrative control (by fiat), and forbearance is the implicit contract law of internal organization (the parties must resolve their differences internally).

Using dairy cooperatives as an example, several conclusions may be drawn from the analysis of the roles of cooperatives in transaction governance:

- Cooperatives' roles in transaction governance are exactly the same as those of the firm in Williamson's analysis of transaction cost economics—their transactions are under all possible governance modes, depending on the lines of business they engage in. As is the case with other types of business, cooperatives

adapt to various transaction governance structures for economizing on transaction costs.

- Cooperatives do not own the assets that are employed by members to produce milk; the assets and the investment hazard associated with asset specificity belong to members. This reveals the cooperative's unique structure of being an aggregate of its member-farms—the relation between the member-farms and the cooperative is not that of an integration of successive technologically separable production stages or that of a horizontal integration of like businesses under the cooperative's administrative control.
- By pooling milk and marketing it collectively through the cooperative, member-farms also pool and share the investment hazard associated with the assets specifically used for producing the milk. Individual member-farm's share of the hazard should be less than if each member markets the milk by itself and faces the uncertainty alone.
- The countervailing power of the cooperative may be helpful in entering into credible contractual relationships with processors, because such relationships may be more attainable and stable between counterparts that are on a relatively more equal footing.
- Being an aggregate of its member-farms, the cooperative serves as a focal transaction entity for its members and simplifies members' relations with milk buyers (processors). The cooperative infuses order among member-farmers, thereby eliminating conflicts that arise from individuals competing for customers, thus realizing transaction cost savings.

The transaction governance analysis reaffirms the unique structure of the cooperative being an aggregate of member-farms that entails the cooperative's other unique features:

Unique Cooperative Organization: Cooperatives are business organizations of member-patrons. They can be of any size and can be local, regional, or national in scope; they may be centralized organizations with direct members, federations of cooperatives or hybrids of the two.

Unique Cooperative Governance: Members of cooperatives exercise ownership and business controls through a board of directors that is elected from among member-farmers. The separation of the responsibility of the board (governance) and the role of management (managing operations) is emphasized.

Unique Cooperative Equity Financing: Equities of cooperatives are supplied by members. By obtaining equity financing internally, cooperatives do not incur the cost of soliciting investment capital in the capital market.

Unique Cooperative Operation—Unique Economics: This results from the cooperative's structure of being an aggregate of member-farms as well as from its being the exclusive marketing agent of members' milk production. Members' farming operations are not under the cooperative's administrative control, and the cooperative cannot dictate how members operate their dairy farms. This operating mode entails its own unique economics that comprises the following elements:

- When milk price goes up or down, the milk volume a farm may produce depends on the financial objective of the farm: whether it wants to attain maximum total profit (minimum loss in a loss situation), maximum total revenue (up to the break-even point), or minimum average cost.

- Production input cost changes do not change a farm's rated capacity but shift the farm's cost curves straight up or down. The milk volume that the farm produces, again, depends on the financial objective of the farm.
- Depending on how farmers respond to milk price and input cost changes, the milk volume the cooperative has to handle may continually fluctuate.
- The cooperative markets the aggregate milk volume produced by members; therefore, it does not have its own milk production functions, milk production cost curves, or milk supply curves.
- Milk production is a biological process and is subject to daily and seasonal fluctuations. The seasonality of milk production shifts a farm's cost curves downward and to the right during a seasonally high production month or upward and to the left during a seasonally low production month (figure 5, page 23).
- The seasonality of milk production generally does not match the seasonality of fluid milk demand. This mismatch requires cooperatives that supply milk to the fluid market to balance seasonal supply with seasonal demand and handle the inevitable seasonal surplus milk volume at a substantial supply-balancing cost.

Different commodities have their own characteristics and different types of cooperatives have their own special features; they represent variations on a theme (table 5, page 18).

This study shows how cooperatives relate to other market participants through their roles in transaction governance. This broadens our understanding of the cooperative's place in the market economy beyond the postulations made by Nourse. The fact that asset specificity and the associated investment hazard belong to individual members reaffirms the cooperative's unique economic structure of being an aggregate of its member-farms, as posited by Emelianoff. Thus, the perspective gained through the lens of transaction cost economics complements the earlier work on cooperative basics (*Nourse; Emelianoff*). Together, they present a clearer picture of the nature of the cooperative.

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K. Charles Ling
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Introduction

The first work in economic literature to give the cooperative its precise economic definition was Ivan Emelianoff's *Economic Theory of Cooperation: Economic Structure of Cooperative Organizations*, published in 1942. This book marked the beginning of a new era in the development and evolution of cooperative theory.

Emelianoff carefully reviewed the worldwide literature on cooperative theory from the late 19th century until 1939. He concluded that for economic analysis of cooperatives, the economic structure of cooperative organizations should be clearly defined and that the definition should be free from the encumbrance of sociological, legal, technical, social-philosophical, and ethical considerations.

Against this backdrop, Emelianoff established this definition: "Cooperative organizations represent the aggregates of economic units." This clear economic definition liberated economists to analyze cooperatives as economic entities, in the paradigm of orthodox microeconomic theory or what is called neoclassical economics.

Neoclassical economic theory treats the firm as a production function, where, given the available technology, an optimal amount of inputs is transformed into an optimal amount of outputs at the least cost when "marginals" (e.g. marginal cost and marginal revenue) equate. The price system thus optimally allocates resources among various uses in the economy and, by implication, the competitive market does not incur transaction cost. This orthodox paradigm analyzes economic activities of the firm through "the lens of choice."

However, the firm in neoclassical economic theory is an abstract construct and does not manifest the inner workings of real firms or explain the firm's behaviors and activities in the real world. The search for alternatives to explain the nature of the firm started as early as in the 1930s (*Coase; Hall, et al.*).

Then, in a 1971 paper, "The Vertical Integration of Production: Market Failure Considerations," Oliver Williamson raised questions about using the competitive market norm for judging market performance of the firm. His work spurred follow-up research that has come to be referred to as transaction cost economics. Concurrently, theories for studying organizations (such as agency theory, property rights theory, game theory, etc.) were also further developed. The results of these research efforts constitute a new paradigm for analyzing economic activities of the firm through "the lens of contract" (*Williamson 2010*).

Research on cooperatives prior to the 1980s used microeconomic models of vertically or horizontally integrated firms to optimize cooperative operations (e.g., *Phillips; Helmberger, et al.*). This was because the cooperative was interpreted to be a form of vertical or horizontal integration of its members. However, cooperatives usually have to accept whatever product volumes delivered by members to them for marketing and cannot dictate how or how much members should produce.

This is unlike a vertically integrated firm that brings successive technologically separable stages under one central management and control, or a horizontally integrated firm that "lords it over" its subunits. It is worth noting that: because member-farms are independent entities, represent independent profit centers, and act independently, the cooperative association is neither a horizontal integration of its member-farms nor a vertical integration between member-farms and the cooperative—it is a third mode of organizing coordination (*Shaffer*).

With the advent of the alternative (lens of contract) paradigm for analyzing economic activities of the firm, research on cooperatives has followed along to focus on cooperative governance, management, membership, and related issues (*Royer; Staatz; Cook, et al.*). These efforts have contributed substantially to understanding the organizational and institutional aspects of cooperatives. Further research advances would benefit from a clear understanding of the nature of the cooperative.

The nature of the cooperative may be viewed as a composite picture of these three facets:

I. The economic structure of cooperatives—their unique structure, organization, governance, equity financing, and operation.
II. Market performance of cooperatives, i.e., cooperatives' place in the market economy.
III. Cooperatives' relations to other market participants through their roles in transaction governance (or "in aligning incentives and crafting governance structures that are better attuned to their exchange needs" (*Williamson*, 2002, p. 172)).

This report explores the third facet through the lens of transaction cost economics to analyze cooperatives' roles in transaction governance and the related subjects. The first two facets were fully explained in a recent report (*Ling, 2011*); the inclusion of their concise versions here is for the composite picture to be complete.

Facet I. The Economic Structure of Cooperatives

Following Emelianoff, the economic structure of cooperatives is defined as: "Cooperative organizations represent the aggregates of economic units."

In agriculture, farms are such economic units. The nature of cooperative associations as aggregates of member-farms is clearly discernible in the embryonic forms of such associations. For example, a buying club of farmers may want to purchase certain goods together, such as fertilizer.

The buying club would have someone take orders from member-farmers and place orders with a vendor, as well as perform other related chores. If the vendor requires a deposit, members may advance money to the buying club for the deposit requirement in proportion to their respective buying volume.

There may be an elected committee to facilitate decisionmaking if the number of members is large. Each member may have one vote if the member's purchasing volumes are about the same. Otherwise, some forms of proportional voting may be adopted to conciliate large-volume members.

