Service Report 18

Cooperative Theory: New Approaches

ABSTRACT

COOPERATIVE THEORY: NEW APPROACHES, edited by Jeffrey S. Royer, Cooperative Management Division, Agricultural Cooperative Service, U.S. Department of Agriculture.

This report contains nine papers on cooperative theory relating to operations, market behavior, decisionmaking, finance, and other aspects of farmer cooperation. These papers were written as part of an ACS project intended to stimulate research and thinking on practical aspects of cooperative theory. This report does not represent an exhaustive theory of cooperatives, but presents new approaches to thinking on several topics. In addition to answering some questions, these papers ask others in an attempt to encourage more thought.

Key words: cooperatives, cooperative theory, cooperative principles, operating procedures, methodology, structure, behavior, economic coordination, collective action, markets, decisionmaking, competition, finance.

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FOREWORD

Since Ivan Emelianoff's dissertation on the "Economic Theory of Cooperation" in 1942, a number of U.S. researchers have made contributions toward further developing a theory of cooperation. These contributions often have come in waves as concerted efforts have been made to strike new directions, or to formulate refinements to the evolving economic theory of cooperation. Notable waves of activity can be identified with Frank Robotka (1947) and Richard Phillips (1953) at Iowa State University; Sidney Hoos and Peter Helmberger at the University of California (1962); Peter Helmberger and James Youde at the University of Wisconsin (1966); and George Ladd and Jeffrey Royer at Iowa State University (1978). Others also have made individual conceptual contributions such as those by Aaron Sapiro and E. G. Nourse, which predate Emelianoff, and subsequent refinement by writers at various stations on a more sporadic basis.

As various researchers have made contributions to an evolving theory of cooperation, significant changes have been occurring in the size, complexity, and direction of the cooperative business institution itself. A number of regional cooperatives have evolved into complex, multipurpose, multistate industrial organizations. Theories developed for single-purpose local cooperatives are found wanting in conceptualizing activities of these complex organizations. At the same time, management schools have advanced various behavioral, game, and other theories that have potential application to cooperative businesses and ultimately to an extended cooperative theory.

It is with these facts in mind that a need was perceived for refocusing attention of researchers upon cooperative theory. The Agricultural Cooperative Service-USDA served as a catalyst to augment this probe through cooperative research agreements with a number of universities to encourage further research. The papers found herein represent the product of these theoretical investigations. Together they represent the latest "wave" of probings into the evolving theory of cooperation.

Work does not stop here but must be encouraged to continue. This proceeding represents efforts toward pushing the frontiers of knowledge on this business form toward new heights.

Randall E. Torgerson
Administrator
Agricultural Cooperative Service

PREFACE

The nine papers contained in this report were written as part of an ACS project intended to stimulate research and thinking on cooperative theory. ACS invited researchers interested in conducting studies on cooperative theory to submit research proposals. These papers are the result of research agreements between ACS and the University of Connecticut, Michigan State University, the University of Missouri-Columbia, and Virginia Polytechnic Institute and State University.

The project consists of three phases. In the first, the authors met as a group several times to discuss important cooperative problems and theoretical perspectives. The participants of these discussions wrote numerous working papers based on this interaction and input from colleagues, ACS researchers, and cooperative leaders. These working papers were freely exchanged for further discussion and criticism.

In the second phase, the authors met once again--to plan the contents of a "book of essays" on cooperative theory and assign themselves the topics represented in this report. The nine papers contained herein benefit greatly from the working papers and the cross-fertilization stimulated by them. After the authors wrote the papers in this report, the papers were circulated for further input and the authors had the opportunity for revision. Each paper was reviewed by at least two other authors and an ACS researcher.

In the third phase of the project, ideas from these papers and the working papers are to be integrated into an ACS research report useful to cooperative managers and directors. John Staatz of Michigan State University currently is working at this task.

We appreciate the efforts of the authors, who worked hard and thoughtfully on the papers contained in this report:

Andrew M. Condon, University of Vermont
Ronald W. Cotterill, University of Connecticut
V. James Rhodes, University of Missouri-Columbia

James D. Shaffer, Michigan State University
John M. Staatz, Michigan State University

We also extend our appreciation to these ACS reviewers for providing their valuable time: James R. Baarda, K. Charles Ling, Thomas H. Stafford, Donald W. Street (now with the Foreign Agricultural Service of USDA), and Bruce L. Swanson. These ACS employees spent time cleaning up the manuscripts after they were converted to our word-processing system: Deborah Cooper, Loraine Hill, Nellie Jones, and Greer Ross. Mary Hoke did the final formatting and prepared the camera-ready copy. I also would like to thank Charles Kraenzle, who reviewed many of the manuscripts and helped coordinate the project, and Gene Ingalsbe, who provided technical editing and advice. Finally, we acknowledge the efforts of Eileen van Ravenswaay of Michigan State University, who was an early participant in this project and contributed working papers and constructive reviews, and Peter Vitaliano of the National Milk Producers Federation, who while at Virginia Tech provided early leadership for the project and helped coordinate the reviews.

Jeffrey S. Royer
Editor

THE METHODOLOGY AND REQUIREMENTS OF A THEORY 'OF MODERN COOPERATIVE ENTERPRISE

Andrew M. Condon

> Methodology: The science of method or orderly arrangement; specifically, the branch of logic concerned with the application of principles of reasoning to scientific and philosophical inquiry. (Webster's Seventh New Collegiate Dictionary)

Researchers and policy analysts are reexamining the role cooperatively organized business plays in the U.S. economy. The growth in size and importance of cooperatives in certain sectors of the economy, such as agricultural input supply and the processing-marketing of fibers, dairy products, grains and fresh produce, causes concern that these organizations may be creating some of the problems they originally were intended to mitigate. Of particular concern is the potential for the exploitation of market power in those industries or areas where cooperatives dominate. In addition, there is an emergent need to understand the economic nature of cooperative enterprise to determine its appropriate role in a changing market environment where government policy and budgetary support of agricultural markets for the purposes of price and income stability is becoming increasingly unpopular. To address these issues properly, economists must have at their disposal a sound theory of cooperative enterprise to interpret and predict the behavior of these complex organizations.

The purpose of this paper is twofold. The first part of the paper is devoted to exposing some fundamental methodological issues related to maintaining a research program in cooperative enterprise. I will examine the debate about appropriate methodology in neoclassical economics in the context of the constraints conventional interpretations impose on what is considered researchable or scientific problems in the area of business firm organization. The necessary components common to any economic theory will be outlined. The nature and role of assumptions in economic theory will be examined to demonstrate the advantages of incorporating operational reality into the assumptions economists use to construct economic models. In the case of economic theories of firm organization and, in particular, a theory of cooperative organization, the inclusion of operational assumptions implies an explicit accounting of the impacts of the system of resource property rights to ownership and control of a firm which makes cooperative enterprise unique from other forms of organizing economic activity.

After having laid the methodological foundation for the inclusion of ownership and control rights into a theory of cooperative enterprise, the second part of this paper will explore some of the new directions cooperative research should take as a result. Note that the intended purpose is to expose these relationships and their potential impact on the behavior of cooperative firms in the hope of guiding future research efforts. This paper should be considered as a first step in the process of developing a more meaningful theory of cooperative enterprise.

Methodological Role of Property Rights in a Theory of Economic Organizations

The primary objectives of this paper are to establish the theoretical foundation for incorporating property rights into a theory of cooperative behavior and to suggest how such an inclusion will change the orientation of research into cooperative enterprise. The logical first step in the process is to determine the conceptual role of property rights in the construction of an economic theory. Most economic methodologists agree that all economic theory should consist of a specific set of common and identifiable components.[1] Because the property rights to ownership and control in a firm define the limits of choice over resource use in that firm, it will be shown that property rights fall into a category of economic assumptions that must be empirically verifiable. Machlup calls such assumptions the "assumed conditions" of economic theory (1978, p. 148).

The need for realism and verification of assumptions in economic theory has been subject to considerable debate over the years. Much of the confusion has arisen due to a lack of recognition that a number of functional levels of assumptions exist, each with a specific purpose in the construction of theory. It will be shown that the assumptions reflecting the relevant set of property rights governing a firm fall into this category.

A Brief History of the Methodology of Economic Argument

Most economists will maintain that our discipline operates under an established methodology with commonly understood and accepted rules of reasoning. In particular, most would view as desirable a common set of standards from which to construct theories and test their validity. The concept of a universally accepted methodology of economics is comforting because it means that all economists operate more or less from the same rule book. We need not carefully analyze each and everypiece of research to identify the logic of reasoning and assure ourselves that this logic has been employed correctly. In short, every economist need not be a practiced methodologist, logician, and philosopher conduct sound research and to read and review the quality of their colleagues' work.

It will be assumed that in the discipline of agricultural economics, we operate under the belief in a common method of reasoning and a common general theoretical structure. It remains to decompose the components of this theoretical structure and determine to which component the assumptions reflecting property rights belong. A brief examination of the historical evolution of the method of economic argument will be useful in accomplishing this task.

The Structure of Economic Argument According to Classical Economists--The process of reasoning and structure of theory employed by twentieth century neoclassical economists can be understood more clearly when contrasted to the methodology espoused by nineteenth century classical or political economists. Classical economic arguments were made with what Blaug and others call the "a priori" method. As is evidenced by the following quote from Senior, general principles of human economic behavior were asserted and

known to be unambiguously "true" from introspection, possibly in combination with casual observation of the world.

> . . . a very few general propositions, which are the result of observation or consciousness, and which almost every man, as soon as he hears them, admits, as familiar to his thoughts. (Bowley, p. 43)

Such principles generally included statements of the desire to maximize wealth, aversion to labor or sacrifice, and the pursuit of consumption. Often more specific assertions were included, for example, that rate of population tends to increase faster than the means of subsistence, or that agriculture is subject to long-run diminishing marginal returns.

The key to understanding the difference between the methodological approaches of classical and neoclassical economists is the concept of verification as interpreted by Mill, Cairnes, and, much later, Blaug.

> We cannot, therefore, too carefully endeavor to verify our theory, by comparing, in particular cases to which we have access, the results which it would have led us to predict, with the most trustworthy accounts we can obtain of those which have been actually realized. The discrepancy between our anticipations and the actual fact is often only circumstance which would have drawn our attention to some important disturbing cause which we had overlooked. (Blaug, p. 59.)

> It is always regarded as the strongest confirmation of the truth of a physical doctrine, when it is found to explain facts which start up unexpectedly in the course of inquiry. But the ultimate principles of Political Economy, not being established by evidence of this circumstantial kind, but by direct appeals to our consciousness or to our senses, cannot be affected by any phenomena which may present themselves in the course of subsequent inquiries .. . nor, assuming the reasoning process to be correct, can the theory which may be founded on them. We have no alternative but to assume a disturbing cause. (Blaug, p. 81)

> Thus, in economics, as Mill had explained, we test the applications of theories to determine whether enough of the disturbing causes have been taken into account to explain what actually happens in the real world after allowing, in addition, for noneconomic causes. We never test the validity of theories behavior by virtue of these assumptions, which in turn are true by virtue of being based on self-evident facts of human experience. (Blaug, p. 77)

Predictions of economic behavior were derived based on these general principles. However, empirical testing of these predictions was never intended to prove or disprove the validity of the theory because it was already assumed that the general principles were undeniably true. Comparison of predictions with observations of the world was intended only to determine under what circumstances the theory could be usefully applied.

In applications of classical theory, predictions always were said to be subject to "disturbing causes." These disturbing causes are what we now

recognize as noneconomic influences and ceteris paribus conditions. If the predictions of theory did not hold up to empirical scrutiny, classical economists did not doubt the theory, but rather attributed the discrepancy to the influence of uncontrolled disturbing causes.

To summarize, verificationists make predictions based on general economic principles held to be unquestionably true. These predictions may be tested against observed data, but only to determine when and where disturbing causes will not interfere with the general tendencies of theory. The theory can never be refuted by empirical data, only confirmed.

The Structure of Economic Argument According to Neoclassical Economists--Most twentieth century economic reasoning and theory can be characterized by Popper's concept of **falsification.*' Falsification begins with recognition of what has been called the problem of induction. No universal statement can be logically derived or established by singular statements, but any universal statement can be refuted with the aid of‘deductive logic by a single contradicting statement (Blaug, p. 12). No matter how many times the sun rises in the morning, we cannot prove conclusively the proposition that it always will rise in the morning by using, as evidence, observations that it has always been so. However, with a single observation of the sun not rising some morning, we have conclusively refuted the proposition.

Falsification requires the formation of propositions about some phenomena that are capable of generating predictions that, in turn, are capable of being tested against observation. These predictions must be formulated in such a way so as to establish clearly the conditions that will demonstrate the proposition false. The prediction must be inconsistent with some event(s). If, upon empirical examination, the prohibited event(s) occur, we have discredited the hypothesis. Popper defines as science the body of propositions that can be falsified and nonscience as those propositions that cannot be falsified (p. 43).

In Popper's view, science is a never ending process of testing theory with intent to refute it. Stern warnings are issued against the use of what are called "immunizing stratagems" which insulate a theory from falsifying tests. Such stratagems include unspecified or loosely constructed "ceteris paribus" conditions which, upon falsification, prevent the researcher from knowing if the theory failed to predict accurately or if some vague and unaccounted auxiliary condition influenced the result. The most extreme interpretation of Popper envisions scientists as searching for the single, ultimate test of falsification. If a hypothesis fails this test, the entire theory is invalidated. More sophisticated interpretations recognize that no such ultimate test exists, particularly in social sciences where a test of theory necessarily includes a test of predictions conditional on auxiliary assumptions (Blaug, p. 17). Popper, suggests that a theory is well corroborated if it generally stands up to falsifying tests and successfully predicts results that are not also predicted by competing theories.

The difference between *'verification" and "falsification" as approaches to structuring and examining theories is illustrated most clearly in the context of empirical analysis. "Verificationists" do not envision empirical evidence

as testing the validity of the predictions of a theory but rather its appropriate application. Remember, the theory is already assumed to be true. "Falsificationists" view empirical tests of predictions as tests of theoretical validity.

The Testing of Assumptions in Economic Theory--Popper does not adequately address the role of the assumptions that comprise a theory. He does not specify whether the criteria of "falsification'* apply only to the hypotheses generated from assumptions, or also to the assumptions themselves.

Hutcheson was one of the first to introduce Popper's work to English-speaking economists. Hutcheson took the extreme or naive view of "falsificationism," attacking any form of "a priorism" or introspection. He maintained that many of the basic assumptions employed in economic theory to that point in time were irrefutable and therefore unscientific. Hutcheson proposed, as did Popper, that economic inquiries be limited exclusively to statements that were testable by empirical analysis. However, unlike Popper, Hutcheson seems to require not only that the predictions of theory be "falsifiable," but also the basic assumptions from which the predictions were derived.

> It does not matter in principle whether the specification of the conditions of a test of this theory is obtained 'directly' and 'independently,' or by working back 'indirectly' from specified tests of the conclusions to the assumptions from which the conclusions are deduced. (p. 481)

Hutcheson is saying that equally valid tests of a theory may be obtained either from direct empirical examination of the predictions or through empirical examination of the validity of the assumptions.

Hutcheson's attack on "a priorism" began a debate on the proper components of economic theory that continues to the present day. Students of scientific and economic theory such as Bridgeman, Samuelson, and Gorden argued in support of Hutcheson by insisting that all theoretical economic statements must be operationally meaningful. An economic proposition must imply a "hypothesis about empirical data that could be refuted, if only under ideal conditions" (Samuelson, p. 4). Samuelson concluded that using the criteria of "operationalism," the modern theories of consumer behavior and welfare did not represent valid economic constructs (Blaug, p. 100).

Gorden suggested that operational criteria could and should be applied to mental operations as well as physical. As a result, introspection may be a valid technique for generating assumptions if the assumptions meet operational criteria. For example, we may know in our hearts that managers of firms maximize profits, but we must be able to demonstrate this behavior to use profit maximization as a valid economic assumption, Purely logical statements that are generated from introspective tautologies are not operational and cannot be used in economic theories (p. 49).

Gorden maintains that an "operational statement implies the existence of stable functional relationships among specified economic variables. By

stable is meant the ability to successfully predict changes in the dependent variable of a function over a reasonable period of time.

As an example of the use of propositions in theory that are not operational, Gorden offers the Law of Demand and the resultant prediction of a negative relationship between own price and quantity. Based on operational criteria, the following statement is without empirical content and therefore invalid:

> Assuming that prices of related commodities and the tastes and incomes of buyers are given or constant, then there is a relationship between price and sales with a negative slope. ... (p. 50)

The statement does not prohibit any event from occurring. It cannot be empirically refuted. If both price and quantity should fall, then incomes, other prices, or unobservable tastes have changed and the theory appears equally capable of explaining both positive and negative demand responses. A demand curve is not stable if it can account for either contradictory occurrence. This statement could be made operational only if the relevant ranges of the "ceteris paribus" conditions are explicitly stated and checked for validity.

The other side of the debate has been argued most vocally by Friedman and Machlup. Friedman counters the concept of "operationalism" with the notion of positive science. The goal of positive science is the development of theories that "yield valid and meaningful (i.e., not truistic) predictions about phenomena not yet observed** (1953, p. 26). Positive theories must have certain attributes. A theory should be simple; it should require as little knowledge and data as possible to predict events. A theory should be precise in prediction and yet address as wide a field of phenomena as possible. Theories also must be logically consistent (p.27).

A theory or hypothesis (equivalent in Friedman's usage) is valuable only insofar as its predictions coincide with observation. For Friedman, theories are black boxes for generating predictions and, as such, their basic assumptions need not be realistic (read "operational"). In fact, if assumptions are unrealistic, they may be more desirable if they are more simple as a result. Because, in Friedman's view, theories can and should be unrealistic, it is logical folly to interpret an empirical test of assumptions as a direct test of the validity of the theory. Friedman's "irrelevance-Of-assumptions** thesis has been criticized on a number of counts, mostly stemming from what is considered by many a naive view of what assumptions are and the role they play in theory construction. Friedman generally treats assumptions as homogeneous elements, with little recognition that different categories of assumptions exist, each with a distinct theoretical role. This point will be dealt with in greater detail in the following section on components of theory.

Another criticism leveled at Friedman arises from a confusion as to what is meant by realism in assumptions. Assumptions may or may not be realistic in a number of different senses. Assumptions may be abstract in that they describe the behavior of only a subset of the variables that affect the economic phenomena in question. An attempt is made to include only the most

salient influences in a model. Assumptions may be realistic in the sense that they "ascribe motives to economic actors that we, fellow human beings find comprehensible" (Blaug, p. 105). The pursuit of economic opportunity is a understandable objective for a human being. However, we could not explain profit-seeking by assuming religious adoration of money, even though both statements might imply similar behavior. Finally, assumptions might be unrealistic in the sense that they are patently false in the light of observed behavior.

Friedman's does not seem to intend that assumptions should be patently false, but rather that assumptions should be abstract:

> The relevant question to ask about 'assumptions' of theory is not whether they are descriptively 'realistic,' for they never are, but whether they are sufficiently good approximations for the purpose at hand. (1953, p. 31)

However, he confuses the debate and sometimes leaves the impression that factually false assumptions are acceptable if they lead to theories that predict well:

> Truly important and significant hypotheses will be found to have 'assumptions' that are widely inaccurate descriptive representations of reality and in general, the more significant the theory, the more unrealistic the assumptions. (1953, p. 30)

Machlup, an opponent of operationalism, interprets this concept as applying to all economic propositions, including fundamental assumptions. He finds that theories constructed of purely operational statements become "'low level generalizations' or 'statements of empirical uniformities and regularities"' (1978, p. 192). He believes that the fundamental assumptions of theory ought to be "pure constructs" that are "a priori? in nature because:

> The roughness, or degree of exactness, of empirical concepts depends upon the technical possibilities provided by the state of the arts. The impurities and inaccuracies inherent in most or all practicable operations with sensory observations destroy the logical links between different concepts. But, without logical interrelations, the propositions containing these concepts do not afford logically necessary conclusions. In the possibility of deducing such conclusions lie the sole purpose and value of a theoretical system. (1978, p. 197)[2]

Machlup argues that operational or empirical constructs have only two uses in economics: "(1) when one has to decide what kind of theoretical apparatus will be suitable for answering particular questions, and (2) when one wishes to verify or test the theoretical apparatus" (1978, p. 201).

There is strong evidence to suggest that while most applied economists would attest to some form of the positive school, the actual practice of economic reasoning may be quite different. McClosky argues that the practice of "modernism" (which he defines as a curious mixture of positive science and

operationalism) is impossible and not followed by economists no matter what they say.

> Modernism promises knowledge free from doubt, metaphysics, morals, and personal convictions; what it delivers merely renames as Scientific Method the scientist's and especially the economic scientist's metaphysics, morals, and personal convictions. (p. 488)

McClosky offers the Keynesian model as an example of a contradiction to modernism in modern economics. Empirical formulations of Keynes' macroeconomic ideas were not attempted until the 1950s, well after most macroeconomists had adopted Keynesian theory as their world view. The adoption of a theory before its predictive power has been demonstrated is surely the positivist's equivalent of mortal sin.

McClosky recommends that we examine closely how economics actually has progressed instead of artificially dictating how we think it ought to progress. In addition to falsification, economists employ a host of tools to argue that a hypothesis has merit. McClosky invites us to examine and become aware of what he calls the rhetoric of economics, which includes the complete package of techniques we use to argue our science.

Two often used, but little understood, techniques economists employ are standards of comparison and metaphor. Economists often employ a statistical criterion to decide whether data supports the predictions made by a hypothesis. McClosky argues that statistical criteria alone are arbitrary and do not reflect economic standards of judgment. One economic standard of comparison that often is overlooked is the consequences of being wrong. When we make predictions based on statistical criteria, we should know what associated economic loss function is in terms of misdirected policy or poor advice. McClosky recommends that in addition to statistical criteria, economists must explicitly set down mutually agreed-upon economic standards (as opposed to purely statistical standards) for accepting or rejecting a hypothesis (pp. 496-97).

A second argumentative and communicative technique often overlooked is the power of the literary metaphors economists use to convince. All economic theories, hypotheses, and models are, by virtue of their abstraction, metaphors. We are telling "stories" to instill a higher degree of understanding about how the infinitely more complex real economy operates. A metaphor is not merely an ornament to make prose or poetry more pleasing to read. It is a device that in the words of Max Black, "has the power to bring two separate domains into cognitive and emotional relation by using language directly appropriate to one as a lens for seeing the other" (McClosky, p. 496). Do we really believe Gary Becker's children are "durable goods," or through use of a carefully considered metaphor do we immediately understand that within the household production unit (another metaphor) children play a unique role? Does the demand for food not stretch very well if it is "inelastic" or have we discovered something about the relationship between price and revenue? McClosky asks us not to become upset at the realization that economists tell stories, but rather to understand that this is part of how we convince and that we need to explicitly recognize the metaphors we

use, their effectiveness in imparting the precise message we desire, and their power to persuade in argument.

McClosky's realization that there are a number of ways to make economic arguments may seem inconsistent with the positive economist's view of science, but it does not really challenge the positive structure of economic theories. Most economists still will maintain that there is no fruitful way to directly test the fundamental assumptions of neoclassical microeconomic theory such as rationality, consistent preference ordering, and the resultant postulates of utility and profit maximization. They would agree with Friedman and Machlup that any such test would have little bearing on the validity of a economic theory because these statements are perceived to be introspective and intended to impart ideals. However, as Machlup (but not Friedman) and others recognize, there are multiple levels of assumptions in economic theory, each with a specific role and each requiring a different degree of operational realism. In the following section, these levels of assumptions will be detailed and the role of property rights assumptions in theory will be identified.

Components of Economic Theory

The general purpose of any economic theory is to provide a framework for the analysis, understanding, and prediction of economic behavior. Theory gives meaning to the events economists observe. From theory we derive hypotheses, which, upon testing, should allow us to explain current economic behavior and predict likely future behavior, subject to the suitability of our ancillary conditions. Theory forms the core of what Kuhn refers to as the research paradigm, which includes not only assumptions and hypotheses, but also the appropriate tools of analysis and argument and the world view that defines what are the interesting questions for economists to address.

Much of the confusion that arises from the debate over the components of economic theory occurs as a result of a lack of mutually agreeable nomenclature. Though labeled differently, most methodologists seem to agree on a theory's basic components, if not their purpose and attributes. The purpose of this section is to establish what the components of an economic theory are and to demonstrate that certain classes of assumptions should exhibit a degree of realism in the context of being subject to empirical examination.

One of the most straightforward and informative descriptions of the components of economic theory is to be found in Silberberg. Because of its brevity, Silberberg's discussion is a good starting point from which to examine the structure of modern microeconomic theory. Silberberg argues that economic theory has three basic components. The first is a set of assertions or postulates that are idealized, heuristic statements about how the actors and constructs (i.e., consumers, firms, prices, quantities, etc.) that comprise the economy are expected to behave. These postulates are general in nature and are usually of the form "all X have the property P." Examples given of the assertions of microeconomic theory include profit and utility maximization.

The second part of an economic theory is a set of test conditions, called assumptions, whose purpose is to relate the abstract and ideal notions of human economic behavior expressed by the assertions of theory to real world conditions. Such conditions are necessary due the nature of the "laboratory" in which economists must work. Because it is impossible to establish controlled experiments of the nature found in, for example, the physical sciences, economists must employ restrictive assumptions about the behavior of variables over which they have no control and which could affect the outcomes of hypothesized behavior. Examples of assumptions as defined here are statements like "the price of bread in the theoretical assertions, in fact corresponds to the price of bread posted at xyz supermarket on such and such date" (p. 7) or "ceteris paribus" conditions such as "all other prices, incomes, and tastes constant." Silberberg properly maintains that assumptions defined in this way must be operational with respect to the "essential aspects of the theoretical constructs" to give the theory relevance (p. 8). This means that the assumptions of theory must adequately and realistically describe the important economic variables treated by the theory.

The final component of economic theory according to Silberberg is a set of observable events that are either explained or predicted by the theory. While this may seem a trivial point, a theory whose hypotheses explain or predict outcomes that cannot be observed is of little practical value. Similarly, hypotheses cannot be tested if data is required that is unobservable, either directly or by adequate proxy. For example, suppose we generate a hypothesis that predicts that the property rights structure inherent to cooperatives constrains member-patron investment horizons relative to certain other modes of organizing business, resulting in changed patterns of investment. Such a theory is of little value if we cannot measure a curtailed investment horizon or we cannot establish an observable causal link between the property rights structure and the firm's investment behavior. In either case, the theory would be empty in content. Care must be taken that we do not generate hypotheses that seem to explain a great deal but are not operational and therefore cannot be tested or refuted.

Melitz provides a convincing argument for factual realism in certain classes of assumptions. A close reading of Friedman shows that even though he argues against factual realism in any assumption, he recognizes that some assumptions represent fundamental statements of behavior while others are implied statements that result from the assertions (p. 36). Melitz defines this distinction more clearly as generative assumptions and auxiliary assumptions. Generative assumptions are equivalent to Silberberg's fundamental assertions and are used to derive the postulates of theory. Auxiliary assumptions are used in conjunction with generative assumptions to deduce operational predictions. Melitz maintains that auxiliary assumptions, and quite possibly generative assumptions, benefit from operational validity.

Auxiliary assumptions that are either false or untested (or both) reduce the predictive power of theories because of the increased probability of a hypothesis being consistent with false results. Note that this probability is not equal to one because it is possible to reach true conclusions from

partially false premises. The lack of empirically verifiable auxiliary assumptions in economic theory may lead to ambiguity of prediction.

Melitz makes a strong argument for operational attributes in auxiliary assumptions, but we still are left with a rather vague notion of what exactly these assumptions are and what their role in theory is. Are all nonfundamental assumptions to be tested? If so, how rigorously? We observe the use of assumptions in economic theory that are clearly not fundamental statements of human economic behavior (i.e, they serve as auxiliary assumptions) but are so generally defined that definitive empirical verification would be difficult if not impossible. Are such assumptions valid? To answer these questions, we need a conceptual framework of theoretical structure that is more detailed than those offered thus far.

Machlup offers the most comprehensive classification of the components of economic theory found to date. As do most other authors, he initially divides assumptions into two general categories, fundamental and specific. Specific assumptions he further categorized by application, frequency of change, and the need for rigor in testing. Figure 1 reproduces his classification scheme.

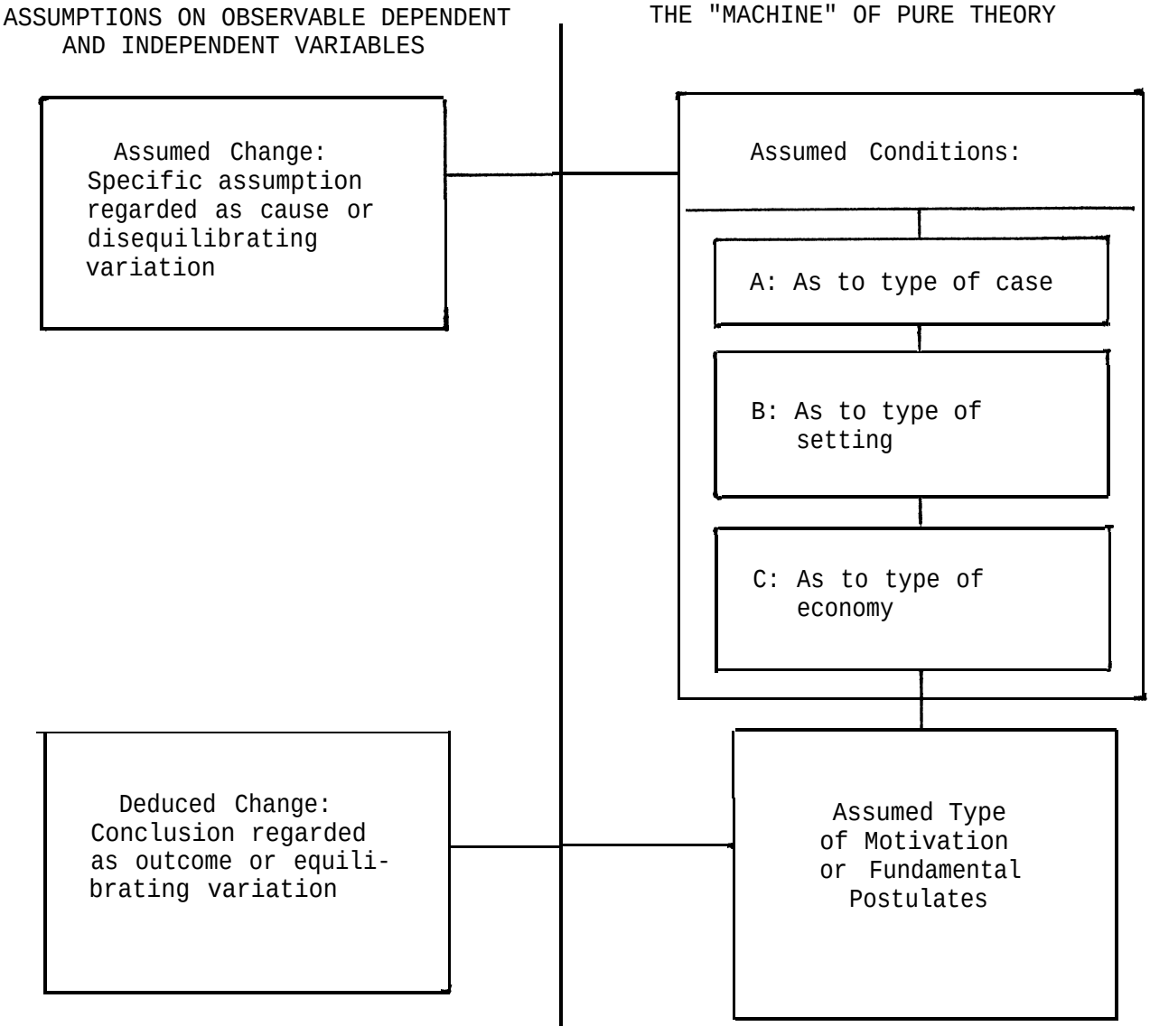
Two additional components are proposed, assumed changes and deduced changes. The assumed change component of a theory is a description of the economic problem to be addressed. A proposition is made describing some change occurring in the economic system. Such propositions usually must be operational to have relevance (1978, pp. 148-49). The deduced change component of a theory is the predicted result of the theory or hypothesis that is subject to empirical test. By definition, this component must be operational for the theory to have value. It is worth noting that the deduced change corresponds exactly to Silberberg's concept of observable events.

The correspondence between proposing a problem and predicting an outcome is found in the assumptions that form the core of the theory. These assumptions form the causal mechanism that allows us to observe economic phenomenon and to deduce -predictions, which, upon successful testing, will demonstrate the value of the theory.

The assumed type of action or fundamental postulates are the, by now, familiar, fundamental statements of economic behavior. As explained, fundamental postulates generally are not subject to direct empirical verification because of their "a priori,** ideal, or abstract nature. Machlup does require that these fundamental statements meet a requirement of realism in the sense that the behavior specified by a postulate, though ideal and/or abstract in nature, must suggest behavior that humans find reasonable and understandable (1978, p. 153).

Machlup makes his most significant contribution to understanding the role of property right assumptions in the structure of economic theory in his exhibition of the various classes of specific assumptions or assumed conditions. These statements define the personal characteristics, technological or organizational circumstances, market forms, and institutions

Figure 1--Machlup's model of the components of economic theory



Source: Machlup 1978.

affecting the economic problem under study (1978, p. 150). Assumed conditions are subdivided into three classes according to the type of circumstance defined and the frequency with which it might be expected to change.

The first class of specific assumptions refers to conditions that affect type of case; i.e., circumstances that may change from problem to problem and that have potential to influence outcomes. Examples of this kind of condition include definitions of the goods involved, cost conditions, elasticities, degree of competition, ease of entry, general expectations, the propensity to consume or save, and liquidity preferences (1978, p. 150).