When the fertilizer (for example) is delivered, members pay the balance of their obligations. After the transactions have been completed, payment to the vendor and other expenses are subtracted from the sum of money paid by members. Any surplus is returned to members in proportion to the volume of fertilizer they have purchased.

This buying service is conducted at cost; every aspect of a member's transaction through the buying club is in proportion to the member's patronage (buying) volume. The buying club may be disbanded after fulfilling its joint-buying purpose.

This scenario shows that the buying club represents the aggregate of its member-farms, through which they purchase fertilizer. If the buying club metamorphoses into a permanent purchasing cooperative association, the picture may look more complicated. However, the underlying nature of the cooperative as an aggregate of member-farms remains the same.

In this new scenario (i.e., a permanent purchasing cooperative), the person who manages buying orders and other chores will be the manager of the cooperative (usually a hired professional). The committee of members becomes the board of directors. Advanced payments by members to the cooperative become equity capital for financing the operation and for carrying inventories and owning facilities.

Year-end surplus is returned to members as refunds in proportion to patronage volume, but a portion may be retained as revolving capital. The principles of proportionality and service at-cost remain intact, but their practices may be less evident because the operation has become more complex.

Although the above example is based on purchasing cooperatives, the same line of reasoning also applies to marketing cooperatives. The difference between purchasing and marketing cooperatives is: instead of procuring goods for members, a marketing cooperative markets products produced by member-farms.

In either case, the member-farms coordinate their activities through the cooperative, but each fully retains its economic individuality and independence.

In summary, the definition that cooperative organizations represent the aggregates of associated economic units provides a clear insight into how cooperatives organize and function. Being aggregates of member-farms in the agricultural context, cooperative associations have the following attributes:

- A cooperative is an agency owned and controlled by members through which they conduct their business.
- Each member-farm fully retains its economic individuality and independence.
- The board of directors is elected from among member-farmers.
- Proportionality and service at-cost are two basic operating principles.
- Members provide advances (i.e., equity capital) for financing the cooperative.
- The surplus or deficit of a cooperative is the account payable to, or receivable from, the member-patrons.
- Patronage refunds are the money returned to members who have been underpaid or overcharged.
- Dividend on capital, if any, is interest payment for using members' capital.
- The cooperative is neither a horizontal integration of its members nor a vertical integration between the members and the cooperative. It is a third mode of organizing coordination.

Facet II. Market Performance of Cooperatives

The first academic paper on the theory of cooperation, published in the *American Economic Review*, was "Economic Philosophy of Co-operation" by E. G. Nourse (*Nourse, 1922; Hess*). This piece, supplemented by his later brief remarks (*Nourse, 1945*), primarily focused on the roles agricultural cooperatives played in the marketplace that are still valid today: providing market access for producers, exerting countervailing power, being pro-market, and serving as a competitive yardstick.

Cooperatives for Market Access and Other Functions

The following examples are taken from Nourse's paper to illustrate how farmers organize cooperatives to perform various functions jointly and efficiently in various market situations — functions that cannot be satisfactorily carried out alone by individual farmers:

1. Cooperatives for market access — an example is a small fruit-producing area far from any large market. The product is perishable; hence, both risk and marketing expense are high. Total product volume is not large enough to attract a private distributor. Facing this situation, producers have the option of organizing a cooperative association to market their products. These cooperatives have frequently demonstrated the ability to achieve successful results where private, outside entrepreneurship fails to perform.
2. Local to regional coordination — a local cooperative creamery may initially be effective in meeting the competition of other small, private creamery operations. However, when competing creameries have grown to be entities of great size, the competition must be met by a distributing organization of equal scope. This will often be achieved through a federation of the cooperative creameries across a region which may embrace an entire State, several States or parts of a State.
3. Region-wide associations — in many instances, growers in horticultural regions have organized and integrated highly efficient businesses that serve producers across an entire production region by assembling, processing, and distributing their products. These agencies have eliminated wasteful competition both at the local shipping point and at the central markets. Furthermore, they are the instruments of the producer and owner of the goods, and hence are likely to be more aggressive in the effort to reduce expense and wastage in the handling process and to improve quality and enlarge outlets.

Countervailing Power

The above examples show how cooperatives are organized and grow to enable farmers to exercise countervailing power in dealing with other market participants. (The term "countervailing power" was coined by economist John Kenneth Galbraith in the 1950s.)

Pro-Market

Cooperatives enable farmers to effectively compete in the marketplace and garner market signals that put them in a position of prompt and sensitive response to the reaction of the consuming public and guide their farming business decisions. According to Nourse, the cooperative objective is twofold (*Nourse, 1945*):

1. "It is to make the most economical and efficient market channel by which whatever volume of product farmers see fit to produce gains access to the attention and the purchasing power of all who might use such a product…Thus, a true supply-and-demand price is allowed (and aided) to express itself for the guidance of producers."

2. "It aims to reflect these market conditions back most promptly and fully to producers in ways that will both guide and, so far as possible, assist them in changing their methods so as to continue production and to prosper or to shift to more suitable lines of production."

Competitive Yardstick

The presence of the cooperative challenges other market participants to operate efficiently and thus strengthens the competitive market mechanism. In this way, the cooperative serves as a competitive yardstick for the market.

In summary, market performance of cooperatives may be described by the following:

- Cooperatives make it feasible for farmers who otherwise may not have outlets for their products to join together and have market access.
- Cooperatives can be of any size and are organized for carrying out specific business functions for member-producers.
- Cooperatives afford farmers the organizational sizes that are necessary for exercising countervailing power to effectively deal with other market participants.
- Cooperatives are pro-market; they let the market supply-and-demand price be the guidance for producers.
- Cooperatives are a means for farmers to promote and maintain competition—as the competitive yardstick.

Facet III. Cooperatives' Roles in Transaction Governance

The nature of the cooperative as it relates to transaction governance is explored by following Williamson's explanation of the nature of the firm that constitutes the core of transaction cost economics (*Williamson, 2010, 2007, 2005, and 2002*).

The Firm and the Modes of Transaction Governance

The premise of transaction cost economics is that "the mission of economics is to understand the organization of economic activity...(Then) firms must be described in relation to other modes of governance, all of which have internal structure…The governance approach maintains that structure arises mainly in the service of economizing on transaction costs" (*Williamson, 2002, p. 178*). "The transaction incorporates the three aspects of conflict, mutuality and order— governance is the means by which to infuse order, thereby to mitigate conflict and to realize… mutual gain from voluntary exchange" (*Williamson, 2002, p. 182*).

A simple contractual schema used by Williamson (*2005*) to explain the essence of transaction cost economics is adopted here (figure 1, page 21). The starting point is Node A (unassisted market). This is the mode where transactions between numerous suppliers and buyers are for an undifferentiated product. The product is made with a general-purpose technology and does not require assets that are specific for its production. If "k" is used as a measure of asset specificity, then k is zero (k=0) in this case. Transaction governance is accomplished through competition (the competitive norm of neoclassical economics).

If the product uses special-purpose technology that requires specific assets for its production, then asset specificity is greater than zero ($k > 0$). Asset specificity is also greater than zero for the buyers if they use the product for next-stage processing/marketing that requires specific assets. An asset is less valuable and the investment is at risk if it is not employed in the production of the specific product as originally intended.

Asset specificity causes uncertainty and poses hazards to the investments of the suppliers and the buyers as they haggle for transactions. Contracts that spell out the terms of trade as legal rules may be formulated in an effort to relieve the hazard.

However, it is impossible to foresee and encompass all contingencies in the contract due to human limitations (what is called bounded rationality), and relying on courts for relief is time-consuming and costly. This is the Node B (unrelieved hazard) mode in figure 1 that denotes the situation where the transaction does not have safeguards (indicated by s=0) to relieve the hazard and protect the investment.

Over time, some firms will seek out reputable and trustworthy counterparts to reduce the hazard. Such transactions give rise to bilateral dependencies and the parties have incentives to promote a continuous long-term relationship and thus safeguard specific investments. The safeguards refer to provisions such as penalties for poor or non-performance, information disclosure and verification procedures, and specialized dispute resolution (such as arbitration).

At Node C (hybrid) in figure 1, transactions are supported by inter-firm contractual safeguards ($s>0$). Instead of a set of legal rules with court enforcement (as at Node B), the contract here is a framework or a set of guidelines for interactions between the firms. Discrepancies in performance are resolved through amicable consultation or negotiations, or by arbitration. The court is only used as a last resort remedy.

Under Node C mode, the price that a supplier offers to supply the product will be lower than the offer price at Node B, because the safeguards at Node C reduce the hazard to the specific investment and thus lower the risk premium. On the other hand, the bid price that a buyer is willing to pay will be higher than the bid price at Node B. In this case, the safeguards serve to assure the buyer that the product is sourced from a reliable supplier. Such assurance reduces the risk discount incorporated in the bid price.