The second class of specific assumptions refers to conditions that affect type of setting. These are conditions that may change from time to time, but not in every case. Such settings might include the stage of a business cycle or the limitations imposed by the economic policy currently in place. These conditions are not likely to change with every new problem examined but rather with events such as a change in government (1978, p. 151).

The final class of specific assumptions defines conditions of type of economy. Such conditions may change from country to country or over large periods of time but are sufficiently stable to be considered "given" at any particular time or particular place. These conditions generally define the legal and environmental constraints under which the economy must operate. Included in this list of conditions are assumptions reflecting legal and social institutions, private property, freedom of contract, corporation law, and enforcement of contracts (1978, p. 151).

Because assumed conditions form the link between fundamental postulates of behavior and actual economic conditions, they must exhibit some degree of operational validity. Machlup maintains that verification of such conditions is appropriate, but the degree of rigor need not be great. He uses terms like "casual," and "impressionistic" to describe the nature of empirical testing required. The justification for reduced rigor in testing of specific assumptions lies in their varied nature (i.e., the multitude of possible conditions), difficulty in observation, and the inherent degree of theorizing involved in establishing the conditions. In addition, the degree of rigor required for testing assumed conditions declines with the frequency with which the conditions change (1978, p. 151).

In summary, a number of students of the methodology of economic inquiry have provided us with specific set of components that all economic theories must contain. Though different terminology is used, the function of each of these components is the same in every case. Each author distinguishes between assumptions that describe fundamental or ideal statements of human economic behavior and assumptions that attempt to describe the particular social and economic environment in which the theory is to be applied. In the latter case, most agree that these assumptions should exhibit some degree of operational realism if the theory is to have relevance to solving real economic problems. In the following section, it will be shown that assumptions reflecting property rights to ownership and control of a firm's

resources properly fall into the class of assumptions in economic theory that must be operational.

The Structural and Functional Roles of Property Rights in Economic Theory

The purpose of this section is to argue that assumptions reflecting the property rights to ownership and control of resources in firms' organization should be explicitly incorporated into models of organizational behavior. To accomplish this objective, it will be necessary to define what property rights are and to identify their specific role in the context of economic organization. Property right assumptions can then be assigned a methodological role in the context of Machlup's model of economic reasoning previously presented. The determination as to whether property right assumptions need to factually realistic can then be made.

A Definition of Property Rights--Considering the relative wealth of property rights literature in economic journals, surprisingly few examples exist that precisely define what property rights are or how they evolve. Generally, property rights are defined only in terms of what they accomplish rather than their specific nature. While terse definitions often are not very useful in contributing to the understanding of complex social institutions such as property rights, for the purpose of assigning a methodological role, we need to know something about what property rights are as well as their function.

Consider the following definitions, found in important contributions to the property rights literature:

> Property rights specify the proper relationships among people with respect to the use of things, and the penalties for violations of those relationships. (Randall, p. 148)

> In the rights of a person to a resource, we include the probability that his decision about demarcated uses of the resource will result in that use, in the sense that his decision dominates that of any other person. (Alchian, p. 237)

> Property rights describe the relationship of one person to another with respect to a resource or any line of action. ... Rights are the instrumentality by which any society controls and orders human interdependence and resolves the question of who gets what. (Schmid, p. 5.)

All of these definitions are cloaked in terms of what property rights do rather than what they are. The statements form a basis for determining the probable impact of property rights, but nothing can be gleaned that can assist in understanding how property rights change and evolve. What is the economic incentive for instituting a particular set of property rights? With respect to the theories of firm organization, the question might well be put: What factors determine the organizational structure actually adopted by a firm? The answer to this question is crucial to understanding the role of cooperative enterprise.

A key to understanding how a particular set of rights comes about is to recognize that they are social institutions that evolve to meet the interests of a segment of society with the power to establish and enforce them. As the needs of society change over time and are identified, so will the property rights that govern resource use (Hite, p. 78).

The following definition synthesizes what is known about the structure and form of property rights to ownership and control of the economic resources of a firm, as well as their function.

> Property rights are social institutions, expressed as legal restrictions, that are devised to place constraints on how the resources available to an economy may be used. Property rights specifically address: (1) who may make decisions over a particular resource's use; (2) who will bear the risk of gain or loss as a result of employing the resource in some productive activity; (3) for how long the right may be considered valid, (4) the circumstances under which the right can be transferred; and (5) the penalties to be incurred for violations of the restrictions imposed by the right.

The Nature and Function of Property Rights to the Resources of a Firm--A neoclassical economic firm usually is defined as a single owner-operated technical entity. Consider the following definition, variants of which can be found in almost every advanced microeconomic textbook:

> A firm is a technical unit in which commodities are produced. Its entrepreneur (owner and manager) decides how much of and how one or more commodities will be produced, and the gains the profit or bears the loss which results from his decision [sic]. An entrepreneur transforms inputs into outputs, subject to the technical rules specified by his production function. The difference between his revenue from the sale of outputs and the cost of his inputs is his profit, if positive, or his loss, if negative. The entrepreneur's production function gives mathematical expression to the relationship between the quantities of inputs he employs and the quantities of outputs he produces. (Henderson and Quandt, p. 52.)

The property right structure implicit in this statement implies that the resources available to a neoclassical firm are pure private property resources. Rights to resource use are privately held and fully allocated to individuals. The single agent responsible for making decisions (the entrepreneur) that determine how resources will be combined, assumes 100 percent of the risk entailed in the outcomes of those decisions. The entrepreneur may transfer these rights to anyone else without restriction.

The firm as described by this definition represents only a subset of the economic organizations we can observe that produce goods and services in an economy. A complete list of such organizations would include sole proprietorships, partnerships, investor-owned firms (IOFs), nonprofit organizations, mutuals, labor-managed firms, and cooperatives.

The factor that distinguishes each of these economic organizations lies in the nature of the set of property rights that describes ownership and control of the resources these organizations employ. The theory of the firm, with its implicit assumption of a single owner-manager, would appear to describe only a single element of the economic organizations we observe. We are left with two alternatives: (1) to develop an individual model of behavior for each of the alternative modes for organizing economic activity or (2) to seek an encompassing theory of economic organization within which the theory of the firm would represent a valid subset.

Fortunately, the ground work for a theory of economic organizations based on property rights has been established in the research of Fama; Jensen and Meckling (1979a, 1979b); Jensen; and Fama and Jensen. We are asked to view an economic organization not as a technical entity but as an established set of legal relationships between all the agents who have dealings with the organization. In the words of Jensen and Meckling, an economic organization is the:

> Nexus of contracts, written and unwritten, among owners of factors of production and customers. These contracts or internal 'rules of the game' specify the rights of each agent in the organization, performance criteria on which agents are evaluated and the payoff functions they face. (1979b, pp. 170-72)

Considering the working definition of property rights previously established Jensen and Meckling have defined an economic organization as the sum of the property rights of those who contribute resources to the firm and purchase its goods and services. Fama and Jensen maintain that the rights that are of prime importance in defining the structure of an organization are those that specify the nature of residual claims and the allocation of the decision process among agents (1983a, pp. 302-4).

An organization has two kinds of claims to the gross cash flow it generates. Certain prespecified payments are contracted to agents for goods or services supplied to the organization. Wages, repayment of debt, and taxes are examples of such fixed claims. The residual claim is the right to the net cash flows of the organization after all fixed obligations have been met.

Residual claimants are the riskbearers of the organization (Fama and Jensen 1983b, p. 328). The residual claims of any organization have four identifiable characteristics: (1) ownership, (2) alienability, (3) redeemability, and (4) ownership horizon. Any restrictions on the ownership of a residual claim means that the role of riskbearing in the organization is tied to some other agent role. For example, partners usually must assume both decision management and decision control rights to hold the residual claim. Alienability refers to the ease with which a residual claim may be transferred from one person to another. A completely alienable claim may be bought or sold with out restriction. Transfer of the residual claims of some organizations may be limited to agents who meet certain criteria[3] or transfer may be prohibited entirely. Redeemability refers to the ability to demand, at a specified price, return of the equity that was used to purchase the rights to residual riskbearing in an organization. Redeemable claims are

a feature of financial mutuals where the entire asset base generally is liquid. The ownership horizon refers to the length of time for which the residual claim is valid. An unrestricted claim is valid for the life of the organization. Restricted horizons are often associated with restricted ownership residual claims. For example, the residual claim of a labor production cooperative is valid only so long as the owner remains an employee.

Fama and Jensen decompose the decision process of any organization into two general categories: (1) decision management and (2) decision control (1983a, p. 304). Decision management includes the right to initiate and implement approved decisions. Decision control includes the right to ratify or choose the decision to be implemented, the right to measure performance and the right to set the reward of decision managers.

The reason why Fama and Jensen consider these particular property rights as crucial in determining the organizational structure of a firm is the existence of what are called agency costs. Agency costs arise because the individual agents, bound together by contract in an organization, are utility maximizers. These individuals will seek to maximize their own interests given the available opportunities. Agency costs include the expense of making, monitoring, and enforcing contracts among the agents of a firm to ensure that those with conflicting interests do not usurp the wealth of others. In addition, agency costs include the value of wealth lost because the cost of full enforcement of a contract will exceed its benefits (Jensen and Meckling 1979b, p. 104).

Separation of residual rights and decision rights occurs in many types of organization because of economies to be gained from specialization of riskbearing (the residual claim) functions and decision functions. However, an agency cost is created because those who make decisions are not necessarily residual claimants and therefore may not bear the full consequences of their decisions. The case of the IOF serves to illustrate this process. In the IOF, residual rights and decisionmaking rights are separated because technology and/or market conditions dictate large capital investments and economies of scale are necessary. Residual claimants' wealth can be increased through specialization of the riskbearing and management roles. A potential agency cost is created because the majority of consequences of management decisions fall on the residual claimants, i.e., the stockholders. Managers could be in a position to make decisions that further their own interests[4] at the expense of stockholder wealth. Fama and Jensen hypothesize that we observe the separation of decision control rights from decision management rights in an IOF to control this source of agency cost. Managers have the right to initiate and implement a particular decision, but the right of approval and evaluation is placed in the hands of a board of directors who presumably must act in the interests of current and future residual claimants.

According to Fama and Jensen, a given economic organization can survive only if it, "... delivers the product demanded by customers at the lowest price while covering costs" (1983a, p. 301). Survival means producing at the lowest possible cost, including agency costs. The function of property

rights to the resources of a firm becomes clear in an economic environment of survival. The rights to the residuals and the decision process of a firm are structured so as to minimize total agency costs.

The nature and function of property rights to ownership and control of resources in an economic organization can now be summarized. Property rights have been defined in general terms as social **institutions'** that restrict the ability of individuals to impose costs on others through the use of resources. Property right systems evolve to protect the interests of segments of society with the power to enforce them. With respect to economic organizations, property rights assign and define the limits of the roles of residual riskbearer, decision manager, and decision controller. 'Such rights are manipulated in the interests of agent groups to minimize the total agency cost involved in producing a good or service. These manipulations result in the various kinds of economic organizations we observe. In the following section, what has been learned about the nature and function of property rights in the context of economic organization will be applied to the methodological task of classifying the role of property right assumptions in economic theory.

The Methodological Role of Property Rights in Economic Theory--The question to be addressed in this section is whether the assumptions reflecting the structure of property rights in a firm need to be operational in the sense of factual realism to construct economic theories that adequately explain and predict the behavior of firms. From **a** methodological perspective, if it is necessary to explicitly represent the property rights structure that determines an organization's structure, then a justification has been established for incorporating these assumptions into a theory of cooperative enterprise.

The appropriate criterion of judgment must be whether property right assumptions fulfill the requirements of assumed conditions as defined by Machlup. In the last section, the function of property rights to a firm's resources was established as defining the roles and limits of risk bearing, decision management, and decision control. In general terms, property rights were shown to determine a firm's organizational structure. In Machlup's terminology, the assumptions describing the property rights to the resources of a firm would appear to fall into one of two categories under the subheading of assumed change: conditions that describe type of setting or conditions that describe the type of economy in which the firm must function.

The ambiguity is due to Machlup's dual classification criteria. Assumptions describing assumed conditions are categorized according to both purpose and frequency of change. Property right assumptions would appear to fit into conditions describing type of economy because this category includes "legal and social institutions; private property; freedom of contract; .. . and enforcement of contracts" (1978, p. 151) which is a fairly complete list of the attributes of property rights as described in the last section. However, Machlup also maintains that condition describing the type of economy will vary from country to country over long periods of time and are "'settled' for a sufficiently large number of cases to justify taking these conditions as

constant" (p. 151). Conditions describing type of setting are said to be able to change over brief periods of time (p. 150).

The property right structures governing the use of the resources of a firm in a given economy are not nearly as homogeneous as Machlup.would have us believe. Assumptions defining these rights are properly classified as "assumed conditions" reflecting the "type of economy,** but they cannot be treated as constant across all organizations within a given economic system. Models attempting to describe or predict firm-level behavior must incorporate a realistic and verifiable set of assumptions reflecting the appropriate rights structure governing that particular firm type.

Summary

The purpose of this section has been to demonstrate, from a methodological perspective, that explicit treatment of property rights is appropriate in the formation of economic theories of firm-level behavior. The ultimate intent is to provide both a justification and a conceptual basis for incorporating property rights into a theory of cooperative enterprise. This task has been accomplished by carefully documenting how modern economists construct and test theories, what the methodological components of these theories are, and where among these components assumptions reflecting the property rights governing firm-level resource use belong.

A brief history of the evolution of economic methodology has demonstrated that falsification is the principal, but not exclusive method, whereby neoclassical economists test the validity of theory. However, falsification does not imply Friedman's "irrelevance of assumptions" thesis where accuracy in prediction is the only requisite of economic theories and therefore the assumptions of theory do not need to be operational.

A detailed analysis of the components of economic theory reveals that there are two general classes of assumptions. Fundamental assertions establish ideal and often abstract statements of human economic behavior. The other class of assumptions defines the socio-economic environment under which a hypothesis will be tested. Operational realism in this class of assumptions was shown to increase the explanatory and predictive power of economic theory.

The property rights to ownership and control of resources in a firm were found to define the roles of residual claimant, decision manager, and decision controller in an economic organization. The manipulation of these property rights was shown to control the problem of agency cost. It is this manipulation of property rights within economic organizations that determines the different organizational structures that are observed. This concept of economic organization will provide the foundation for incorporating the impact of property rights into a theory of cooperative enterprise.

The final task of this section was to take what was learned about the nature and function of the property rights to the resources of a firm and use this information to classify the methodological role of property rights assumptions in the context of Machlup's model of the components of economic

theory. Property rights define the economic environment in which organizations must operate. As such, property right assumptions belong in the category of "assumed conditions'* describing the "type of economy." As was previously demonstrated, this category of assumptions must exhibit some degree of operational realism if the resultant theory is to have relevance.

Requirements of a Theory of Cooperative Enterprise

The first section of this paper attempted to illuminate some important methodological issues with respect to the construction of a theory of cooperative enterprise. In the following sections, the issues such a theory of cooperative enterprise needs to address will be discussed. The knowledge gained about the role property right assumptions in the first section of this paper will lead to an explicit examination of some of the important relationships governing the structure, ownership, and control of cooperative firms. Specifically, the motivations of the various agent groups that comprise a cooperative will be explored.

Motivations of the Agents that Constitute Cooperative Enterprises

In the following discussion, repeated reference will be made to the concept of an agent within the context of firms with complex organizational structures such as IOFs or cooperatives. Usually economists refer to an agent as one who acts on behalf of another. Because the term is used in a slightly different context here, a clarification is in order. Neoclassical microeconomic theory conceives of firms as exclusively entrepreneurial units. A single agent, the entrepreneur, holds the rights to make all production and business-related decisions and the rights to bear the residual risk of gain or loss as a result of these decisions. Note that in this context the term agent does not only imply one who acts for another but also includes those who act for themselves. Employing the usual neoclassical postulates, the entrepreneurial firm is presumed to maximize profits subject to a budget constraint and a known level of technology. In the nontheoretical economy, we observe firms in which the entrepreneurial rights to make decisions (decision management), to monitor decisions (decision control), and to bear residual risk of gain or loss (the residual claim) may be vested in a number of different agents. To maximize profits in the sense of the neoclassical firm, we must assume that the major agent groups, i.e., stockholders, management, and directors, can be without cost constrained to act toward a single objective.

In a similar manner, our most commonly employed model of cooperative behavior, based on the work of Helmberger and Hoos, implicitly assumes that all agents within a cooperative are without cost constrained to behave in the singular and homogeneous interest of members. This assumption follows from the traditional micro view of the firm as an entrepreneurial entity where ownership and control are vested in the same agent. In more complex organizational forms, the assumption of a singular firm objective is a potentially misleading simplification. A cooperatively organized enterprise has at least three identifiable major agent groups, each of which may have goals that complement, supplement, or conflict both among and within groups.

These agent groups are the member-patrons, the board of directors, and management.

The purpose of this section is to demonstrate that the usual microeconomic assumptions with respect to agent roles in a firm are inadequate for the task of describing the complexities of cooperative enterprise. The motivations and resulting constraints each major agent group brings to the cooperative firm will be examined. It will be argued that explicit treatment of agent roles and constraints within cooperatives or any other complex firm type will provide new insights into the economic behavior of these organizations.