If costly breakdowns and transaction hazards continue despite the safeguards at Node C, the supplier and the buyer may be brought under unified ownership and vertically integrated. At Node D (hierarchy), transactions between the two successive stages of production are under the administrative control of the vertically integrated firm. This occurs when a higher degree of asset specificity and added uncertainty pose greater needs for cooperation in mutual adaptation. However, internal administrative controls will incur higher bureaucratic costs.

For production that involves multiple (more than two) technologically separable stages, some successive stages may be vertically integrated while other stages may be under governance of market or credible contracting. There are potentially numerous combinations in the whole spectrum between Node A and Node D—the extreme case where all successive stages are vertically integrated under hierarchical administration.

In summary, each node in the simple contractual schema represents a generic mode of governance. And each generic mode of governance embodies its own internally consistent attributes of incentive intensity (reward for effort), administrative control, and contract law regime and therefore has its own strengths and weaknesses.

At Node A, the governance structure is the unassisted market (competitive market norm). The governance structure at Node B is also the market, where asset specificity exposes transacting parties to uncertainties and, without safeguards, to unrelieved hazards to their investments. Node C is where the market is assisted with credible contracting.

All successive production stages are integrated under hierarchical control at Node D. The attributes of a market mode are high incentive intensity, little administrative control, and a legal rules contract regime. On the other hand, attributes of hierarchy are low incentive intensity (where pricing for the successive stages is cost-plus), considerable administrative control (by fiat), and forbearance is the implicit contract law of internal organization (the parties must resolve their differences internally).

As Williamson says, "try markets, try hybrids and have recourse to the firm only when all else fails. Node D, the unified firm, thus comes in only as higher degrees of asset specificity and added uncertainty pose greater needs for cooperative adaptation" (*Williamson, 2002, p.183*).

This summary may be fitted into a table for a comprehensive view (table 1).

The Cooperative and the Modes of Transaction Governance

How do cooperatives fit in this simple contractual schema? The analysis in this section uses the dairy industry as its example. Extension to cooperatives of other sectors is discussed later.

Transactions in the subsistence agricultural economy where farm production in excess of family consumption is sold off farm may be a Node A (unassisted market) mode. For example, a farm family has one or two cows for producing milk to satisfy the family's food needs. If there is surplus milk, it may be sold to neighbors (if permitted by food safety regulations). The transactions are incidental to subsistence farming and do not require specific asset to effectuate. This mostly represents a bygone era.

Commercial milk production requires substantial capital investment in specialized assets: milk cows, buildings such as barns and milking parlors, machinery and equipment, and skilled labor (including milkers, herdsmen), and management, etc. Most of these assets are specifically for producing milk and cannot be easily employed for alternative uses. Furthermore, milk is a "flow product" and is highly perishable. Its market is inherently volatile due to daily and seasonal variations of milk production and milk demand—and the supply and demand variations are not coordinated with each other.

Asset specificity, high product perishability, and market volatility make dairy farmers vulnerable when dealing with milk buyers (processors of dairy products). Further, there are many dairy farmers but just a small number of milk processors. Although processors also encounter asset specificity due to their ownership of dairy plants that are capital- and technology-intensive facilities and that require large size to take advantage of economies of scale, they are in a dominant bargaining position *vis-a-vis* individual dairy farmers.

Many farmers organized cooperatives to collectively have more bargaining and countervailing power. Various government programs were also instituted in the early decades of the 20th century to stabilize the market (*Manchester*).

Table 1—Transaction governance modes and attributes

Transaction governance mode	Asset specificity	Investment hazard safeguard	Incentive intensity	Administrative control	Contract law regime
A: Unassisted market	0	0	High	Little	Competitive norm
B: Unrelieved hazard	>	0	<	>	Legal rules contract regime
C: Hybrid (Credible contracting)	>	>	<	>	Credible contracting
D: Hierarchy (Administrative)	>	>	Low (Pricing for successive stages is cost-plus)	Considerable (by fiat)	Internal implicit contract law (Forbearance)

Source: Adopted from *Williamson, 2005*, Figure 1: Simple Contractual Schema.
Note: ">" indicates a mode having a higher intensity of the particular attribute than the mode above it.
"<" indicates a mode having a lower intensity of the particular attribute than the mode above it.

The form of government market intervention that is most relevant today is the Federal Milk Marketing Order Program promulgated under the Agricultural Marketing Agreement Act of 1937, as amended. To stabilize market conditions and maintain orderly marketing, Federal Milk Marketing Orders regulate milk marketing in most regions of the country and ensure dairy farmers a reasonable minimum price for their milk throughout the year (California has similar regulations under its State milk marketing order).

As long as a farmer's milk is qualified to be pooled under market orders through a regulated handler—either a cooperative or a processor—the milk will receive at least the regulated minimum price. The regulations frame a marketplace where orderly commerce can proceed. However, if there is no credibl contracting between farmers (or their cooperatives) and processors to safeguard investments, transaction governance is still a Node B (unrelieved hazard) mode.

(Government intervention to frame an orderly marketplace falls in what is called the *public ordering* domain that focuses on *the rules of the game*, while efforts by the immediate parties to a transaction to align incentives and to craft governance structures that are better attuned to their exchange needs are referred to as *private ordering* or t*he play of the game* (*Williamson*, 2002, p. 172).)

For a highly perishable commodity like milk, it is vitally important for both producers and processors to work together to make sure milk flow is smooth and without interruption. Producers need to have an ensured outlet for the milk once it is produced. Most of them (84 percent of U.S. dairy farmers) work together through their cooperatives to better manage the movement of the milk to the market.

On the other hand, processors require a steady supply of fresh milk to manufacture high-quality dairy products and efficiently utilize plant capacity. The dairy industry has evolved in such a way that many dairy cooperatives and processors have developed a high degree of bilateral dependency. Because dairy cooperatives are organizations of farmers, they have the comparative advantages of working closely with members for assembling milk, providing field services, and performing farm-related functions.

Many processors rely on dairy cooperatives for milk supplies that are tailored to their requirements for volume, quality, composition and/or delivery schedule, so they can focus their attention on processing and packaging dairy products. Here, the transactions between cooperatives and processors are assisted with credible contracting and transaction governance is a Node C (hybrid) mode.

Besides selling members' milk to buyers-processors, a dairy cooperative may forward integrate into processing some or all of its members' milk into various dairy products. These processing enterprises are therefore under the cooperative's hierarchical administrative control, a Node D (hierarchy) mode.

Integration into making "hard products" (butter, milk powders, cheese) is in most cases a necessity. Being marketers of members' milk, many cooperatives

have to maintain plant capacity to balance milk supply and manufacture reserve and surplus milk into storable products. Like a reservoir, these cooperative plants absorb milk in excess of processors' demand for fluid milk and provide supplemental milk to the market when it is needed. Without the plant capacity to forward integrate into making storable hard products, surplus milk will be at the mercy of the market and lead to depressed milk prices (a Node B mode).

On the other hand, integration into processing fluid products or specialty dairy products, or further processing hard products, is usually by a cooperative's strategic choice in its effort to generate higher margins from the market for members' milk.

Dairy cooperatives may be classified into one of four categories based on the main marketing function(s) they perform (table 2). Their transaction governance roles depend on their lines of business.

All four categories of dairy cooperatives may have joint ventures with other cooperatives or firms to process and market certain dairy products. The cooperative supplies dairy inputs, and the partner(s) provide technical or marketing know-how to the joint venture. This is one way of bringing product processing under the cooperative's partial control. In this case, transaction governance mode may be viewed to fall somewhere between Node C and Node D.

Inferences

Several inferences may be drawn from the analysis of the roles of cooperatives and other firms (firms other than cooperatives) in transaction governance:

1. Cooperatives' roles in transaction governance are exactly the same as those of the firm in Williamson's analysis of transaction cost economics—their transactions are under all possible governance modes, depending on the lines of business they engage in. Some milk and dairy products are sold in the spot market, a Node B mode. Most milk and dairy products, however, are marketed by the cooperative to the buyers under credible contracting mode, at Node C. Cooperatives that bottle fluid milk or make niche products bring the processing stages under internal control, a Node D mode. A diversified cooperative may integrate into one or more processing stages (Node D mode), depending on the kind of finished products it makes. Just like other firms, cooperatives adapt to various transaction governance structures for economizing on transaction costs.
2. Cooperatives do not own the assets that are employed by members to produce milk; the assets and the investment hazard associated with asset specificity belong to member-farms. This reveals the cooperative's unique structure of being an aggregate of its member-farms—the relation between the member-farms and the cooperative is not that of an integration of successive technologically separable production stages or that of a horizontal integration of like businesses under the cooperative's management oversight and administrative control.
3. By pooling milk and marketing it collectively through the cooperative, member-farms also pool and share the investment hazard associated with the assets specifically used for producing the milk. Individual member-farm's share of the hazard should be less than if each member markets the milk by itself and faces market uncertainty alone.
4. The countervailing power of the cooperative may be helpful in entering into credible contractual relationships with processors, because such relationships may be more attainable and stable between counterparts that are on a relatively more equal footing.
5. Being an aggregate of its member-farms, the cooperative serves as a focal transaction entity for its members and simplifies members' relations with milk buyers (processors). It is far easier for processors to build credible contracting relations with a single entity (the cooperative) than with many individual farmers. Without the cooperative, it would require much more effort by processors to maintain credible contracting relations with farmers, i.e., there could be more transaction uncertainties, to the detriment of farmers and processors as well as the ultimate consumers. So there is an extra dimension in the cooperatives' roles in transaction governance: Infuse order among member-farmers, thereby eliminating conflicts in which individuals compete for customers, thus realizing gains for all parties.

(The other 16 percent of milk producers are not cooperative members. They market their milk in one of several ways: making artisan, niche, or farmstead dairy products, bottling their own milk as producer-handlers, or being direct shippers to processors—some of the processors may be owned by farmers but are not organized or operated as cooperatives.)

Table 2—Category of dairy cooperatives by marketing function(s) and transaction governance roles

Category of cooperatives	Main function	Dimension	Transaction governance
Bargaining	Negotiate with milk buyers (processors) for milk prices and terms of trade; a few may operate milk handling facilities but not milk plants.	108 cooperatives (out of 155 U.S. total, or 70 percent). Together handled 23 percent of the 155.8 billion pounds of U.S. cooperative milk volume, but few handled more than 1 billion pounds of milk each.	Regular milk sale is usually at Node C (hybrid); may be at Node B (unrelieved hazard) for spot milk sales.
Niche marketing	Own or retain plant capacity to process members' milk into specialty/niche products.	19 cooperatives. Most handled less than 50 million pounds of milk each. Together handled less than 1 percent of U.S. cooperative milk volume.	Products processing stages are at Node D (hierarchy); wholesale distribution of products is usually at Node C and may be at Node B; and retail sales are usually at Node B.
Fluid processing	Own or retain plant capacity to process members' milk into fluid products. May also process soft and cultured products.	4 cooperatives. Milk volume processed was moderate. Together handled less than 1 percent of U.S. cooperative milk volume.	Products processing stages are at Node D; wholesale distribution of products is usually at Node C.
Diversified	Perform bargaining and all or most other marketing functions. As a group, sold 53 percent of milk to other handlers (bargaining); manufactured the remaining 47 percent into various products.	24 cooperatives. Three out of four cooperatives in this group handled 1 billion or more pounds of milk, and none handled less than 50 million pounds. Together, handled 75 percent of the U.S. cooperative milk volume.	Bargaining function is usually at Node C; products manufacturing and further processing stages are at Node D; wholesale distribution of products is usually at Node C and may be at Node B; and spot milk sales may be at Node B.

Source: All dairy cooperative statistics cited are 2007 data, the year of USDA Cooperative Programs' most recent dairy survey.

The Unique Cooperative Model

The transaction governance analysis reaffirms the unique structure of the cooperative being an aggregate of member-farms. The unique cooperative structure entails the uniqueness of the cooperative's organization, governance, equity financing, and operation. Dairy cooperatives are again used as an example for discussion.

Unique Cooperative Structure

Following what has been discussed thus far in this report, a brief definition of the structure of dairy cooperatives should suffice: The economic structure of dairy cooperatives represents aggregates of dairy farms, organized for the purpose of marketing milk produced by members. The cooperative is neither a horizontal integration of its member-farms nor a vertical integration between member-farms and the cooperative—it is a third mode of organizing coordination.

Unique Cooperative Organization

Cooperatives are business organizations of member-patrons. Dairy cooperatives can be of any size and can be local, regional, or national in scope, depending on whatever scale the membership considers to be the most appropriate for marketing their milk.

A small local cooperative may have a few member-farms and market less than 1 million pounds of

milk a year. A regional one may have hundreds or thousands of members in more than one State with milk pounds in the millions or even billions. The Nation's largest dairy cooperative has about 10,000 member-farms in the 48 contiguous States; together, they deliver tens of billions of pounds of milk.

All dairy cooperatives are known to be centralized organizations with direct membership. A limited number may have other dairy cooperatives as association members, but the practice is usually for accommodating the fact that the cooperative is the marketing agent of all or part of the milk, dairy products, or services of these association members.

Unique Cooperative Governance

Members of dairy cooperatives exercise ownership and business controls through a board of directors that is elected from among member-farmers. Candidates for the board are typically nominated by a committee of elected members who are not directors. Elections of the directors are usually done at the annual membership meeting.

If a cooperative is large, in terms of membership or geographical area, members may be grouped into districts (or areas/regions/divisions/locals, as the case may be). Then the directors may be nominated from the district and elected at the cooperative's annual meeting. Voting at the district level is typically by one member/one vote. The number of directors each district is entitled to may differ due to proportionality considerations based on milk volume. Some boards may have at-large members. (A limited number of dairy cooperatives are known to have non-member directors, typically in the States where they are required by law. Non-member directors usually play an advisory, non-voting role on the board.)

Also in a large cooperative, a delegate body elected by members may be needed to channel information and make decisions on behalf of the membership. The delegate body may be empowered to represent the membership in all decisions, except for matters that specifically require votes by the entire membership.

An executive committee of elected officers and selected board members may be constituted to facilitate decisionmaking when the board is not in session. The board may also appoint several committees to carry out specific board functions, such as audits, finance, membership, and marketing committees.

The board controls the cooperative's business on behalf of members, makes major decisions, sets the policy, and determines the overall direction of the cooperative for the management to follow in its day-to-day operations. The emphasis on the separation of the responsibility of the board (governance) and the role of management (managing) accentuates the difference between the function of a cooperative's manager and that of a chief executive of other firms. Another very important function of cooperative board members is serving as a conduit of communication between the cooperative and the rank-and-file members.

Being membership organizations, dairy cooperatives attach great importance to effective communication with their members to foster sound governance. This requires transparency regarding the cooperative's policies, operations, finance, and issues and problems; and awareness of members' concerns, opinions, and aspirations. Many people including board members, delegates, management staff, and field personnel all play a role in the information flow between the cooperative and the members. Various media of communication are used: routine contacts, membership meetings and functions, special mailings, newsletters, and Web site postings, etc.

Unique Cooperative Equity Financing

Equities of dairy cooperatives are supplied by members. They can be grouped into four categories: common stock (0.1 percent of total equities), preferred stock (7 percent), retained earnings (10.8 percent), and allocated equities (82.1 percent) (*Ling, 2009*).

Common stock

Common stock only accounts for a miniscule portion of total equities. This is because common stock of cooperatives is usually issued for witnessing membership and carries minimal nominal value.

Preferred stock

A small number of dairy cooperatives issue preferred stock for witnessing retained patronage refunds or for witnessing members' or farming community's investments in the cooperative.

Retained earnings

Retained earnings could be earnings derived from non-member businesses, but may also include net savings that have not been allocated. (In most cases, non-member businesses of dairy cooperatives are incidental to the dairy operation.)

Allocated equities

The overwhelming portion of dairy cooperative equities is allocated equities. They are members' capital from one or more of these sources:

- Retained patronage refunds: Retained patronage refunds are net savings that are allocated to members based on patronage but are retained to finance the cooperative's operations. Members must treat the entire patronage refunds (retained as well as cash payment) as income for tax purposes. Dairy cooperatives usually revolve retained patronage back to members after a certain period of time (the shortest noted being 6.5 years).
- Capital retains: Some cooperatives use capital retains to finance the operations or, more often, for special projects, such as building new plants. Money is withheld from milk payment at a certain rate per hundredweight of milk. Members must treat capital retains as income for tax purposes. Capital retains are also revolved back to members after a certain period of time.
- Base capital plan: Some larger diversified dairy cooperatives have adopted base capital plans to establish a more stable equity pool. Under such a plan, a target base capital level is established at a rate per hundredweight of milk marketed during a base period. The base capital may be funded by retained patronage and/or capital retains, or by other means of member contribution. Once a member attains the prescribed base capital level, future patronage earnings allocated to the member are paid in cash.

By obtaining equity financing internally from members, cooperatives do not incur the cost of soliciting investment capital in the capital market.

Unique Cooperative Operation—Unique Economics

The uniqueness of dairy cooperatives results from their structure as aggregates of member-farms, as well as from being the exclusive marketing agent of members' milk production. The cooperative takes whatever milk volume members produce and markets it on their behalf. Members' farming operations are not under the cooperative's administrative control and the cooperative cannot dictate how members operate their dairy farms. This operating mode entails its own unique economics that deserves a fuller explanation.