The Role and Motivation of Members in a Cooperative--Past theories of cooperative enterprise have approached the issue of member motivation from quite different perspectives. Emelianoff and Phillips viewed members as the sole decision agents in a cooperative. Members would decide the level of patronage to supply based on equating the sum of their own operation's marginal cost plus an appropriate segment of the joint-plant marginal cost function with the marginal revenue produced from the cooperative sale of product. The appropriate segment of the cooperative plant's marginal cost curve was argued to be that which began after all other members had made their production decisions. Thus, in the cooperative of Emelianoff and Phillips, members exhibit Cournot-like behavior by implicitly assuming they can make production decisions without regard to subsequent adjustments by other members.

Enke presented a model of consumer cooperative behavior where members may pursue a number of alternative goals, each with different implications for firm performance and equilibrium. Enke demonstrated that the level of production that results in a maximization of the sum of cooperative producer and consumer surplus is optimal from a standard welfare perspective. However, within the context of his model, members may be more concerned with their share of the firm's surplus (based on patronage) than the firm as a whole (Vitaliano). Successful pursuit of individual consumer surplus would result in a level of business where average cost is minimized. Enke's welfare goal for the cooperative would require that price be set where marginal cost equals average revenue. Enke admitted that the actual equilibrium a cooperative would attain will depend on the goals and bargaining strength of members' interests relative to management's, but he provided no mechanism for such bargaining. While Enke's model contains a number of serious flaws, it is the earliest attempt at a model that allows for trade-offs among differing group objectives.

The Helmberger and Hoos model of cooperative enterprise assumes that all members are profit-maximizers and that no single member firm is large enough to affect the price the cooperative pays, i.e., members are price-takers with respect to their cooperative. No other role is specified for members. This assumption reduces member participation in the cooperative to an aggregate supply function response. In addition, this assumption contributes to the formation of the operating condition that cooperatives will operate to maximize the per-unit payment price to members.

Historical theories of cooperative enterprise have placed a great deal of emphasis on how members perceived the impacts of their patronage decisions on others in the organization. Resolution of this issue is vital if member behavior is to be modeled correctly. However, the ultimate answer is unlikely to be found in either the awkward marginal response curves of Phillips, the vague multiple-objective function of Enke, or the Helmberger and Hoos simplistic member supply function.[5]

It is not difficult to conceive of still other alternative member objectives, consistent with rationality, that would lead to hypotheses and conclusions quite different from these. Members may view the cooperative as providing long-term access to input or output markets that an IOF cannot guarantee. Such an objective would require a dynamic analysis including an understanding of how members discount future versus current returns. Members also may view the cooperative as an institution for reducing the unique risks faced in production agriculture. In particular, farmers have relatively large amounts of capital invested in undiversified, specialized-use assets such as land, buildings, and equipment. Having all their "eggs in one basket," producers may view the cooperative as a mechanism to avoid exploitation of their risky positions by concentrated upstream and downstream markets. Cooperatives also reduce short-term producer price risk through pooling. The implications of these and other alternative member objectives cannot be adequately addressed in the context of a static maximization model that assumes a world of perfect certainty.

The Role of Director Boards in Cooperative Enterprise--The role of elected directors remains an ignored issue in cooperative theory. This failure of existing theory to explicitly examine the role of directors in cooperative enterprise seems to imply by default that their intended purpose is to act as representatives of the common entrepreneurial interest of members. As previously suggested, the interests of members can differ due to reasons of size, risk preference, and perceived discount rate of future returns. A role that directors may play that is consistent with the traditional micro view is the reconciliation of diverse and potentially conflicting members so the cooperative makes decisions that contribute to the long-run benefit of the cooperative firm.

Directors form the link between the large-group, decisionmaking process of members and the actual decisions adopted by the cooperative. Olson has demonstrated that small groups may be able to make decisions that large groups cannot, even if the common interest is served. Under this view, directors establish policy for operation of the firm, rectify major operational decisions taken by management, and monitor management behavior to ensure the protection of member interests however they are expressed or perceived.

Thus far, nothing has been revealed about the role of directors of a cooperative that conflicts with the neoclassical theory of the firm or the Helmberger and Hoos models. However, the structure of the board of directors encountered in cooperatives is sufficiently different from that found in the IOF so one is compelled to ask why. The typical board found in an IOF is made up of a combination of "inside" members who are usually representatives

of management or major stockholders and "outside" members who are respected for their expertise but who have no financial interest in the firm. In contrast, the board of most cooperatives is made up entirely of elected member-patrons whose primary experience is related to farm management and who typically have little prior experience in controlling the affairs of a large and complex business enterprise. There are important exceptions to this norm, particularly in the case of interregional agricultural cooperatives where some board members are representatives of the management of constituent regional cooperatives and others may be selected as "outside" directors.

The unique structure and role of the board of directors in a cooperative is hypothesized to be a function of the unique set of property rights embedded in cooperative enterprise. For this reason, discussion of board structure and the impact directors may have on the performance of cooperative associations will be left to the following section on the impact of cooperative property rights.

The Role of Management in Cooperatives --The Helmberger and Hoos model of cooperative behavior holds that management is constrained to operate within the limits dictated by a firm-wide objective function (i.e., maximization of per-unit price paid for member-supplied input) despite the fact that the authors have maintained that organization theory allows for alternative management behavior.

Other historical treatments of cooperative theory are worth mentioning because of the polar manner in which they treat the role of management. Enke was the earliest of formal cooperative theorists and the only early writer to suggest an active role for management. He specified a number of possible management objectives and strategies, including member-price minimization and the avoidance of hostile behavior on the part of business rivals. He maintained that the ultimate managerial role will depend on the voting strength of the interest groups in a cooperative (p. 153). The possibility of an independent managerial agenda distinct from member interests was not considered.

Most other early writers followed Emelianoff and Phillips in specifying that there was little or no role for management in cooperatives. These writers, including Clark (1952a); Aizilnieks; Aresvik; and Robotka, believed that all decision activity emanated solely from member firms. Ohm followed the Phillips model but specified a coordinating role for management. Savage and Trifon opposed the Phillips model and insisted that cooperatives had an independent economic existence apart from member firms in that some decisions were clearly made at the cooperative plant level by directors and management.

Those models that do specify an active role for management in cooperatives relegate such activity to the operation of a well-expressed, single-purpose, objective function. Yet, conditions may exist that would afford managers the opportunity to pursue goals other than those that could be considered strictly in the interest of members. Informational, institutional, or structural constraints may be present that prevent any manager from achieving a specified, firm-wide goal or acquiring the information necessary to do so. In addition, constraining management to act exclusively in the interest of

members is not costless (Jensen and Meckling 1979b). The level of expenditure of monitoring resources on the part of members or the board required to ensure maximization of member interest may be excessive. The marginal cost of monitoring and enforcement may exceed the marginal benefit generated. Another condition that could allow managers to pursue other objectives is the cooperative% structural inability to generate certain information related to the quality of management performance. Because the generation ɔf this information is a function of the unique set of property rights that defines a cooperative, discussion of this issue will be left to the following section.

Economists have proposed a number of objectives a firm's manager might follow if allowed the latitude to do so. Such objectives include the maximization of some form of firm revenue (Baumol), firm growth rate (Marris), or managerial amenities (Williamson). More recently, Jensen and Meckling (1979a, 19798) and Fama and Jensen (1983a, 1983b) offered a more general theory in which all agent groups within a firm (owners, directors, employees, management, etc.) will pursue the objective of constrained personal utility maximization. Managers will act so as to maximize the value of their pecuniary and nonpecuniary reward. Pecuniary awards are based on salary and contractual performance incentives specified by the firm. Nonpecuniary rewards are based on the utility gained from actions that managers perceive will increase their present and future stock of human capital and by such personal amenities as good working conditions, large and cooperative staffs, prestige, etc.

The behaviors implied by agent utility maximization clearly allow for conflict with operation of a firm at maximum profit (IOF) or maximum per-unit payment price (cooperatives). Managerial behavior can be partially constrained by expending resources on monitoring and contractual incentives, but this process is costly and imperfect. Models of cooperative enterprise that are constructed without at least considering the effects of the types of described here must leave open the possibility of biased results.

The Impact of Property Rights on Cooperative Structure and Performance

The concept of a property right refers to the probability that an individual's decision over the use of a particular resource will determine that use (Alchian). This simple, yet informative definition of a property right leads us to a discussion of what is perhaps the most important and overlooked distinction between cooperative enterprise and other forms of organizing business. There exists a number of definitions of what a cooperative is, yet the essential distinction from other firm types lies in the basic restructuring of the property rights relating to control over resource use and the rights to the benefits or loss (residual risk) generated by the business enterprise. In an IOF, control over how resources are used and the rights to residuals ultimately rest in the hands of the owners of common stock in the organization. Decision control is based on the share of capital invested, and decisions are assumed to be judged on the merits of the returns generated by that capital. In a cooperative, the basic property rights governing ownership and control are structured so that decision

control and the rights to residuals rest solely in the hands of those who patronize the firm as members. The possible reasons behind this alteration of property rights, particularly in the case of agricultural cooperatives, were discussed in the earlier section on member motivations.

The issue of how changing property rights may affect the structure and performance of cooperatively organized firms is completely ignored in current models of cooperative behavior that employ some variant of the entrepreneurial theory of the firm. The theory of the firm assumes a given and constant distribution of property rights for all types of business organization. The Helmberger and Hoos model of cooperative enterprise merely manipulates by assumption the standard objective function of a profit-maximizing firm so that the firm itself earns no profit. In this way, traditional analysis focuses on price and output determination and treats any impact changing property rights might have on cooperative firm performance as a nonexistent issue. The following discussion will attempt to show that explicit treatment of the effects of property rights may reveal impacts on the organizational structure and performance of complex firms.

As previously mentioned, the essential difference between the structure of property rights defining a cooperative and IOF is the restriction of ultimate decision control and the rights to firm residuals to those who patronize the firm as purchasers of goods or users of services. Ancillary to this restructuring of rights is the fact that cooperative firm control is generally based on one-member/one-vote terms and not by share of capital invested. In addition, because membership and control in such organizations is restricted to patrons, these rights have value only as long as the member firm or individual remains an active patron. In agricultural cooperatives, this restriction on membership limits the term of decision control and residual claim on the firm to the active working life span of the member-producer.

A number of impacts on cooperative organizational structure and performance are suggested by this change in basic property rights. The first impact relates to the unique structure observed in the cooperative board of directors. In an IOF, the rights to ownership and control are traded openly on the stock market. Jensen and Meckling (1979b) and Fama and Jensen (1983a) have maintained that if the stock market can be considered a perfect market, then, among other things, stock prices will perfectly reflect the quality of management decisions in a given IOF. Firms whose stock is considered undervalued due to poor management are subject to takeover by rival firms. It is hypothesized that this process serves as a partial constraining force on management to act in the interests of stockholders or face loss of their livelihoods. In a cooperative, the rights to ownership and control usually are not transferable; thus there can be no market for these claims. No information is generated by a secondary market for use in the evaluation and control of management behavior in cooperatives. It can be hypothesized that this loss of an important control mechanism is responsible for the observed structure of the board of directors in a cooperative; i.e., that directors are required to be member-patrons of the firm to replace the control mechanism on management that is lost due to the effect of the property right that prevents useful information about management performance from being

generated. Because they have a direct and personal interest in the well-being of the firm, board members are less likely to condone behavior that they perceive as not serving the general interest of members.

It has now been shown that the lack of marketability and limited life span of the rights members hold in a cooperative firm may have bearing on the organizational structure of these firms. It remains to be shown that property rights also have potential to affect the performance of a cooperative firm as compared to an IOF. Accepting the assumption of a perfect market, the stock held in an IOF is considered to have an infinite horizon in that stock prices should reflect investors' expectations with regard to the present value of the returns to investments in the firm regardless of the length of the income stream to be generated by the investment (Fama). However, in a cooperative, there is no secondary market for ownership and control rights and a member cannot capture the benefits from an investment beyond the term for which he or she remains active. Upon retirement from a cooperative, members typically are returned only the original face value of any outstanding equity capital they have invested in the firm (Baarda). Members can capture economic gains from the firm only through patronage. Therefore, the member may perceive the value of the income stream generated by such an investment as truncated by his or her expected term of membership. An investment would not be judged acceptable unless the present value of returns generated by the truncated income stream was deemed adequate.

Cooperatives whose membership behaves in this manner may either underinvest relative to IOFs that perform the same function or the distribution of their investment portfolio may be skewed toward shorter-term projects. In either case, Fama has shown that the portfolio of investments adopted by a firm whose residual claims are limited in horizon will be not be optimal relative to firms whose claims have infinite horizon.

The adverse effects of the investment horizon problem in cooperative enterprise may be overcome, to some degree, by inclusion of certain features into these firms' organizational structures. First, because it is the board of directors that ultimately ratifies investment policy, a concentrated educational effort to convince directors of the necessity of guarding the long-term interests of their firms may help to overcome the built-in incentive for members to maximize shorter-run interests. Secondly, it may be possible that the horizon problem is eliminated if there exists another mechanism whereby members can capitalize the present value of investments whose stream of future returns extends beyond their expected term of membership. In the case of agricultural cooperatives, it could be hypothesized that the present value of future investments is capitalized into the value of a member's fixed assets, e.g., the value of farmland. In the simplest example, the farmland of a producer may become more valuable in areas where there is access to a cooperative than in cases where there is not, ceteris paribus. Further, farmland values may fluctuate with relative performance of the local marketing or supply cooperative, ceteris paribus. Unfortunately, experience with research into the constituents of farmland value has demonstrated that is quite difficult to separate empirically and measure the various components contributing to land prices. Finally, in

cases where farmers can pass cooperative membership to succeeding generations and they perceive utility in doing so, the horizon problem may be ameliorated.

At this point, it is reasonable to ask why it is important to know how a changing set of property rights will affect the performance of cooperatively organized firms, i.e., what policy implications can be drawn from the knowledge that cooperatives may follow an investment pattern different from an IOF performing the same function. If cooperatives invest inefficiently relative to IOFs in industries that require longer-term commitments of capital, then, from society's point of view, resources will be better utilized if government does not subsidize entry into these industries. The investment horizon problem may provide at least a partial explanation of why cooperative organization in the U.S. economy is rarely observed outside the agricultural sector. The marketing and supply activities of agricultural cooperatives require investments that generally are of a short-term nature (relative to member horizons). However, a cooperatively organized firm in the steel industry (e.g., a labor-managed firm) may be at a disadvantage due to the long-term nature of returns to investments in plant, equipment, and research and development.

The effect property rights have on cooperative organizational structure and control features also have important policy implications. If the hypothesis that the structure of the cooperative board of directors replaces the unique control function that is lost due to the lack of a secondary market for residual claims proves valid, then it can be expected that this control function will weaken as organizational hierarchies emerge that are further removed from the member-patron and member-director agricultural experience. The emergence of the giant interregional agricultural cooperative in such areas as petroleum products, equipment manufacture, and international export of commodities in recent years has led to boards of directors consisting of agricultural producers who may have little experience in the complexities of their cooperative's lines of business. Directors may feel incapable of judging the quality of management decisions. In such situations, the rights to decision control may be effectively relinquished to management. In addition, such boards often are partially made up of management representatives from the constituent regional organizations. Such a trend could lead to increasing degrees of management control and possibly to affairs such as the AGRI Industries (Waterloo) and Farmers Export (Rowen) incidents where a large interregional cooperative apparently became controlled by management with resultant adverse results for members.

Summary and Conclusions

The first objective of this paper was to justify, from a methodological viewpoint, the direct examination of the impact of property right assumptions with regard to their effect on the predictive and explanatory power of economic theories of business organization, particularly a theory of cooperative enterprise. Property rights were shown to fall into a class of economic assumptions that must exhibit a degree of factual realism if the theory is to have relevance in accurately explaining and predicting the

behavior of complex economic organizations. Because factual realism in certain classes of assumptions to which property rights belong is shown to enhance -the power of a theory, it is methodologically sound to empirically examine the validity of property right assumptions either by direct test of the assumption when possible or by test of the resulting hypotheses generated by the theory.

Having established the methodological foundation for the explicit incorporation property right assumptions into a theory of cooperative organization, the second purpose of this paper was to present and discuss the new issues that become relevant research questions as a result and have been largely ignored in conceptual or applied research in the United States. As more realistic assumptions are made regarding the incentive structure of the various agents that constitute a cooperative firm and the nature of the property rights that govern cooperative ownership and control, testable hypotheses can be formed and examined that will increase our knowledge of how cooperatives can be expected to function relative to competing firm types. Specifically addressed are the potential implications of member, director, and management incentives on firm performance and the impact of cooperative property rights on organizational structure and performance.

Notes

1. For examples, see Friedman 1968; Machlup 1978; Melitz; and Silberberg.

2. It is important to note that after having made this definitive statement, Machlup goes on to demonstrate that some assumptions of theory need necessarily be operational. This will be demonstrated.