The Economics of Cooperative Operation

Dairy cooperatives, again, are used as an example. A model dairy farm is introduced here to facilitate the discussion.

A Model Dairy Farm

A farm is constructed with its dairying infrastructure to accommodate a dairy herd of a certain size. It has a rated capacity of producing "v" pounds of milk per day at an average cost of "P" dollars per hundredweight (cwt). This is pinpointed in figure 2 (Page 21) by the lowest point along the average cost curve (AC), where marginal cost curve (MC) also intersects. If the expected milk pay price for the month is the same as the minimum average cost P, then the farm's milk production for the month is v pounds per day and the farm is said to be in "equilibrium."

[Expected milk pay price is used in the discussion of a farmer's milk production decision, because actual pay price will not be known until after the end of the current month—the trade practice is to calculate milk pay price to farmers after the delivery month is complete. In the meantime, farmers form their price expectations based mainly on pay prices actually received during the recent past and on price signals revealed by the trading data from cash markets for dairy products and from futures markets for milk and dairy products. Depending on how the price expectation is formed, a given farmer's expected milk pay price may not be the same as those of other farmers.]

Milk Price Variation

If the expected milk pay price is P_1, which is lower than P, the farm will incur a loss of at least [P – P_1] for every cwt of milk it produces. According to textbook optimization theorization, the farm would minimize its total loss by producing v_1 pounds of milk a day, as determined by A, at which point marginal cost equals P_1 (marginal revenue). However, although marginal cost is a useful concept, its real-life calculation has many complications and is, therefore, not readily available for practical day-to-day operational decisionmaking. (This also applies to other concepts related to marginal productivity.) For such decisions, the time-honored business practice is to use average cost in the profit-and-loss estimation (*e.g., Hall, et al.*). In the present case, it is very likely that the dairy farm will strive to attain the lowest average cost P by producing up to v pounds of milk, even though doing so

would incur a higher loss. So, depending on which cost concept a farmer uses, when the expected milk pay price is P_1, milk volume produced by the dairy farm may be v_1 pounds or v pounds, or somewhere between the two amounts.

When the expected milk pay price is P_2, which is higher than P, then the farm will enjoy a profit of [P_2 – P] per cwt if the farmer decides to attain the lowest average cost P by producing at its rated capacity of v pounds of milk a day. Or, the farmer may strive for maximum revenue and increase its production up to the break-even point C and produce v_2 pounds of milk per day. Alternatively, the farmer may want to achieve maximum profit by producing v_3 pounds of milk as determined by D, at which point P_2 (marginal revenue) equals marginal cost, if the latter is actually known. Thus, when the expected milk pay price is P_2, milk volume produced by the dairy farm may be somewhere between v pounds and v_2 pounds.

(To a limited extent, a dairy farm may be able to adjust milk production by changing its feeding practice. Changing cow numbers to adjust the volume of milk production will change the rated capacity of the farm and will result in a new set of cost curves.)

Replicating the model dairy farm tens, hundreds or thousands of times, depending on the size of a cooperative, members together would deliver milk in the volume as depicted in figure 3 (Page 22). The aggregate volume of members' rated capacity is V cwt per day, which the cooperative may know with certainty. Less certain is the volume of members' actual deliveries. When the expected milk pay price is P_1, the aggregate volume of milk deliveries will be somewhere between V_1 cwt and V cwt, depending on how members make their production decisions.

In the same vein, if the expected milk pay price increases to P_2, then the aggregate volume will be somewhere between V cwt and V_2 cwt.

Logically, the cooperative would plan its milk handling capacity based on the total volume of members' rated capacity. However, the uncertain volume of actual delivery means on some days the cooperative will have slack capacity, while on other days it may have to scramble to make sure every drop of milk has a home. The logistics of hauling and shipping the fluctuating milk volume is another management challenge.

It should be noted that because a cooperative is formed to market whatever the aggregate volume of milk produced by its members, it does not have its own milk production functions, milk production cost curves, or milk supply curves.

Milk Production Input Cost Variation

Suppose the expected milk pay price remains at P, but the cost of production input such as feed or fuel has increased. Since the infrastructure and the size of the dairy herd do not change, the rated capacity of the farm will stay at v pounds of milk per day. However, the average cost curve and its associated marginal cost curve will shift upward to AC_1 and MC_1 (figure 4, Page 22). The average cost curve is everywhere higher than the expected milk pay price P and the farm will suffer a loss. The farm may want to minimize its total losses by producing v_1 pounds of milk, identified by A, at which point the expected milk pay price P (marginal revenue) equals marginal cost. Short of knowing the marginal cost, it is very likely that the dairy farm will work to produce up to v pounds of milk in order to attain the lowest average cost as indicated by B. So when production input cost increases, milk volume produced by the dairy farm may be somewhere between v_1 pounds and v pounds.

On the other hand, if production input cost decreases, then the average cost curve and the associated marginal cost curve will shift downward to AC_2 and MC_2 and the farm will reap a profit. The farm may decide to produce milk at its rated capacity of v pounds of milk a day to attain the lowest average cost as shown by C. Or it may increase its production up to the break-even point D and produce v_2 pounds of milk per day that will return the highest total revenue. Alternatively, the farm may want to achieve maximum profit by producing v_3 pounds of milk, as determined by E, where P (marginal revenue) meets marginal cost. So, when production input cost decreases, milk volume produced by the dairy farm may be somewhere between v pounds and v_2 pounds.

The milk situation faced by the cooperative is *similar* to that depicted in figure 3. The aggregate volume of members' rated capacity remains at V cwt per day. When production input cost increases, members' actual milk delivery will be somewhere between V_1 cwt and V cwt, depending on how members make their production decisions. Conversely, when the cost of production input drops, the aggregate volume will be somewhere between V cwt and V_2 cwt.

The discussion thus far shows the challenges a dairy cooperative faces in handling fluctuating milk volume when either the expected milk pay price or production input cost changes. When both price and cost changes are considered at the same time, the picture is even more complicated. Still, this is just a highly simplified scenario. In real life, not every farm is like the model dairy farm; in fact, no two farms are

alike. They are not likely to be of the same size and make the same production decision. The volume variation may thus be even less predictable than in figure 3.

In addition, bovine milk production is a biological process and is subject to daily and seasonal fluctuations. Daily volume variation may be readily addressed by "rolling" milk stocks to even out the flow if the cooperative has sufficient milk holding capacity. Seasonality of milk production requires more effort to handle.

Seasonal Production Variation

Milk production is affected by a cow's physiological condition that is subject to seasonal changes. The seasonal nature of milk production is best portrayed by the index of seasonality, such as in table 3, for example, which is based on milk deliveries to the Northeast regional market and documented in an earlier RBS research report (*Ling, 2001*). The table shows that the first six months of the year is a period of higher-than-average milk deliveries, with May being the peak. The index of 106 indicates that May is 6 percent higher than the annual average daily deliveries.

Milk deliveries decline sharply from June to July and stay relatively low throughout summer and fall. Deliveries are usually lowest in November. With an index of 95, November is 5 percent below annual average daily deliveries. Deliveries recover in December and increase steadily through winter and spring. The drop from May to November is 11 percentage points. (Table 3 is used here as an example for discussion. It should be noted that different regions of the country may experience different seasonality, and seasonality may change over time.)

Seasonality of milk production in essence shifts a farm's cost curves downward to the right during a seasonally high production month or upward to the left during a seasonally low production month. To see this, continue with the model dairy farm as an example. The farm's rated capacity, at the intersection of AC and MC in figure 5 (Page 23), is v_{100} pounds per day and reflects milk production at a seasonality index of 100 (annual average).

During a seasonally high production month (seasonality index is more than 100, for example, 105), since the same infrastructure and the same herd size will produce more milk, the farm's capacity should be higher than v_{100}, shown in figure 5 to be at v_{105} pounds per day. Also, because the same fixed cost is spread over a higher milk volume, the average cost of producing milk should be lower. The combined effect would shift the cost curves rightward and downward, as represented by AC_1 and MC_1.

On the other hand, during a seasonally low production month (seasonality index is less than 100, for example, 95), since the same infrastructure and herd size will produce less milk, the farm's capacity should be less than v_{100}, shown in figure 5 to be at v_{95} pounds per day, as an example. And because the same fixed cost is spread over a smaller milk volume, the average cost of producing milk should be higher. The combined effect would shift the cost curves leftward and upward, as represented by AC_2 and MC_2.

The net effect of shifting seasonal capacity and cost curves means that members' milk volume the cooperative has to handle will fluctuate seasonally throughout the year. This further compounds the challenges of marketing members' milk.

Table 3—Indices of seasonality of producer milk deliveries and fluid demand

Month	Producer milk deliveries	Fluid demand
	Percent	
January	100.1	101.9
February	101.8	100.6
March	103.7	100.9
April	105.4	98.2
May	106.0	98.1
June	103.4	94.0
July	97.8	94.2
August	97.0	98.1
September	96.3	105.2
October	95.4	104.6
November	95.0	102.8
December	98.1	101.4
Simple average	100.0	100.0

Source: *Ling, 2001.*

Seasonal Demand Variation

On the milk demand side, seasonal variation is mainly caused by fluid (beverage) uses. This is because the milk volume required by fluid processing plants is directly and instantaneously derived from consumers' demand of fluid products, which is highly seasonal in nature. Manufacturing plants that make storable products such as cheese are different. They tend to maintain a constant throughput volume at or near plant capacity in order to achieve least-cost operations.

The example in table 3 shows that fluid demand is highest in September and maintains a higher-than-annual-average level, though declining, through fall and winter and until March; fluid demand is lower than annual average from April through August. The peak in September (seasonality index=105) is 5 percent above annual average daily consumption. The lowest fluid consumption month is June, with an index of 94, or 6 percent below the annual daily average. The June low is a drop of 11 percentage points compared with the September peak.

Thus, seasonality of fluid demand by and large runs counter to the seasonality of milk production. Fluid demand tends to be high during those months when milk production is low, and tends to be low when milk production is high. Handling this mismatch of supply and demand is a major challenge to the cooperative.

Balancing Seasonal Supply and Demand

Most diversified dairy cooperatives have plant capacity to balance milk supply and demand and manufacture surplus milk into storable dairy products for future marketing or further processing, as shown in the following example.

Suppose, on an annual daily average basis, the cooperative's members together deliver 10 million pounds of milk a day, and the cooperative markets 4 million pounds to fluid milk processing plants and 2.5 million pounds to dairy product manufacturing customers. Suppose further that milk production and fluid demand follow the seasonal patterns given in table 3. Then, in May, the cooperative's members will produce 10.6 million pounds of milk a day, while fluid plants will use 3.9 million pounds and the manufacturing customers will use 2.5 million pounds. The cooperative will have 4.2 million pounds of milk a day that is in excess of demand by fluid plants and manufacturing customers (table 4).

On the other extreme, the same calculation will show that the daily excess volume will be 2.9 million pounds in the fall months (September through November); a reduction of 1.3 million pounds a day from May. If the cooperative has its own manufacturing plants to use a constant volume of 2.9 million pounds of milk a day, then the cooperative still needs to have facilities to handle seasonal surplus of 1.3 million pounds of milk a day in May. During other months, the seasonal surplus balancing facilities will be under-utilized and will run dry in the fall months, resulting in costly plant operations (*Ling, 2001*).

If a cooperative does not have enough surplus balancing capacity, or in the case of bargaining cooperatives that do not have any plant capacity, there are two ways for them to dispose of surplus milk. They can sell the surplus milk in the spot market, usually at a price discount. Or they can pay a "tolling fee" to have the milk manufactured into storable dairy products at plants owned by others. The price discount and the tolling fee are charges for defraying the costs of owning and operating surplus handling plant facilities.

Summary of the Economics of Cooperative Operation

A dairy cooperative is an aggregate of its member-farms for the purpose of marketing whatever milk volume members produce. Because members' milk production is subject to variations caused by many factors, there are two main challenges the cooperative has to manage in performing marketing functions: (1) coordination of hauling a fluctuating milk volume and shipping the milk to processors whose demands are also subject to variations and (2) daily and seasonally balancing milk supply with demand. The economics of dairy cooperative operation considers the following elements:

- When the expected milk pay price goes up or down, the milk volume a farm may program depends on the financial objective of the farm: whether it wants to attain maximum profit (minimum loss in a loss situation), minimum average cost, or maximum revenue (up to the break-even point).
- Production input cost changes do not change the farm's rated capacity but shift the farm's cost curves straight up or down. What milk volume the farm produces, again, depends on the financial objective of the farm.
- When both price and input cost changes are considered at the same time, the volume of milk production the cooperative has to handle may be even less predictable.

Table 4—An example of a cooperative's milk in excess of demand by fluid plants and manufacturing customers[1]

Month	Member milk deliveries	To fluid processing plants	To manufacturing customers	Co-op milk in excess of sales
		----------Million pounds/day----------		
January	10.0	4.1	2.5	3.4
February	10.2	4.0	2.5	3.7
March	10.4	4.0	2.5	3.8
April	10.5	3.9	2.5	4.1
May	10.6	3.9	2.5	4.2
June	10.3	3.8	2.5	4.1
July	9.8	3.8	2.5	3.5
August	9.7	3.9	2.5	3.3
September	9.6	4.2	2.5	2.9
October	9.5	4.2	2.5	2.9
November	9.5	4.1	2.5	2.9
December	9.8	4.1	2.5	3.3
Simple average	10.0	4.0	2.5	3.5

[1] Items may not add to totals due to rounding.

- Farmers organize the cooperative to market whatever the aggregate milk volume they produce. Therefore, the cooperative does not have its own milk production functions, milk production cost curves, or milk supply curves.
- Milk production is a biological process and is subject to daily and seasonal fluctuations. Daily volume variation may be readily taken care of by rolling the milk stock. It is handling seasonality of milk production that is more problematic.
- Seasonality of milk shifts a farm's cost curves downward to the right during a seasonally high production month or upward to the left during a seasonally low production month.
- The seasonality of milk production generally does not match the seasonality of fluid milk demand. This mismatch requires the cooperative to balance seasonal supply with seasonal demand and handle the inevitable seasonal surplus milk volume at a substantial supply balancing cost.

Variations on a Theme

Different commodities have their own characteristics and different types of cooperatives have their own special features. They all represent variations on a theme.

Marketing Cooperatives

The analysis using the simple contractual schema shows that in transaction governance, dairy cooperatives are not different from non-cooperative firms. However, the corollary of the analysis reveals the uniqueness of dairy cooperatives in structure, organization, governance, equity financing and operation that stems from their being aggregates of member-dairy farms. The unique economics of cooperative

operation is applicable in the situation where the cooperative is the exclusive marketing agent of the milk produced by members.

Other agricultural commodities (such as fruits, vegetables, nuts, poultry, sugar, etc.) that exclusively rely on a cooperative to market members' products would have unique cooperative operations similar to that of dairy cooperatives. However, they differ from dairy cooperatives in some important aspects. The main one is that milk is a flow product, day in and day out, while other farm commodities are harvested in lumps toward the end of the growing season of several weeks or months. In the analysis of the economics of cooperative marketing of milk, the unit of time used is on a per-day basis (cwt/day). The same analysis of other commodities has to use a unit of time that is appropriate for a particular commodity.

Some producers of commodities that are storable and have a long marketing season (such as grains and oilseeds) may view the cooperative as but one of multiple outlets and market through it only if the cooperative offers the best terms and services among all alternatives. In such a case, the cooperative may still maintain its uniqueness in its cooperative structure, organization, governance and equity financing. Its marketing operation, however, is not different from other marketing firms.

New-Generation Cooperatives

Interest in new-generation cooperatives surged in the 1980s and 1990s, largely in response to the market conditions prevailing during that time period. It was believed this form of cooperative organization would solve the problem of depressed farm income by engaging in value-added processing and capturing processor margins.

A distinct feature of the new-generation cooperative is its equity financing method. It is unique even among cooperatives:

- It requires significant equity investment as a prerequisite to membership and delivery rights—to ensure that an adequate level of capital is raised.
- The delivery right is in the form of equity shares that can be sold to other eligible producers at prices agreed to by the buyer and the seller, subject to the approval of the board of directors—to satisfy members' desire of having the freedom to cash in on the hoped-for increases in the value of the cooperative.

A new-generation cooperative is organized to market members' commodities through its main function of value-added processing. By bringing processing functions under internal administrative control, the cooperative's transaction governance mode in the simple contractual schema is at Node D. For wholesale distribution of finished products, transaction governance is usually at Node C and may be at Node B.

The delivery right is instituted to ensure that the capacity of the processing plant is fully utilized. A member delivers to the cooperative according to the volume conferred by such right, which may be more or less than the volume the member produces. Under such terms, the cooperative is not an exclusive marketing agent of members' total production. Though the cooperative is still an aggregate jointly owned and operated by members to process and market their farm production, the volume the cooperative handles is predetermined. This should minimize the cooperative's volume variation uncertainties.

Purchasing Cooperatives

Farm supply cooperatives are organized to procure production supplies and services for sales (mainly) to members. Many also handle farm and home items, such as heating oil, lawn and garden supplies and equipment, and food. Most supply sales to farmers are at the retail level by local cooperatives that are centralized organizations with direct members. Many local cooperatives also federate with other cooperatives to form regional cooperatives to achieve economies of scale in sourcing major supply items such as seeds, feed, fertilizer, and petroleum products.