3. For example, it may be necessary for the residual claimant to also become a partner.

4. For example, better working conditions, prestige, or an enhanced perception of worth in the market for managers.

5. It should be noted that while U.S. cooperative theorists have effectively ignored, for the most part, the issue of conflicting members, director, and management goals, several foreign writers have made initial attempts at dealing with the issue. For examples, see Eschenburg; Perrault; and Pichette.

References

Aizsilnieks, Arnolds P. "Farmer Cooperatives and Economic Welfare: A Reply." Journal of Farm Economics 34(1952):563-66

Alchian, Armen. "Some Implications of Recognition of Property Right Transaction Costs." In Economics and Social Institutions, ed. K. Brunner, pp. 233-54. Boston: Martinus Nijhoff Publishing, 1979.

Aresvik, Oddvar. "Comments on 'Economic Nature of the Cooperative Association."* Journal of Farm Economics 37(1955):140-44

Baarda, James. Personal conversation, 1984.

Baumol, William. Business Behavior, Value and Growth. New York: Macmillan co., 1959.

Blaug, Mark. The Methodology of Economics. Cambridge, England: Cambridge University Press, 1980.

Bowley, M. Nassau Senior and Classical Economics. New York: A. M. Kelly, 1948.

Clark, Eugene. "Farmer Cooperatives and Economic Welfare." Journal of Farm Economics 34(1952a):35-51.

_____ "Farmer Cooperatives and Economic Welfare: Rejoiner." Journal of Farm Economics 34(1952b):404-7.

Domar, Evsey. "The Soviet Collective Farm as a Producer Cooperative." American Economic Review 56(1966):735-57.

Emelianoff, Ivan. Economic Theory of Cooperation. Washington, D.C.: By the author, 1948.

Enke, Stephen. **Consumer Cooperatives and Economic Efficiency." American Economic Review 35(1945):148-55.

Eschenburg, Rolf. bkonomische Theorie der genossenschaftlichen Zussammenarbeit. Tubingen, West Germany: J. C. B. Mohr, 1971.

Fama, Eugene. "Agency Problems and the Theory of the Firm." Journal of Political Economy 88(1980):288-307.

Fama, Eugene, and Michael Jensen. "Separation of Ownership and Control. Journal of Law and Economics 26(1983a):301-25.

_____. "Agency Problems and Residual Claims.** Journal of Law and Economics 26(1983b):327-49.

Friedman, Milton. Essays in Positive Economics. Chicago: University of Chicago Press, 1953.

Friedman, Milton. "The Methodology of Positive Economics." In Readings in Microeconomics, ed. William Breit and Harold Hochman, pp. 23-47. New York: Holt, Rinehart, and Winston, 1968.

Gorden, Donald. "Operational Propositions in Economic Theory." In Readings in Microeconomics, ed. William Breit and Harold Hochman, pp. 48-59. New York: Holt, Rinehart, and Winston, 1968.

Hardie, Ian. "Shadow Prices as Member Returns for a Marketing Cooperative." American Journal of Agricultural Economics 51(1969):818-33.

Helmberger, Peter. '*Cooperative Enterprise as a Structural Dimension of Farm Markets." Journal of Farm Economics 46(1964):603-17.

Helmberger, Peter, and Sidney Woos. "Cooperative Enterprise and Organization Theory." Journal of Farm Economics 44(1962):275-90.

Henderson, James, and Richard Quandt. Microeconomic Theory, 2nd ed. New York: McGraw-Hill Book Co., 1971

Hite, James. Room and Situation. Chicago: Nelson Hall, 1979.

Hutcheson, Terrence. The Significance and Basic Postulates of Economic Theory. New York: A. M. Kelly, 1938; reprint ed., 1965.

_____ '*Professor Machlup on Verification in Economics." Southern Economic Journal 22(1956):476-83.

Jensen, Michael. "Organization Theory and Methodology." Accounting Review 58(1983):319-39.

Jensen, Michael, and William Meckling. "Rights and Production Functions: An Application to Labor-Managed Firms and Codetermination." Journal of Business 52(1979a):469-506.

_____ "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure." In Economics and Social Institutions, ed. Karl Brunner, pp. 305-60. Boston: Martinus Nijhoff Publishing, 1979b.

Jesse, Edward, and Aaron Johnson. "Marketing Cooperatives and Undue Price Enhancement: A Theoretical Perspective." N. C. Project 117 Pap. WP-46, University of Wisconsin, Oct. 1980.

Kaarlehto, Paavo. "Cooperation as a Form of Economic Integration." Acta Agriculturae Scandinavica 5(1954-55):85-97.

Kuhn, Thomas. The Structure of Scientific Revolutions. Chicago: University of Chicago Press, 1970.

Ladd, George. "A Model of a Bargaining Cooperative Association.*' American Journal of Agricultural Economics 56(1974):509-59.

LeVay, Clare. "Agricultural Cooperative Theory: A Review." Journal of Agricultural Economics 34(1983)1-44.

McClosky, Donald. "The Rhetoric of Economics.*' Journal of Economic Literature 21(1983):481-517.

Machlup, Fritz. Essays on Economic Semantics. Englewood Cliffs, N.J.: Prentice Hall, 1963.

_____ Methodology of Economics and Other Social Sciences. New York: Academic Press, 1978.

Marris, Robin. "A Model of Managerial Enterprise." Quarterly Journal of Economics 77(1963):185-209.

Melitz, J. "Friedman and Machlup on the Significance of Testing Economic Theory." Journal of Political Economy 73(1965):37-60

Ohm, Hans. "Member Behavior and Optimal Pricing in Marketing Cooperatives.*' Journal of Farm Economics 38(1956):613-21.

Perrault, Paul T. Application des theories de la firme et de quelques notions modernes à l'étude de l'enterprise cooperative. Sherbrooke, Quebec: Librarie de la Cite Universitaire, 1972.

Phillips, Richard. "Economic Nature of the Cooperative Association." Journal of Farm Economics 35(1953):74-87.

Pichette, Claude. Analvse microeconomique et cooperative. Sherbrooke, Quebec: Librarie de la Cite Universitaire, 1972.

Popper, Karl. Objective Knowledge: An Evolutionary Approach. London: Oxford University Press, 1972.

Randall, Alan. Resource Economics. Columbus, Ohio: Grid Publishing, 1981.

Richardson, Ralph M., et al. Farmer Cooperative Statistics 1980. Washington, D.C.: USDA ACS Cooperative Information Rep. 1, Sec. 27, Sept. 1982.

Richardson, Ralph M., et al. Farmer Cooperative Statistics 1982. Washington, D.C.: USDA ACS Cooperative Information Rep. 1, Sec. 27, March 1984.

Robotka, Frank. "A Theory of Cooperation." In Agricultural Cooperation, ed. Martin Abrahamsen and Claud Scroggs, pp. 121-42. Minneapolis: University of Minnesota Press, 1957.

Rowen, Roy. "A Farm Co-op in the Hands of High Rollers." Fortune, Apr. 20, 1981, pp. 151-60.

Samuelson, Paul. Foundations of Economic Analysis. Cambridge, Mass.: Harvard University Press, 1948.

Savage, Job. "Comments on 'Economic Nature of the Cooperative Association.'" Journal of Farm Economics 36(1954):529-54.

Schmid, Allan. Property, Power, and Public Choice. New York: Praeger, 1978.

Silberberg, Eugene. The Structure of Economics. New York: McGraw-Hill Book co., 1978.

Trifon, Raphael. "The Economics of Cooperative Ventures: Further Comments." Journal of Farm Economics 43(1961):215-35.

Vitaliano, Peter. "The Theory of Agricultural Enterprise: Its Development and Present Status." In Agricultural Cooperatives and the Public Interest, ed. Bruce Marion, pp. 21-42. North Central Regional Res. Pub. 256, Research Division, College of Agricultural and Life Sciences, University of Wisconsin, Sept. 1978.

Waterloo, Claudia. "Expanding Too Fast, a Major Grain Co-op Fell into Big Trouble." Wall Street Journal, July 18, 1983, p. 1.

Williamson, Oliver. "Profit, Growth, and Sales Maximization." Economica 33(1966)1-16.

THE STRUCTURAL CHARACTERISTICS OF FARMER COOPERATIVES AND THEIR BEHAVIORAL CONSEQUENCES

John M. Staatz

To understand decisionmaking in farmer cooperative firms, it is first necessary to understand how cooperative firms differ from other types of businesses. This paper outlines the distinguishing structural characteristics of farmer cooperatives and, based on those characteristics, it develops hypotheses about how the behavior of farmer cooperatives, is likely to differ from that of investor-owned firms (IOFs). The term "structure," as used in the paper, is defined to include not only the organizational components of cooperative firms but also basic operating rules common to these firms, such as distributing net margins via patronage. The first part of the paper briefly reviews alternative definitions of farmer cooperatives and identifies several characteristics common to these organizations. The second, and largest, part of the paper traces through some of the consequences of these characteristics for the behavior of participants in farmer cooperatives and develops hypotheses regarding how that behavior will vary in different circumstances. The final section briefly summarizes the major conclusions of the paper.

Defining a Farmer Cooperative

Cooperative firms frequently are defined as businesses that are owned by their patrons and follow at least some of the Rochdale principles, which are listed by Roy (p. 258) as:

1. Net margins distributed according to patronage;
2. Democratic control--one-member/one-vote;
3. Limited return on stock;
4. Limitation on the number of shares owned;
5. Open membership;
6. Trading on a cash basis;
7. Membership education in the cooperative way of doing business;
8. Political and religious neutrality;
9. No unusual risk assumption; and
10. Goods sold at regular retail prices, with net margins rebated to members, rather than discounted retail prices.

Practically no modern cooperatives follow all the Rochdale principles. The problem of defining a cooperative as a business that follows some of these principles is that any two cooperatives thus defined may not have any characteristic in common. Furthermore, while some of the Rochdale principles may be important in fundamentally defining the structure of cooperatives, others simply represented prudent business practices at the time of the

Rochdale pioneers. The prohibition on credit sales, for example, may have been appropriate during the 18th century, when the banking and credit system was relatively undeveloped, but prohibiting present-day cooperatives from extending credit would place them at a severe competitive disadvantage. Certain other Rochdale principles, such as the requirements that there be "no unusual risk assumption" and that goods be sold at "regular retail prices," are so vague as to be nonoperational.

Even the more "fundamental" of the Rochdale principles are not always followed by farmer cooperatives. Every agricultural cooperative, for example, follows some form of closed membership, at least insofar as membership is restricted to farmers. Many agricultural marketing cooperatives further restrict membership because of limitations in plant capacity, the desire to ensure product quality, or other reasons. Nor do all farmer cooperatives follow the one-member/one-vote rule (see Ward, Schneider, and Lopez).

Given the ambiguity of using the Rochdale principles to define a cooperative, Schaars (cited by Roy, p. 259) argued that there were only three essential characteristics of a cooperative:

1. Service at cost to member-patrons;

2. Democratic control by member-patrons (where the exact meaning of "democratic" was left undefined); and

3. Limited return on equity capital.

A cooperative, in Schaars' view, was a member-controlled business in which the return to investment was distributed primarily according to patronage rather than according to ownership of equity in the organization.

Given the variation in cooperatives' practices, it probably is impossible to devise a concise definition of a cooperative that would be valid for every organization that appears, on the basis of everyday observation, to act like a cooperative (Bateman, Edwards, and LeVay). The approach taken in this paper is similar to that of Schaars: Three characteristics common to most farmer cooperatives are identified and used to define an "archetypical" or "pure" farmer cooperative. These characteristics incorporate and elaborate on the points covered in Schaars' definition and in the first four Rochdale principles. There undoubtedly are cooperatives that do not exhibit all of these characteristics. As Eschenburg (pp. 84-85) pointed out, given the diversity of these organizations, no one definition or theory of cooperatives is likely to be comprehensive.

For the purposes of this paper, a farmer cooperative firm is defined as a business with the following characteristics:

1. The stockholders, who are farmers, are the major users of the firm's services.

2. The benefits a stockholder receives from committing capital to a cooperative are tied largely to patronage. There are three reasons for this:

   (a) The business pays a strictly limited dividend on equity capital invested in the organization.

   (b) Net margins are distributed among stockholders in proportion to their patronage with the business rather than in proportion to their equity ownership in the firm.[1]

   (c) Stock of cooperative firms does not appreciate because there is a very limited or nonexistent secondary market for it. Therefore, capital gains are not a major benefit of stock ownership in cooperatives, in contrast to IOFs.[2]

3. The formal governance of the business by the stockholders is structured "democratically" in the sense that:

   (a) Voting power is not proportional to equity investment. The limitation on "voting one's equity" may be in the form of one-member/one-vote rule, or voting may be proportional to patronage or stock ownership but subject to some limit such as restricting any one member from having more than 5 percent of the total votes.

   (b) There are strict limitations on the number of nonstockholders who may serve on the board of directors.

Implications for Participant Behavior

Each of these three characteristics results in differences between the incentives faced by participants in cooperatives and those faced by participants in IOFs. These differences in turn may lead to differences in the behavior of the two types of organizations.

Behavioral Differences Due to Stockholders Being Maior Users of the Firm's Services

To the extent that stockholders influence a firm's decisions, one would expect the decisions of a firm to be different if its stockholders were major users of its services than if they were not. Cooperative theorists from the 1940s through the 1970s have stressed some of these differences by pointing out how the objective function of cooperatives might differ from that of IOFs (LeVay).

Broader Scope for Optimization- -The scope for optimization in a farmer cooperative is potentially broader and more diffuse than in a competing IOF that is not vertically integrated into farming. It is broader in the sense that a profit-maximizing farmer-member would be interested not in running the farm and the cooperative as separate profit centers but in optimizing the

performance of the integrated farm/cooperative system. The scope for optimization is more diffuse because cooperative returns are distributed according to patronage, not investment. As a result, the cooperative does not have one locus for profit maximization but a separate locus for each member, giving rise to a host of problems that attend collective choice. These problems are reflected most clearly in debates within cooperatives about pricing, financing, and pooling policies.[3]

The broader scope for optimization in cooperatives may be manifested by cooperatives taking into account their farmer-members' fixed costs when making decisions and by differences between the pricing practices of farmer cooperatives and those of IOFs.

Items that represent fixed costs for the stockholder-patrons may receive greater consideration in a cooperative's decisions than they would in the decisions of an IOF because the market transforms the fixed costs of an IOF's customers or suppliers into variable costs for the firm. An agricultural processing cooperative, for example, will likely give greater emphasis to providing its supplier-members a "home" for their product than will an IOF because the cooperative takes account of the need of its stockholders to amortize their fixed on-farm production investments. An IOF usually does not have to deal directly with its suppliers' fixed costs; they are transformed via the market into the raw-product price that the IOF pays, which the IOF processor considers as a purely variable cost.

This tendency of farmer cooperatives to give greater weight to their patrons' fixed costs results in the capital of cooperatives being less mobile than that of other firms. Farmer cooperatives tend to concentrate their investments in agribusiness activities closely related to the farming activities of the member-stockholders because the stockholders might suffer substantial capital losses if their farming activities were not adequately supported. These capital losses would not affect the income of stockholders of an IOF serving these farmers; hence, there would be little pressure on IOF management to invest in these agribusiness activities if more profitable opportunities lay elsewhere. One would therefore expect IOFs to shift their resources in and out of agribusiness more frequently than would cooperatives, whose assets are tied to those of their stockholder-members.

The vertically integrated nature of a farmer cooperative may also lead to different managerial behavior than in an IOF because the cooperative may have to bear certain costs that it could shed onto others were it not owned by its patrons. For example, a cooperative may be less able to drive a hard bargain with a unionized labor force than is an IOF. The cost of a strike can be very high to the stockholders of a farmer cooperative, as it can deny them access to the cooperative's services at a critical time in the crop cycle. Whereas an IOF might try to weather a strike by simply shutting down, thereby shifting some of the cost of the strike onto its farmer-customers, a cooperative manager who tried this strategy would likely face strong pressure from the stockholders to settle the strike quickly. The stockholder-user identity forces the manager to take a more integrated view of the firm's costs and benefits.

Because cooperative firms are owned by their patrons, their pricing behavior may differ from that of IOFs. Indeed, the rationale for establishing a "competitive yardstick" cooperative is that the cooperative will price its services differently than local IOFs, thereby forcing these firms to behave more competitively. The pricing behavior of cooperatives also may differ from that of IOFs because cooperative managers recognize that pricing decisions of a cooperative affect the distribution of income among the stockholders. This limits the managers' latitude in setting prices.[4]

In addition, the prices paid or charged by cooperatives have some of the characteristics of transfer prices in a vertically integrated firm; potentially they can be adjusted to affect the cash flow and tax liability of the patrons. For example, patrons in high marginal tax brackets may pressure the cooperative's management to retain net margins as unallocated equity so that the tax liability for the earnings accrues to the cooperative, which may be in a low marginal tax bracket, rather than to the members. Patrons in low tax brackets, who also may face cash flow difficulties, often lobby for net margins to be paid to the members as cash patronage refunds. For these patrons, the tax liability on the refund is often small compared to its benefits in terms of increased cash flow.[5]

The cooperative may even eliminate some of the combined member/cooperative tax liability by converting potential earnings into nontaxable forms, such as consumer surplus. This can be achieved by using some of the cooperative's earnings to subsidize the price of consumer goods and services sold to members. This suggests that cooperatives have an incentive to provide certain amenities to their members, such as cut-rate life insurance, that are not directly related to farm production.[6]

A cooperative's ability to benefit from its broader scope for optimization may be limited by two factors: (1) the structure of incentives facing individual farmer-members and (2) a dearth of common interests among a highly heterogeneous membership.

Several cooperative theorists (Kaarlehto; Eschenburg; Lopez and Spreen) have noted that in many situations the interest of the membership of a cooperative as a whole does not correspond with that of individual members. For a farmer cooperative firm to take advantage of its broader scope for optimization, the operations of the cooperative have to be coordinated with those of the members' farm firms. If incentives exist for the members to operate their farms in a totally independent manner (e.g., expanding production even though all members would benefit from a mutual reduction of output), the benefits of coordination will be lost. These situations often resemble prisoner's dilemmas and are analyzed in another paper.[7]

Coordination of the cooperative's activities with those of its member firms also may be reduced if the membership is highly heterogeneous. With a highly heterogeneous membership, particularly one in which the members perceive themselves as being in opposing camps (e.g., butterfat producers vs. oilseed producers), it may be difficult to get members to agree on anything other than running the cooperative as a separate profit center. This is the classic problem of collective choice, i.e., trying to find a pattern of

behavior for the collective that faithfully reflects the preferences of all the individual members (Arrow).[8] In game-theoretic terms,[9] the core of the bargaining game between stockholders may collapse to only one solution- -independent profit maximization of the stockholders' individually and jointly-owned firms. This does not necessarily mean the farmer-members are poorly served by such cooperatives. The stockholders may be happy with the cooperative's performance in the same sense investors in an IOF are happy with their firm's performance. To the extent that the cooperative operates as a separate profit center, however, the potential gains to the cooperative's stockholders from the organization's broader scope for optimization are lost.

More Diffuse Scope for Optimization: Pooling Issues and Income Distribution- -In multiproduct or multiservice cooperatives, one of the most important consequences of the stockholders being users of the firm's services is that the stockholders become vitally interested in the firm's pricing of individual goods and services, not simply in its overall financial performance. The income that a stockholder derives from an IOF depends on the firm's "bottom line," but the income of a cooperative's stockholder often depends more on the prices of the individual goods and services purchased from the cooperative than on the organization's overall profitability. As a result, questions of pricing, product pooling, and joint cost allocation become issues of keen interest to the stockholders. Unlike their counterparts in an IOF, the stockholders of a cooperative are intensely interested in the income-distribution consequences of their firm's marketing and cost-allocation decisions. Members' concerns about those decisions are likely to be greatest when the members face financial difficulties and hence cannot "afford" to cross-subsidize their co-members.

Because members of a cooperative who produce or purchase different products will have different preferences for how the cooperative should set prices and allocate costs, price setting and cost allocation become much more delicate issues for management of cooperatives than they are in IOFs. Instead of representing merely strategic questions about how best to improve the firm's financial performance, these decisions directly affect the stockholders' willingness to patronize and contribute financially to the organization. This stockholder sensitivity to pricing and cost-allocation has two implications. First, price setting and cost allocation are likely to be more costly processes in cooperatives than in IOFs. Not only do cooperative stockholders often demand to be involved in these decisions (e.g., via the board of directors), but because of the diversity of stockholder interests it may be difficult to reach a consensus about what the appropriate pricing and cost-allocation rules should be. In contrast, in an IOF, management often makes these decisions with no stockholder input whatsoever. Second, a cooperative's ability to cut prices and employ cross-subsidies to gain market share may be much more circumscribed than that with an IOF. The stockholders who, through their patronage of particular goods and services, finance the subsidies for the discounted items may object to carrying an "unfair burden" in the cooperative's quest for an expanded market share. As a result, cooperatives may be less able than IOFs to enter new fields where gaining a toehold in the market requires initial price-cutting. This reinforces the

tendency of cooperatives to have a more narrow range of activities than do IOFs.[10]

Limited Pool of Equity Capital--A major consequence of tying stock ownership to patronage is that the potential pool of equity capital for cooperatives becomes sharply circumscribed. Whereas an IOF can raise additional equity capital by selling stock to the general public, a farmer cooperative can increase its equity base only by convincing existing stockholders to subscribe additional capital or by attracting new farmer-stockholders. Existing members may be reluctant to subscribe additional capital for several reasons. The members may operate under absolute capital rationing, requiring them to invest mostly in their own farm enterprises just to continue operating. Members also may perceive that the return on their investment in the cooperative is lower than in the farm enterprise.[11] This may occur because the member's perception is indeed correct, because the member undervalues investment in the cooperative due to free riding and delays in receiving allocated patronage refunds, or because the member overvalues investments in the farm enterprise, such as overlarge and complex equipment. Attracting new members may be difficult because of geographic limits on the cooperative's scope of operations and because, in certain cooperatives, only farmers engaged in particular types of production are admissible as members.

The difficulty in raising equity capital, combined with the "horizon problem" (discussed later), may restrain farmer cooperatives from entering certain highly capital-intensive areas of agribusiness, such as farm machinery manufacture and sales, in which one would otherwise expect them to play an important competitive yardstick role (Rhodes; Heflebower). In addition, the difficulty of rebuilding a cooperative's equity base once it has been eroded may make managers of cooperatives (particularly supply cooperatives) reluctant to initiate risky activities such as price wars that might threaten the firm's equity base. In the words of one cooperative manager, "Because equity cannot be enticed into cooperatives, equity is more sacred: it must be guarded more carefully** (van Nostrand, p. 86).

In certain types of marketing cooperatives, however, the common practice of accepting all the raw product that members produce may result in managers having to cut the price of their processed products to move their inventory. The threat that such price cutting poses to the cooperatives' equity base has led many marketing cooperatives to reconsider their policy of providing a "home" for their members' products.

Risk Aversion- -Farmers invest in agricultural cooperatives as a means of strengthening their farm businesses. The investment represents a deepening of the farmers' financial commitment to a particular line of business rather than a diversification of their portfolios. The tying of patronage to stock ownership in cooperatives prevents the stockholding from being handled by specialized agents, such as independent investors in an IOF, who are either more risk-preferring than the patrons or who can spread their risks by diversifying their portfolios (Carson; Condon and Vitaliano). Because the patrons of cooperatives tend to "have all their eggs in one basket,," they may pressure management to adopt more conservative business strategies than those of competing IOFs. This is particularly true because farmers' investments in

their cooperatives are largely sunk whereas owners of an IOF can "bail out" if the IOF's investments begin to sour. Furthermore, because of the immobility of cooperative capital previously discussed, it is more difficult for cooperatives than for IOFs to spread their risks by diversifying into totally unrelated activities; hence, management itself may prefer more conservative business strategies. Consequently, farmer cooperatives may be more risk-averse than their IOF competitors, particularly if the latter are divisions of large diversified firms.[12]

Better Information Flows and Product Specification--The identity of the patron with the stockholder in cooperatives may lead to better information flows between patrons and management and better product specification. Part of the supply cost of a product is the cost of determining the characteristics of the product desired by patrons. This cost may be lower in cooperatives because they often are structured in a way that makes it easier to collect such information. Unlike many IOFs, a cooperative usually has a list of its patrons and may be able to collect a substantial amount of information about their production practices and needs by asking the members to fill out questionnaires on joining the organization and through periodic member surveys. The members may give more truthful information to the cooperative than they would to an IOF because as stockholders they are more assured that the cooperative will not use the information to act opportunistically toward them.[13] Furthermore, members of cooperatives have more channels open to them to communicate their desires to the firm than do customers of an IOF. In addition to the firm's management and customer representatives, cooperative patrons have access to the firm's formal governance structure through the board of directors. Exercising "voice" therefore may be cheaper for patrons in a cooperative than in an IOF (Hirschman).

Greater Loyalty of Patrons--Because the patrons of cooperatives are stockholders who may have substantial investment in the company, they may be more willing than customers of an IOF to continue to patronize the same firm even though competing firms offer goods and services on more favorable terms in the short run. This willingness to stick with the cooperative even though there exist short-run incentives to defect is commonly termed "cooperative loyalty." Such loyalty is not irrational; it reflects the members' belief that: (a) The short-run performance of the cooperative can be improved if members stay with the organization and work to remedy the problems; and (b) Even though there may be short-run incentives to patronize the cooperative's competitors, in the long run the discounted net benefits from patronizing the (improved) cooperative are greater than those available from alternative sources. These net benefits not only include direct monetary benefits but also the option-demand benefit of having a market alternative to IOFs and the public-good benefits generated by the cooperative, which would be lost if members abandoned the organization. Loyalty can help generate monetary benefits to the members by improving the cooperative's ability to project demand, thereby reducing inventory costs and facilitating the planning of new facilities.

One element that strongly influences a member's view of whether there are long-term monetary net benefits from continuing to patronize the cooperative

is whether the rate of return on the member's investment in the cooperative appears to be contingent on continued patronage. This rate of return has two components: the return of capital, that is, the recovery of the initial investment; and the return on capital, that is, the additional net earnings engendered by the investment (Gittinger, p. 66). In an agricultural cooperative, the return of capital, in an undiscounted sense, depends on the cooperative's equity redemption program. The return on capital is derived through patronage, through limited interest payments on capital invested in the organization, and through the cooperative's provision of public and semipublic goods, such as lobbying. The current return gained through patronage is represented by the difference between the cooperative's prices (net of any patronage refund) and those of competing IOFs, appropriately adjusted to take into account any quality differences between the goods and services available from the cooperative and those available from the IOFs.

If the cooperative's net prices are less favorable than those of competing IOFs, if the rate of interest paid on capital invested in the cooperative is less than the member's opportunity cost of capital (as it usually is), and if it is possible to act as a free rider with respect to the cooperative's provision of public and semipublic goods, then the individual member's short-run return on capital invested in the cooperative is negative. Even though the competitors' prices may be as low as they are because of competitive pressure from the cooperative, the individual cooperative member has no incentive to take this into account if it is believed that patronage decisions do not affect the viability of the cooperative. If the member believes that the speed with which cooperative equities will be retired does not depend on continued patronage, then the perceived return of capital is unaffected by patronage decisions. Given these conditions, there is no reason, based on current financial considerations, for the cooperative member to be any more loyal to the firm than is the customer of an IOF. If the member's perceived rate of return on investment in the cooperative is negative or is not contingent on continued patronage, the member may rationally regard the investment as a sunk cost and therefore not take it into account in making current patronage decisions.

This situation is most likely to occur if the cooperative has an open membership policy and if the member believes that market prices will be unaffected by patronage decisions. Given these conditions, a member who does not patronize the cooperative in the current year can freely patronize it in succeeding years if the cooperative's prices or services become more favorable, and the member believes that the patronage decision in the current year will not affect the future prices offered by either the cooperative or competing IOFs. The member will therefore base current patronage decisions solely on current prices.

If, on the other hand, exit from and reentry into the cooperative is costly or if the member believes that current patronage decision will materially affect future prices (e.g., by weakening the cooperative's ability to enforce workable competition or by denying the cooperative the volume it needs to achieve economies of size), then in making patronage decisions the member has to consider not only current prices but expected future prices as well. Here the role of member expectations becomes important in determining cooperative

loyalty. Older members who have vivid memories of what marketing conditions were like before the cooperative existed may be more loyal to the organization than are younger members. The older members may believe that IOFs, unencumbered by competition from a strong cooperative, would offer very unfavorable prices to farmers; younger members may be less sanguine about that conclusion. To the extent member relations programs and other attempts to instill "cooperative ideology" in the membership change members' beliefs about the importance of cooperatives as *'competitive yardsticks," they may therefore affect member loyalty. Even so, members still may have incentives to free ride with respect to the cooperative's competitive yardstick activities, relying on other members' patronage to keep the cooperative strong enough to compete effectively with IOFs.

The preceding analysis suggests that member loyalty will be greater in those cooperatives that make a member's rate of return on investment in the cooperative contingent on continued patronage. In cooperatives maintaining a revolving fund for equity redemption, this could be accomplished by giving priority among nonretired members to the revolvement of equities belonging to those who maintain their patronage. The analysis also suggests that loyalty will be lower where the costs of switching patronage are low. In this sense, the Rochdale principle of completely open membership (with its attendant implication that no penalties should exist for switching patronage back and forth between cooperatives and IOFs) may hinder the viability of cooperatives.

Other Pressures on Management[14]--Implicit in the discussion of many of the preceding issues was the notion that managers in farmer cooperatives face different types of pressures from the stockholders than do managers of IOFs. Because the stockholders of a cooperative are the firm's patrons, there are pressures on cooperative managers in addition to those previously outlined. For example, the stockholder-patrons of a cooperative are intensely interested in technical aspects of the firm's products and services (e.g., the composition and quality of the fertilizers it sells) as these affect the profitability of the members' farming operations. Shareholders therefore may demand that their manager be fairly conversant in technical matters as opposed to being solely a financial expert, as is often the case in IOFs. Whereas IOF customers who are interested in the technical characteristics of the firm's products can be referred to the firm's technical staff, cooperative shareholders may have greater power to demand to talk to "the guy at the top."[15]

In addition, because many managerial decisions that would be considered merely strategic in IOFs have important effects on the distribution of income among the stockholders in a cooperative, managers of cooperatives may be called on much more frequently than their IOF counterparts to justify these decisions to stockholders. Because the stockholders frequently may disagree among themselves about what the proper decision should be, the manager may face discontented stockholders no matter what he or she decides. If stockholder disagreements become extreme, the manager may have to play the role of peacemaker among the stockholders to hold the firm together. All this implies that managers in cooperatives "are more interdependent and interactive with user owners and execute more interpersonal and leadership

roles" than their IOF counterparts (Perraut, p. 94). Much of the time of cooperative managers, particularly those of large, diversified cooperatives, may be spent on member relations. This perhaps puts these organizations at a competitive disadvantage because their chief executive officers have less time than IOF managers for strategic planning and administration.

Behavioral Differences Due to the Return on Investment Being Gained Through Patronage

As mentioned in the beginning of this paper, there are three reasons why the benefits a stockholder receives from committing capital to a cooperative are largely tied to patronage:

1. The cooperative pays a strictly limited dividend on equity capital invested in the organization.

2. Net margins are distributed according to patronage rather than equity ownership in the firm.

3. Cooperative stock does not appreciate because of a limited or nonexistent secondary market for it.

This section examines how these three factors combine to affect the behavior of cooperative participants.

Tendency to Underfinance the Cooperative--To the extent that farmers invest in an agricultural cooperative to obtain the right to patronize the firm, they view the value of their investment in the cooperative as instrumental, depending not on their capital's productivity in the cooperative per se, but on how that productivity accrues to the members through patronage. If the cooperative pays no dividend on invested capital, that is, if members derive benefits from the cooperative solely through patronage, then as long as it is profitable for a farmer to patronize the cooperative, he or she can raise the return on capital invested in the organization by increasing patronage relative to their investment.[16] If left unchecked, this incentive to increase patronage relative to capital investment would lead to severe underfinancing of the cooperative. Members would contribute only enough capital to gain the right to patronize the cooperative and then expand their patronage as long as it was profitable to do so. The rest of their capital would then be available for investment in their farm enterprises or in other ventures (cf. Murray 1983a, 1983b, 1983c). To prevent members from behaving in this way, cooperatives have developed mechanisms such as capital retains, base capital plans, substantial "up-front" entry capital contributions, and the withholding (allocation) of patronage refunds, that attempt to force members to align their capital contributions with their patronage.

Payment of dividends on capital also increase a member's incentive to invest in the cooperative. However, if members differ in the amount of capital they have invested relative to their patronage, the setting of the dividend rate is likely to be a contentious issue. Members who are "overinvested" (i.e., who have contributed more capital relative to their current patronage than the average member) benefit financially from a high dividend rate, while

"underinvested" members prefer a low rate (Staatz 1984, pp. 92-93). The development of mechanisms such as base capital plans that attempt to align capital contribution to patronage can therefore be seen as an attempt by the cooperative to reduce conflict in the organization over payments to capital as well as an effort to assure adequate capital retention to finance growth.

The Lack of a Secondary Market for Cooperative Stock--Although a number of authors have discussed how the absence of a secondary market in ownership rights affects the behavior of participants in worker-managed firms, only a few (e.g., Condon and Vitaliano) have attempted to extend that discussion to farmer-owned cooperatives. Secondary markets for the equity certificates of a few cooperatives exist, but for a number of reasons such markets are not common (see Staatz 1984, pp. 94-96). Discussions with participants in farmer cooperatives suggest that the lack of such markets has several important consequences.

A stock certificate of an IOF confers to the holder a residual claim on the earnings of that firm in perpetuity. A well-functioning secondary market will therefore value the stock in terms of the expected present value of the firm's future net earnings. At any time, stockholders can realize- the capitalized value of those future earnings by selling the stock. Actions that increase the firm's future earnings potential raise the value of the stock, allowing stockholders to capture capital gains. The access to these capital gains via the secondary market gives stockholders a strong incentive to be concerned about the future earnings as well as the present earnings of the firm.

A stock certificate of a farmer cooperative, in contrast, grants to the holder a residual claim on the earnings of the firm only so long as he or continues patronage. Depending on the equity retirement policies of the cooperative, the stock certificate may also confer a fixed claim to the member's original investment in the cooperative, usually payable in nominal terms after several years. Because there is no secondary market for the stock, increases in the cooperative's future earnings capacity do not affect the value of the cooperative's stock. The absence of a secondary market prevents the stockholder from directly realizing, at any time, the full share of the expected present value of the cooperative's future income stream.

If belonging to a cooperative increases a farmer's future on-farm earning capacity, the farmer may, in the current period, be able to realize some of the future value of the cooperative's activities by borrowing against future farm earnings. This often is a poor substitute for a secondary market in the cooperative% stock, however, because lenders base their loans to the member not on the expected present value of the cooperative's future earnings over the cooperative's lifetime, but only over the period during which the farmer is expected to be an active member. If the farmer is close to retirement, he or she may be able to tap only a small percent of accrued investment in the cooperative through the capital market.

As a result of the illiquidity of cooperative stock, shareholders in cooperatives are forced to obtain most of their ownership benefits via current patronage. This may lead members to pressure the cooperative to

increase current earnings at the expense of future earnings. Members may be reluctant to finance long-term investments by the cooperative if they believe that these investments will generate most of their benefits after the current members have retired. One would therefore expect older members, in particular, to pressure management to increase current earnings, even if this involves liquidation of some of the firm's assets.[17]

Observers of the labor-managed firm have identified this tendency to emphasize current cash flow at the expense of future earnings as a major problem in worker-owned firms, labeling it "the horizon problem" (Jensen and Meckling; Condon and Vitaliano; Furubotn). In a farmer cooperative, the horizon problem may be manifested by members pressuring management to:

1. Increase the proportion of the cooperative% cash flow devoted to current payments to members relative to investment (e.g., pressuring the management of a marketing cooperative to have a large "cash payout" or pressuring the management of a supply cooperative to enter into price wars with competitors, even if such cutthroat competition impairs the long-term viability of the cooperative).

2. Speed up equity retirement programs and increase the dividend paid on capital invested in the organization, both at the expense of retained earnings. (As previously pointed out, higher dividend rates will be favored only by members who are "overinvested" in the cooperative and will be opposed by "underinvested" members, who prefer that most of the cooperative's cash flow be devoted to benefits that are distributed according to patronage.)

3. Liquidate the cooperative's assets, in whole or in part. Pressures for total liquidation may be muted by provisions in most state incorporation statutes that specify that in the case of total liquidation a cooperative's assets must be distributed among past as well as current patrons. Pressures for a partial liquidation of the firm's assets, however, may remain.[18]

Several mechanisms may partially substitute for a secondary market in cooperative stock, thereby attenuating the horizon problem in farmer cooperatives.[Es] If cooperative membership can be sold with the farm, then the expected future earnings of the cooperative will be capitalized into the value of the farm and the horizon problem will be largely overcome. Such effective salability of cooperative membership could be achieved if the farm were incorporated and the corporation, rather than the farmer who owned it, was the member of the cooperative. A change in the ownership of the corporation, by itself, would not change the corporation's status as a member of the cooperative (Baarda). Similarly, if production quotas or contracts of a processing cooperative are tradeable, then the value of the cooperative will be capitalized into their price, providing de facto salability of membership.

Even if membership in the cooperative cannot be transferred, if the cooperative has a completely open membership policy, then the value of the cooperative will be fully capitalized into the value of the farm. If

membership is not fully open but the probability of gaining membership is higher if one buys the farm of a member (e.g., if the cooperative restricts membership to a certain geographic area), then the discounted value of the cooperative's future earnings will be partially capitalized into the farm's value. If the cooperative, through its competition with IOFs, leads to higher farm product or lower farm input costs in the area, then the present value of the cooperative's future activities also will be partially capitalized into the value of both members' and nonmembers' farms.[20]

The horizon problem also may be attenuated if members derive satisfaction or a higher retirement income from bequeathing a more viable farming operation or structure of agriculture to their heirs or community. For example, if the cooperative permits members to transfer membership intergenerationally within families, older members may be willing to help finance long-term investments in the cooperative even though these members will not directly benefit from the investments. The older members may derive satisfaction from knowing that their heirs will have access to a strong cooperative and may feel as though they are repaying a debt to their predecessors who acted similarly. Such behavior may be reinforced if the retiring members' heirs have agreed to support the retirees in their old age. In this situation, the size of the retirees' *'pension" is dependent on the farms' future financial performance. To the extent that the cooperative, through various socialization processes like member relations programs, can convince members to generalize their "feelings of family" to the entire membership of the cooperative, the horizon problem may be reduced even more. Such a generalization is more likely to occur in small cooperatives where the members know each other well than in organizations with large, diverse memberships.

The'foregoing analysis suggests that the horizon problem may be more serious in cooperatives with the following characteristics:

1. The per-member capital investment in the cooperative is large;

2. The cooperative has a closed membership;

3. Few of the member firms are legally incorporated;

4. The intergenerational transfer of membership within families is prohibited; and

5. The cooperative has a large, diverse membership.[21]

On the other hand, in smaller cooperatives, especially those in which the members have strong ties to one another (e.g., because of a common religion or set of social beliefs) and in which there is a strong tradition of family farming, the horizon problem may pose fewer difficulties.

The preceding discussion implicitly assumed that management faithfully implemented the members' desires. To the extent that management is interested in growth of the cooperative, however, its interests are opposed to those of members seeking to decapitalize the firm. Ironically, if management is successful in pursuing its own goals of growth rather than the

goals of the membership, the manager may act as the guardian of the cooperative's long-term viability. If, as suggested by some authors (e.g., Staatz 1984; Murray 1983a, 1983b, 1983c), management has more leeway to pursue its own goals in large, diversified cooperatives, the importance of the horizon problems in such organizations may be reduced.

Because cooperative certificates generally are not redeemable via a secondary market, many cooperatives in the United States have committed themselves to retiring member equities via equity redemption programs. Such programs partially address the problem of intergenerational transfer of ownership of cooperatives. In addition, if a cooperative redeems its equities on a regular schedule and members are confident that this will continue, then equity redemption may effectively provide a retired member of the cooperative with a pension (at least for a few years) whose payments depend on the financial performance of the cooperative after the member retires. The member therefore has an interest in the long-term viability of the cooperative, which may attenuate the horizon problem.

Systematically retiring member equities places an additional demand on both the cooperative's capital structure and its cash flow. If a stockholder in an IOF redeems his or her ownership right in the IOF via the stock market, the size of the firm's equity remains unchanged; only its ownership changes. Redemption of equities by a cooperative, on the other hand, reduces the firm's equity. As a result, a cooperative that operates a systematic equity redemption program also must systematically acquire new capital from members to maintain the organization% equity structure. Unlike an IOF, which can time the issuance of new stock to coincide with favorable market conditions, the cooperative is forced to obtain additional member capital year-in and year-out, a task that one cooperative manager described as "an onerous obligation.** The difficulty of attracting capital to cooperatives is compounded by the fact that capital contributions are tied to patronage. Therefore, a cooperative usually cannot expand its equity base by simply issuing more stock; it must expand the patronage of current members, attract new members, or obtain additional capital per unit of patronage from current members.

Due to the difficulties of attracting and maintaining capital in a cooperative, managers are under strong pressure to create some form of permanent equity in the firm, for example, through the use of unallocated reserves. Such permanent reserves facilitate long-run planning and give the manager greater flexibility in allocating the firm's resources. This flexibility becomes increasingly important as the membership of the cooperative grows more heterogeneous and different groups within the organization pressure management to respond to their particular interests (Murray 1983a, 1983b).

To the extent that a cooperative systematically retires member equities, equity redemption becomes one of several competing claimants on the firm's cash flow, including:

1. Payments for the firm's inputs purchased from outside the cooperative;

2. Payments for member-supplied inputs;

3. Patronage dividends, in addition to those included in (2);

4. Dividend payments to member capital;

5. Retained earnings;

6. Equity redemption; and

7. Provision of other benefits that are distributed among the members in a manner unrelated to patronage.

Members who have heavily invested in the cooperative and hence have a strong stake in equity redemption (typically older farmers) may therefore find themselves in conflict with "underinvested" members, who prefer that cash flow be devoted to other uses such as increasing raw product prices or lowering input prices. If, as in many agricultural cooperatives, retired farmers are barred from voting, the board may give equity retirement a low priority relative to other uses of cash flow unless these "voiceless" members are successful in bringing outside pressure to bear on the board.[22] Neglect of equity retirement may in turn aggravate the horizon problem.

A common rule for investors in IOFs states, "If you don't like what management is doing, sell your stock." If enough stockholders follow this advice, the value of the stock declines, imposing capital losses on those who bought their stock at a higher price but still hold it. In an effort to recoup those losses or at least avoid further erosion in their asset values, stockholders may coalesce into a bloc that attempts, via a proxy fight, to displace the current management with one more to their liking. Alternatively, outsiders may be tempted to take over the IOF via a tender offer if they believe that the current management is leaving unexploited substantial earning opportunities. In either case, it is not simply the potential of higher future earnings for the firm that induces "renegades*' to try to displace current management. An important added incentive is the knowledge that if the stock market "agrees" with the renegades' analysis, those who initiated the takeover will be rewarded with substantial capital gains, as the market will capitalize the increase in expected future earnings into the value of the stock (Alchian and Demsetz).

Fluctuation in the value of an IOF's stock therefore serves as an important disciplining mechanism on management, indicating the degree of stockholder satisfaction with current managerial policies. Many firms reinforce the potency of this disciplining mechanism by offering stock options to top management, which makes the earnings of these personnel contingent on the stock's value. Tying the manager's earnings to the firm's performance, as judged by the stock market, may thus reduce managerial shirking (Alchian and Demsetz).[23]

The possibility of capturing capital gains or suffering capital losses in the stock market also creates incentives for the development of a specialized market in information about the managerial resources and earnings potential

of publicly traded IOFs. The business press, a consequence of the secondary market for IOF stock, serves as an additional disciplining mechanism on the management of IOFs.

The lack of a secondary market for cooperative stock denies the cooperative these tools for influencing managerial behavior. Cooperative stockholders have no simple indicator like a stock price by which they can evaluate how well management has enhanced the future earnings capacity of their firm. If they evaluate management primarily on the current prices the cooperative charges for its services, the manager may be induced to decapitalize the firm in an attempt to increase current earnings, simply reinforcing the horizon problem.

Denied the stock price and the business press as concise indicators of managerial performance, stockholders in cooperatives have to develop other ways of monitoring managerial behavior, including requiring the board of directors to play a more active role in the firm's affairs. Some of these control mechanisms are discussed later in the section on "democratic control."

The impossibility of benefiting from capital gains in a cooperative also may reduce the incentive to found a cooperative even when the social benefits of doing so exceed the social cost (Shaffer 1982, p. 3). Whereas entrepreneurs who found a successful IOF are rewarded with substantial capital gains as the net worth of the firm increases, the founders of a cooperative cannot benefit from capital gains in the value of the cooperative firm because cooperative stock does not appreciate. Although the creation of the cooperative may substantially improve the profitability of the founders' farm enterprises, these benefits generally are available to all who join the cooperative, not just those who incur the costs of establishing the firm. Therefore, the free-rider problem may reduce individual incentives to start a cooperative even when ample social justification for the cooperative exists. Because of the free-rider problem, there may be a legitimate role for governmental subsidies to encourage the formation of cooperatives.

The Nature of Ownershin in a Cooperative--Much of the preceding analysis suggests that the tying of equity ownership to patronage, the strict limits on dividend payments to equity invested in the cooperative, the distribution of net margins in proportion to patronage, and the lack of a secondary market for cooperative stock combine to result in a fundamentally different concept of ownership in a cooperative than in an IOF (see Shaffer 1983). Indeed, one critic of farmer cooperatives has argued that the term 'cooperative equity capital" is simply "an accounting misnomer for junior, subordinated revolving debt" (Cortopassi).

The view that '*cooperative equity capital" is nothing more than revolving debt implies that there is no true stockholder equity in the organization and raises the question of who really "owns" the cooperative. It is true that except for unallocated reserves, cooperatives rarely have permanent equity; consequently the ownership claim of a cooperative stockholder differs in several ways from that of either a stockholder or a bondholder of an IOF.

Cooperative stock confers a residual claim on the firm's earnings, not in perpetuity, but only as long as the member maintains patronage. It also confers a fixed claim on the firm's cash flow (much like an IOF bond) if the cooperative has committed itself to retiring the equities of "overinvested" members. The residual claim on the firm's earnings usually has very limited transferabililty and, if members are not required to keep their capital contributions in line with patronage, the claim will not be proportionate to investment. The fixed claim on the firm's cash flow is a much less enforceable fixed claim than an IOF debt instrument, such as a bond, because it is subordinate to other cooperative debt instruments and because in most states, cooperatives' boards of directors have the discretion to decide when and if equity certificates are to be retired and what rate of interest, if any, they should earn in the interim (Cobia et al.).

Behavioral Differences Due to Democratic Control

Democratic control of cooperatives has two aspects: limits on voting one's equity (or equivalently, limits on stock ownership) and restrictions on nonmembers serving on the board of directors.

Limits on Voting on the Basis of Equity Ownership--Allocating voting power in a cooperative on a basis other than equity ownership prevents the concentration of nominal political control of the organization in the hands of those who contribute the bulk of the capital. Supporters of cooperatives usually have justified such restrictions on the grounds that they "prevent the domination of capital in the cooperative." This diffusion of political power, however, raises the possibility that a majority of members, who may contribute only a small part of the patronage or capital of the organization, may impose policies that exploit the minority of large patrons (Zusman). The scope for such exploitation is limited by the possibility that large members may withdraw their patronage and take their business elsewhere. Exploitation of the minority by the majority is less feasible where potential market competition is intense (including the possibility of disaffected members setting up their own firms) than where the cooperative holds a secure local monopoly.

Potentially more dangerous is the possibility that the quality of decisionmaking by the board of directors may suffer as a result of this diffusion of political power. If board members believe that they are dependent for their reelection on the mass of small patrons, each of whom has only a small stake in the cooperative's investment decisions, the board may treat those decisions more cavalierly than if voting power were proportional to capital contribution. Limitations on voting one's equity may put nominal control of the cooperative in the hands of those who do not have to bear the full consequences of their decisions, at least in the short run. Again, potential competition limits the extent of such behavior in the long run, as cooperatives that habitually make decisions that alienate members who contribute the majority of patronage and capital to the firm soon lose those members' business. In addition, large patrons may be particularly adept at influencing the board and management through informal channels (Staatz 1984, chap. 6; Bartlett, pp. 130-56).

The diffusion of political power is one reason why coalition building among stockholders usually is much more important in the decisionmaking process of cooperatives than in that of IOFs.[24] Because many of the decisions in cooperatives affect the distribution of income among the members, cooperative stockholders are more likely than their IOF counterparts to seek involvement (e.g., via the board) in deciding a broad range of issues that are considered merely strategic in an IOF. The interests of the members on these issues are seldom homogeneous and, because voting power is not concentrated, simply convincing a few large patrons of the correctness of one's views may be insufficient to ensure that they will prevail.

The need to build coalitions suggests that the transaction costs of reaching decisions may be higher in cooperatives than in IOFs. As a result, cooperatives may be less able to react quickly to market opportunities than are their IOF competitors. Cooperatives that delegate greater decisionmaking authority to management thus may be better able to compete with IOFs, albeit at the cost of less direct member involvement in decisionmaking. In delegating decisionmaking authority to management and the board, cooperative members have to balance the reduction of transaction costs against the risk that management and the board may act contrary to the members' wishes. Because the cost of group decisionmaking is likely to increase with the size and diversity of the group, the proportion of decisions delegated to management and the board probably is higher in large, diverse cooperatives than in small, homogeneous ones.

The diversity of member views and the need to build coalitions suggest that logrolling (tying the negotiation of one issue to another) may play an important role in cooperatives. Given divergent member preferences, logrolling can expand the scope for agreement (Raiffa). It also reduces the predictive power of models of cooperative behavior that assume that members vote on each decision independently.

Limits on Nonstockholders Serving on the Board of Directors--In an effort to ensure "member control," most farmer cooperatives prohibit or severely restrict nonstockholders from serving on the board of directors. This is particularly true of local cooperatives; federated regional cooperatives sometimes permit managers of locals to serve on the board of the regional. In addition, some state cooperative incorporation statutes provide for public representation on cooperative boards.

The board members of a farmer cooperative are users of the firm's services; hence, they bring two sets of concerns to the board: owner concerns and user concerns. Owner concerns revolve around the security and overall profitability of the stockholders' investment in the cooperative. User concerns include issues of product quality and the pricing of member services, which affect the profitability of the cooperative to the individual user. Because of the limitation on dividend payments and the stockholders' inability to capture capital gains in a cooperative, user concerns are likely to attract much of the board's attention. Unlike an IOF board, which functions primarily as a trustee of the stockholders' investment, a cooperative board serves as both a trustee for the investors and a

representative of the firm's patrons, providing an important channel by which user concerns can be conveyed to management.

Because members of the board are users of the firm's services, they may bring to the board some of the technical knowledge about the firm's services and operations that "inside directors" provide in IOFs. If the cooperative's operations are complex or extend far beyond the farm, however, it is likely that farmer directors will lack the expertise in marketing, manufacturing, or retailing that inside and outside directors could provide. This leads to a dilemma in farmer cooperatives: To the extent that farmers participate in leadership roles in the board, they may contribute to poor decisions and hamstring management; to the extent that they do not participate, ownership is separated from control (Helmberger, p. 1431).

Restricting board membership to stockholders limits the pool of potential directors. If board member skills are a scarce commodity, one can well imagine an inverted U-shaped curve relating average effective member control, as exercised through the board, to the number of members in the cooperative. In small cooperatives, the pool of board member talent may be so limited that it is difficult to constitute a board that can effectively monitor managerial behavior. Managers in these small cooperatives may therefore "run the show." As a cooperative becomes larger, the pool of board member talent expands, allowing selection of a board that can play a more active role in the cooperative's decisionmaking. At some point, however, a cooperative may become so large and complex that no part-time board, no matter how talented-, can fully monitor managerial behavior. Management in these large cooperatives may therefore have considerable scope to pursue its own goals.[25]

Cooperative boards of directors not only have a different structure than IOF boards, but for several reasons they also typically play a much more active role in their firm's decisionmaking than do IOF boards. First, as discussed before, cooperative stockholders are intensely interested in issues such as price setting that in an IOF would be left entirely to management. Second, the difficulty in cooperatives of devising simple indicators of managerial performance and automatic incentive systems (such as stock options) leads to the need for greater direct monitoring of managerial behavior by the board. Stockholders in a cooperative are interested in many facets of the firm's performance beyond just net margins. A board that evaluated its manager solely on the basis of net margins would give the manager an incentive to raise the price of member services and run the cooperative as a separate profit center rather than trying to coordinate the cooperative's operations with those of its member firms. Similarly, evaluating the manager's performance based solely on the current price of member services could exacerbate the horizon problem and lead to member conflict over which services should have their prices discounted the most. Rather than focus on any one indicator of the manager's performance, the board has to balance several aspects, which may change as the distribution of power among the membership changes. Doing so requires the board to be more integrally involved in the affairs of the firm than is the board of an IOF.

The lack of a secondary market for cooperative stock makes it difficult for farmers who have a substantial investment in the cooperative to exit the organization. Even if they quit patronizing the cooperative their capital is still committed to the firm. Large patrons' limited ability to exit the organization may lead them to pressure the board to be more directly involved in the affairs of the firm. Because these stockholders cannot discipline the manager by immediately withdrawing their capital from his or her control, they are forced to rely more on member voice to convey their concerns to management (Hirschman). In this process, the board serves as their mouthpiece. Members who have only a small investment in the cooperative, on the other hand, may find exit much easier, particularly if the cooperative has several competitors. Such members may simply leave management of the cooperative to the managers and rely mainly on exit to discipline managers who get out of line.

Conclusions

Cooperative theorists have long debated how the behavior of farmer cooperatives varies from that of IOFs. Much of the theoretical literature begins by hypothesizing a particular objective function for cooperatives and then shows how striving to maximize that function leads to behavior different from that of a profit-maximizing IOF (LeVay). The approach taken in this paper is more structuralist: It argues that, regardless of objective functions, the unique structural characteristics of cooperatives may lead them to behave differently from IOFs.

The structuralist approach is not new. Several authors (e.g., Kravitz) have argued that as farmer cooperatives grow into large corporations, their behavior often becomes indistinguishable from that of IOFs. This paper has shown, however, that structure involves more than just size. The patron-stockholder identity, the distribution of ownership benefits through patronage, and the democratic governance of farmer cooperatives can all lead farmer cooperatives to behave dissimilarly from IOFs. Some of the differences in behavior may be highly beneficial for the cooperative and its members while others may hinder its performance. For example, the flow of information between patrons and the firm may be better in cooperatives than in IOFs, which can lead cooperatives to be more responsive to farmers' needs. On the other hand, cooperative capital may be less mobile than that of IOFs, and there may be serious problems in inducing cooperative stockholders to act in the long-term interest of their firm. As a result of these differences, the roles and behavior of cooperative managers and board members may vary markedly from those of their IOF counterparts.

Not all of the hypotheses raised in this paper are mutually consistent. For example, the paper argued that the limited ability of cooperatives and cooperative stockholders to diversify their investments may lead cooperative decisionmakers to be more risk-averse than decisionmakers in IOFs. On the other hand, the horizon problems may give stockholders incentives to push their cooperatives into reckless price wars in an effort to increase the members' current return from the organization in the form of more favorable short-run member prices. While the paper outlines some of the possible

behavioral differences between farmer cooperatives and IOFs, determining the relative importance of these will require more empirical research.

Notes

1. The frequently mentioned cooperative principle of *'service at cost" is subsumed under this characteristic. How the cooperative defines its costs and the level of those costs are obviously important in determining what *'service at cost" really means. *'Service at cost" does not always mean "service at minimum cost." In practice, some farmer cooperatives also distribute net margins to nonmembers as well as to members. The description in the text refers to an archetypical cooperative.

2. In this paper the term "stock" includes all forms of ownership claims on the cooperative (e.g., retain certificates, revolving fund certificates, and patronage refund certificates), not just common and preferred stock.

3. Peter Vitaliano, in his review of an earlier draft of this paper, stressed the diffuse nature of optimization in a cooperative.

4. See the section "More Diffuse Scope for Optimization: Pooling Issues and Income Distribution."

5. For an analysis of how cooperatives' tax status affects the income of members in different tax brackets, see Schrader and Goldberg, pp. 34-44.

6. Subsidizing the price of production inputs sold to members would not reduce the members' income tax liability because the cheaper inputs would result in higher farm profits.

7. See Staatz, "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives," in this volume.

8. For a discussion of this problem in cooperatives, see Savage.

9. See Staatz, "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives,*' in this volume.

10. This is not to deny that cooperatives sometimes use cross-subsidies to gain market share. For example, many dairy cooperatives use hauling rate subsidies on the fringes of the cooperatives' geographical areas to expand membership. The argument presented here is simply that the scope for cooperatives to use cross-subsidies is much more limited than for IOFs. For a game-theoretic analysis of the limits to cross-subsidization in cooperatives, see Staatz, "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives," in this volume.

11. Although stockholders in a cooperative derive their financial benefits largely through patronage, not from a direct return on investment in the form of dividends and capital gains, it is still legitimate to speak of

a farmer's return on investment in a cooperative. When deciding whether to commit capital to the cooperative, either through initially joining it or through continuing to patronize it (which often requires incremental purchases of cooperative equities, e.g., through per-unit retains), the farmer compares the benefits derived from this use of capital to the benefits derived from investing it elsewhere, such as on the farm. The return on the investment in the cooperative is indirect, being gained through patronage, but it is still a return on capital in the sense that without a commitment of capital, the stockholder cannot receive the benefit. The return on capital, however, also requires a commitment of patronage, and in this sense is different from the return on investment in an IOF. In those cooperatives that extend patronage refunds to nonmembers, the return on the investment required to join the cooperative is limited to the dividend paid on that capital and the other benefits of membership, such as voting rights.

12. Dunn, Ingalsbe, and Armstrong report that in general farmer cooperatives tend to be less diversified than the IOFs with which they compete (p. 245).

V. James Rhodes, in his review of an earlier draft of this paper, pointed out that farmers are reluctant to allow their cooperatives to diversify into businesses unrelated to farming because the farmers' investment in the cooperative is largely sunk. For activities unrelated to farming, the farmers can get the same investment service from an IOF investment firm and have far greater liquidity of investment than they would through a cooperative. Only when the cooperative provides services that strengthen the farming operation and that are not available through IOFs are farmers willing to accept the illiquidity that accompanies investment through a cooperative.

13. Some incentives for dissembling may remain, depending on how the members believe the costs of developing and producing new products will be shared among the members of the cooperative. For example, consider corn farmers who are members of a supply cooperative whose patrons include producers of many different commodities. If the corn farmers believe that because of the cooperative's cost-sharing practices the cost of developing an improved corn herbicide would be borne by all the members, the corn producers have an incentive to overstate their need for such a product because they would have to pay only a fraction of the cost of its development.

14. This section draws heavily on Perraut.

15. The smaller emphasis given to financial expertise among cooperative managers also is due to several other factors. Raising capital in cooperatives is not a specialized activity like in IOFs; it is a byproduct of patronage, which requires favorable pricing, successful member relations, etc. In addition, in many countries, cooperatives raise debt capital through specialized agencies like the Banks for Cooperatives, which often assume many of the financial management functions that in IOF are normally carried out by the firm's management;

hence, cooperatives have less need for financial expertise. In addition, stockholders of cooperatives may put little pressure on management to develop financial expertise because cooperative stock does not appreciate; therefore, the stockholders cannot capture capital gains, the magnitude of which in an IOF often depends on the management's financial prowess.

16. For a proof, see Staatz 1984, p. 91.

17. This assumes that the members act entirely selfishly. Concern about bequeathing a viable farming operation to one's heirs or community may attenuate this conclusion. This is discussed later.

18. For example, the manager of a major agricultural processing cooperative told the author that one board member (who had recently joined the cooperative) had proposed selling one of the cooperative's brand names, which had an estimated market value of $30-$50 million, to an IOF. The member reasoned that the terms of sale could specify that the cooperative would sell its raw agricultural product to the IOF at little reduction in the present field price, and the sale would allow current members to capture the $30-$50 million as current income. Management resisted the suggestion on the grounds that it was unfair to previous members of the cooperative, who, over 65 years, had built up the value of the cooperative's brand name but would not share in the proceeds of the sale.

19. Some of the following points have been discussed by Condon and Vitaliano, pp. 38-42.

20. The higher farm values will reflect only a partial accounting of the cooperative's future activities because if the cooperative's only benefit were to force IOFs to offer farmers more favorable prices, and these prices were available to both members and nonmembers, nobody would have an incentive to maintain their membership in the cooperative; everyone would try to be a free rider. The existence of the cooperative suggests that it offers members appropriable as well as public goods.

21. See the following paragraph for an important qualification to this last statement.

22. For example, pressure from Congress. The increased attention that farmer cooperatives have paid to equity redemption in recent years is partly attributable to calls in Congress for legislation that would have mandated certain levels of redemption if cooperatives had not improved their performance in this area (see U.S. General Accounting Office).

23. Because of imperfect information, however, the stock price often reflects the short-term performance of the firm more than its long-term potential. Consequently, if an IOF relies heavily on the value of its stock to reward or discipline the manager, the firm may create incentives for the manager to emphasize the company's short-run financial performance at the expense of long-term performance. For

example, managers may manipulate current income statements to misrepresent the condition of the firm or concentrate on other strategic actions, such as takeover bids, to increase the stock value in the short run rather than emphasize increasing the firm's long-run productivity. Such behavior can result in these IOFs facing their own type of horizon problem.

24. A possible exception is during proxy fights and tender offers in IOFs, when coalition building among stockholders often becomes critical.

25. The structure of the cooperative (e.g., its complexity) may be more important than size per se in determining the degree of member control. For details, see van Ravenswaay.

References

Alchian, Armen A., and Harold Demsetz. "Production, Information Costs, and Economic Organization." American Economic Review 62(1972):77-95.

Arrow, Kenneth J. Social Choice and Individual Values. New York: John Wiley and Sons, 1951.

Baarda, James R. Personal interview.

Baccigaluppi, Roger [President and CEO of California Almond Growers' Exchange]. Personal interview, Jan. 26, 1982.

Bartlett, Randall. Economic Foundations of Political Power. New York: Free Press, 1973.

Bateman, D. I.; J. R. Edwards; and Clare LeVay. *'Problems of Defining a Cooperative as an Economic Organization." Oxford 8(1979):53-62.

Carson, R. "A Theory of Cooperatives." Canadian Journal of Economics 10(1977):565-89.

Cobia, David W., et al. Eauitv Redemption: Issues and Alternatives for Farmer Cooperatives. Washington, D.C.: USDA ACS Res. Rep. 23, 1982.

Condon, Andrew M., and Peter Vitaliano. "Agency Problems, Residual Claims and Cooperative Enterprise.'* Cooperative Theory Working Pap. 4, Dept. of Agricultural Economics, Virginia Polytechnic Institute and State University, July 1983.

Cortopassi, Dean A. "An Open Letter to Dr. Ray Goldberg Re: 'An Alternative to Cooperatives.'" Stockton, Calif.: Suzy Bel, n.d.

Dunn, John R.; Gene Ingalsbe; and Jack H. Armstrong. *Cooperatives and the Structure of U.S. Agriculture." In Structure Issues of American Agriculture,

pp. 241-48. Washington, D.C.: USDA ESCS Agricultural Economics Rep. 438, 1979.

Eschenburg, Rolf. Ökonomische Theorie der genossenschaftlichen Zussammenarbeit. Tubingen, West Germany: J. C. B. Mohr, 1971.

Furubotn, Eirik G. "The Long-Run Analysis of the Labor-Managed Firm: An Alternative Interpretation." American Economic Review 66(1976):104-23.

Gittinger, J. Price. Economic Analysis of Agricultural Projects. Baltimore: Johns Hopkins University Press for World Bank, 1972.

Heflebower, Richard B. Cooperatives and Mutuals in the Market System. Madison, Wis.: University of Wisconsin Press, 1980.

Helmberger, Peter G. "Future Roles for Agricultural Cooperatives." Journal of Farm Economics 48(1966):1427-35.

Hirschman, Albert 0. Exit, Voice and Loyalty. Cambridge, Mass: Harvard University Press, 1970.

Jensen, Michael C., and William H. Meckling. "The Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." Journal of Financial Economics 3(1974):305-60.

Kaarlehto, Paavo. "On the Economic Nature of Cooperation." Acta Agriculturae Scandinavica 6(1956):243-352.

Kravitz, Linda. Who's Minding the Co-op? A Report on Farmer Control of Farmer Cooperatives. Washington, D.C.: Agribusiness Accountability Project, 1974.

LeVay, Clare. *'Agricultural Co-operative Theory: A Review." Journal of Agricultural Economics 34(1983):1-44.

Lopez, Rigoberto A. and Thomas A. Spreen. "A Conceptual Analysis of Processing Cooperatives." Paper presented at annual meeting of the American Agricultural Economics Association, West Lafayette, Ind., Aug. 1, 1983.

Murray, Gordon C. "Management Strategies for Corporate Control in British Agricultural Co-operatives--Part 1." Agricultural Administration 14(1983a):51-63.

_____. *!Management Strategies for Corporate Control in British Agricultural Co-operatives--Part 2." Agricultural Administration 14(1983b):81-94.

_____. "Towards an Agricultural Co-operative Classification.'* Journal of Agricultural Economics 34(1983c):151-61.

Perraut, Ellis Edward. "A Comparison of Managerial Behavior in Cooperatives and Investor Owned Firms Serving Farmers." Master's Plan B paper, Michigan State University, 1983.

Raiffa, Howard. The Art and Science of Negotiation. Cambridge, Mass.: Belknap Press of Harvard University Press, 1982.

Rhodes, V. James. "Cooperatives and Contestable/Sustainable Markets." In this volume.

Roy, Ewe11 Paul. Cooperatives: Development. Principles and Management, 3rd ed. Danville, Ill.: Interstate Printers and Publishers, 1976.

Savage, Job K. "Comment on 'Economic Nature of the Cooperative Association.'" Journal of Farm Economics 36(1954):529-34.

Schrader, Lee F., and Ray A. Goldberg. Farmers' Cooperatives and Federal Income Taxes. Cambridge, Mass.: Ballinger Publishing Co., 1975.

Shaffer, James D. "Notes for a More Comprehensive Theory of Farmer Owned Cooperative System." Cooperative Theory Working Pap. 1, Dept. of Agricultural Economics, Michigan State University, 1982.

_____. "Notes on Firm Ownership and Control." Cooperative Theory Working Pap. 10, Dept. of Agricultural Economics, Michigan State University, 1983.

Staatz, John M. "The Cooperative as a Coalition: A Game-Theoretic Approach." American Journal of Agricultural Economics 65(1983):1083-89.

_____ "A Theoretical Perspective on the Behavior of Farmers' Cooperatives:' Ph.D. dissertation, Michigan State University, 1984.

_____ "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives:' In this volume.

U.S. General Accounting Office, Comptroller General. Family Farmers Need Cooperatives --But Some Issues Need to Be Resolved. Washington, D.C.: Rep. to Congress CED-79406, July 26, 1979.

van Nostrand, Maurice. "Competition between Cooperatives." In Research on Cooperatives in the 1980s, pp. 85-88. Washington, D.C.: USDA ACS Staff Rep., 1983.

van Ravenswaay, Eileen. "Formal and Substantive Democracy in Cooperatives (Part I)." Cooperative Theory Working Pap. 5, Dept. of Agricultural