Some federated cooperatives also have individual farmers as members and are, therefore, hybrid of centralized and federated forms. Many supply cooperatives also market members' crop and livestock production, just as marketing cooperatives may also have supply and service businesses.

Supply cooperatives share marketing cooperatives' unique structure, organization, governance, and equity financing. However, their operations are unique in their own way, because supply cooperatives' main business of procuring supplies for members operates on the buying side of market transaction. Transaction governance mode for sourcing products is most likely under credible contracting at Node C in the simple contractual schema. Here, they serve as focal points for credible contracting with suppliers and economizing on transaction costs on behalf of individual members. If they integrate upstream and bring the business of

processing supply items under the cooperative's administrative control, then the mode of transaction governance for this part of the operation is at Node D.

Their transaction governance mode in selling products to members depends on the degree of member loyalty. If members are loyal patrons, or if the cooperative is the only store in the relevant market area, the cooperative would resemble a buying club. Utility cooperatives and many service cooperatives are also in this category.

If member loyalty is low, then the cooperative would operate as any other firm in selling supplies, although it may still maintain its uniqueness in its cooperative structure, organization, governance, and equity financing.

Consumer cooperatives and credit unions are similar to supply cooperatives, except consumer cooperatives' main business is in consumer products, foods, groceries, etc., while credit unions' is in satisfying members' credit needs.

Local-Food Cooperatives

In recent years, consumers have shown growing interest in locally produced food. Because production of locally marketed food is more likely to occur on small farms located in rural areas near metropolitan counties, this trend will help invigorate the rural economy by expanding market opportunities for local agricultural producers.

However, there are barriers to local food market entry and expansion that include: capacity constraints for small farms and lack of distribution systems for moving local food into mainline markets; limited research, education, and training for marketing local food; and uncertainties related to regulations that may affect local food production, such as food safety requirements (*Martinez, et al.*).

Local food producers could be better equipped to overcome these barriers if they are organized into entities such as cooperatives (or hubs, networks, etc.), that can serve as focal points for addressing the issues:

- A cooperative can assemble the production of small farms into a larger volume and become viable to access mainline markets.
- A cooperative with a sufficiently large number of members who could complement each other's production and even out volume variation will be able to provide a more consistent supply to the market.
- A cooperative that can provide a large and consistent volume will be able to enter into credible contracting relations with mainline market operators, who prefer to conduct transactions with reliable business partners. As the simple contractual schema shows, buyers can relieve hazard to assets and reduce transaction cost by entering into credible contracting relations with trustworthy sellers (transaction governance at Node C).
- A cooperative with a sufficiently large membership can muster enough resources to partner with researchers, conduct member education and training programs, and provide many other member services.
- A cooperative can better address regulatory and food safety issues on behalf of its member-producers.

Multi-Stakeholder Cooperatives

Along with the local food trend, there have been some limited recent attempts at organizing multi-stakeholder cooperatives that comprise everyone who has a stake in the local food chain, including farmers, processors, distributors, truckers, buyers, etc.

On the surface, this brings together the successive stages of the transaction into the organization and appears to be a Node D transaction governance mode in the simple contractual schema. In reality, members are economic units that independently operate their respective business. The importance of their stakes in the cooperative to their economic well-being may vary widely.

By organizing all stakeholders in the successive stages of the supply chain under one roof, the cooperative becomes a framework for mutual adaptation and for multi-party, multi-stage credible contracting among members (Node C mode) only when they deal with each other in attending to the cooperative's business of moving products from farmer-members to buyer-members. The durability of the cooperative is dependent on the stability of the collective credible contracting relationships.

Farming Cooperatives

In parts of the United States, there are a few farms that are organized as cooperatives of producer-members. The farm enables members to pool resources together and operate it at an economically beneficial scale. This is one way of organizing and managing inputs for production as a farm. Its structure, organization, governance, and financing may be the same as a cooperative. Its operation, however, needs to have overall coordination for it to be a coherent and efficient production entity, and some form of manage-

ment oversight and administrative control over members' participation in the farming operation is necessary.

Members cannot make farming decisions independent of the farm, and they do not represent independent profit centers. In essence, the production operation is a vertical integration between producer-members and the cooperative.

Cooperatives With Non-Patronage Members

Some States have enacted new cooperative laws in recent years that allow cooperatives to have non-patron members (investors) as well as patron members. These laws vary from reserving the voting power to member-patrons only to setting a minimum level of voting power for member-patrons. Requirements regarding earning distribution between patron members and non-patron members also differ substantially. Differences in governance and earning distribution rules and the type of non-patron members involved (for example, for-profit investors, non-profit economic development organizations, community supporters, etc.) will cause the cooperative's structure, organization, governance, equity financing, and operation to deviate in various ways from the uniqueness of the cooperative model that was described earlier in the report. These organizations have to be analyzed case by case because of the variety of State laws.

Variations on the uniqueness of the cooperative business model are summarized in table 5. Local-food cooperatives are cooperatives organized to market locally produced food and should be classified as marketing cooperatives. In addition to farm supply cooperatives, purchasing cooperatives may include utility cooperatives, service cooperatives, consumer cooperatives, credit unions, and many more.

Conclusions

Transaction cost economics offers an approach to further probe the nature of the cooperative. Cooperatives are transaction governance structures, just like other firms (firms other than cooperatives). Depending on the lines of business that a cooperative or a firm operates, the transactions are under all possible governance modes. Cooperatives adapt to various governance modes for economizing on transaction costs, just as other firms do.

For entering into credible contractual relationships with buyers (processors), the cooperative's functions of providing market access and exercising countervailing power put its members, collectively through the cooperative, on a relatively more equal footing with buyers. This should make credible contractual relationships with buyers more attainable and stable.

Furthermore, as its members' collective marketing agency, the cooperative serves as a single transaction entity for credible contracting with buyers and infuses order and eliminates conflicts among members in individually competing for customers. This should reduce the transaction cost.

These analyses show how cooperatives relate to other market participants through their roles in transaction governance. This broadens our understanding of the cooperative's place in the market economy beyond the postulations made by Nourse.

A cooperative does not own the assets that are employed by members for farm production; the assets and the investment hazard associated with asset specificity belong to member-farms. By pooling members' products in its marketing efforts, the cooperative in essence also pools the investment hazard. As a result, each member's share of the hazard conceivably is less than if the member individually markets his or her products. The fact that asset specificity and the associated investment hazard belong to individual members reaffirms the cooperative's unique economic structure of being an aggregate of its member-farms. As posited by Emelianoff, this unique economic structure entails its uniqueness in organization, governance, equity financing and operation—and unique economics of operation for marketing cooperatives.

Thus, the perspective gained through the lens of transaction cost economics complements the earlier works on cooperative basics (*Nourse; Emelianoff*). Together, they make clear the nature of the cooperative.

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Table 5—Variations on the uniqueness of the cooperative business model

Type of cooperatives	Structure	Organization	Governance	Source of equity	Operation
Dairy cooperatives[1]	Aggregates of economic units	Centralized member organizations	Member-governed	Members	Member's exclusive marketing agent—unique economics
Marketing cooperatives[2]	Aggregates of economic units	Mostly centralized member organizations; some are federated	Member-governed	Members	Unique economics if exclusive marketing agent; otherwise, like other firms
New-generation cooperatives	Aggregates of economic units	Centralized member organizations	Member-governed	Members; tied to delivery rights	Business volume defined by delivery rights
Purchasing cooperatives[3]	Aggregates of economic units	Local (retail) cooperatives are centralized; many federated with other locals; federated cooperatives may have direct members	Member-governed	Members	Sourcing supplies or services for sale to members and patrons
Multi-stakeholder cooperatives[4]	Aggregates of economic units	Centralized member organization	Member-governed	Members	A framework for multi-party, multi-stage credible contracting among members
Farming cooperatives	Aggregates of economic units that are not independent in production operation	Centralized member organization	Member-governed	Members	A vertical integration between members and the cooperative in production
Cooperatives with non-patronage members	Mixture of patron and non-patron members	Defined by State laws	Defined by State laws	Defined by State laws	Defined by State laws; most likely member-patrons' business

[1] Separately listed due to dairy cooperatives' role in explaining the cooperative business model.

[2] Include local-food cooperatives.

[3] Include farm supply cooperatives, utility cooperatives, service cooperatives, consumer cooperatives, credit unions, etc.

[4] As defined in this report.

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Figure 1 : The simple contractual schema
(Williamson, 2005)

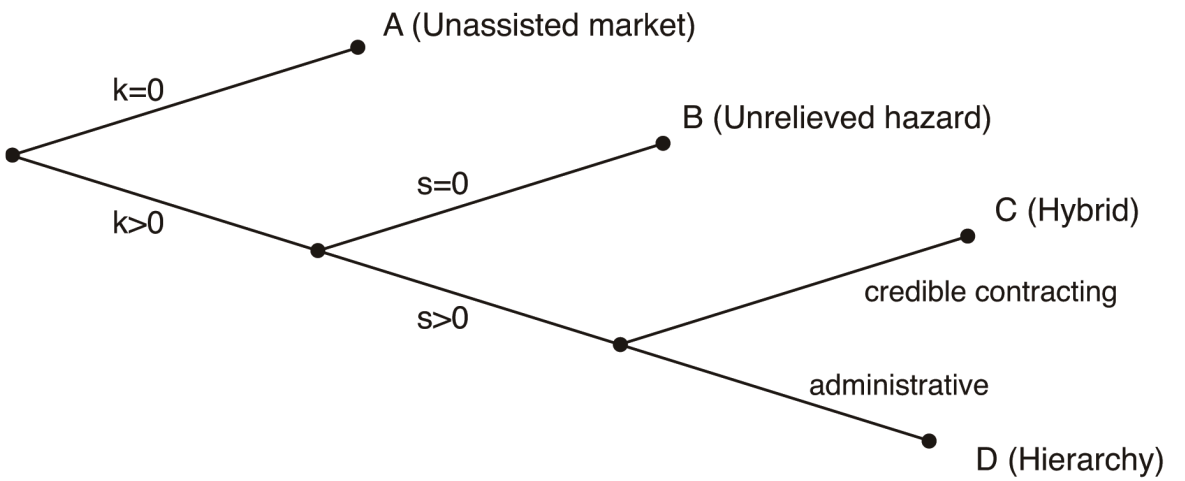


Figure 2 : A dairy farm's milk production volumes when expected pay price changes

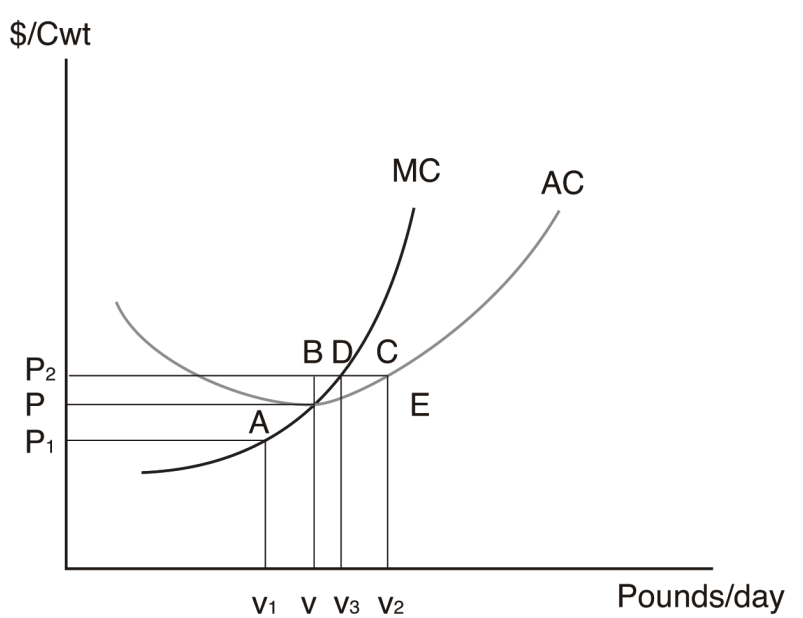


Figure 3 : A dairy cooperative's aggregate milk volume

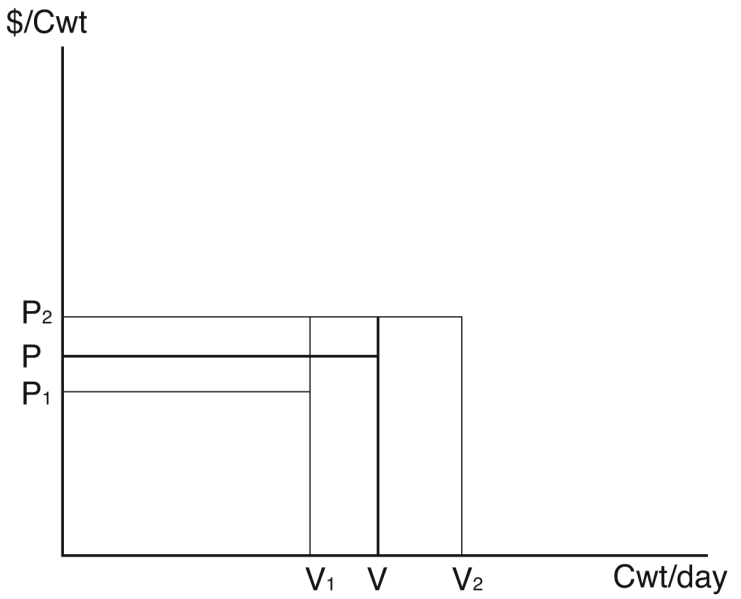


Figure 4 : A dairy farm's milk production volumes when input costs change

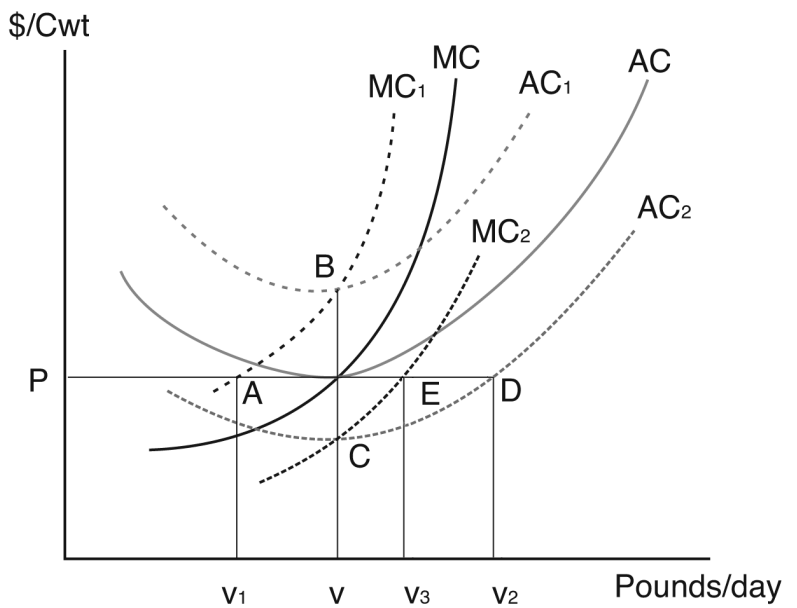
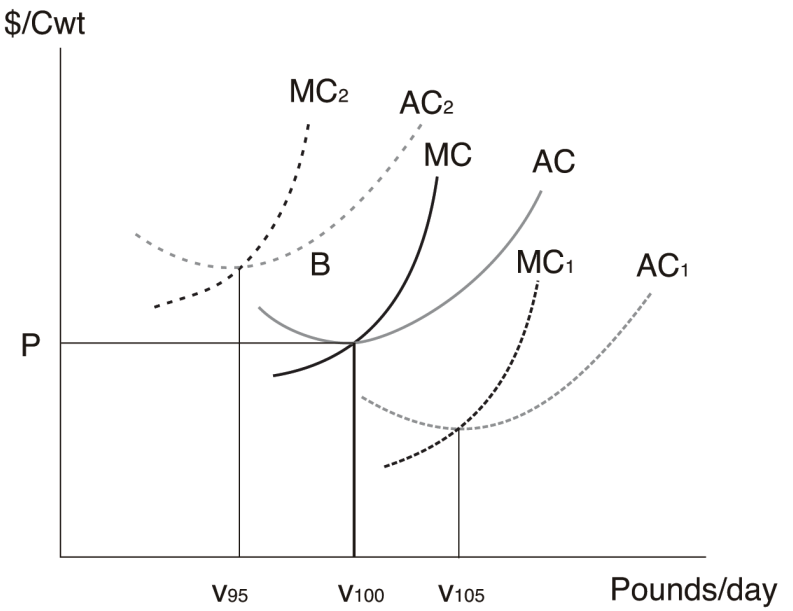


Figure 5 : Seasonality of milk production changes
a farm's capacity and shifts its cost curves



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Rural Business–Cooperative Service (RBS) provides research, management, and educational assistance to cooperatives to strengthen the economic position of farmers and other rural residents. It works directly with cooperative leaders and Federal and State agencies to improve organization, leadership, and operation of cooperatives and to give guidance to further development.

The cooperative segment of RBS (1) helps farmers and other rural residents develop cooperatives to obtain supplies and services at lower cost and to get better prices for products they sell; (2) advises rural residents on developing existing resources through cooperative action to enhance rural living; (3) helps cooperatives improve services and operating efficiency; (4) informs members, directors, employees, and the public on how cooperatives work and benefit their members and their communities; and (5) encourages international cooperative programs. RBS also publishes research and educational materials and issues *Rural Cooperatives* magazine.
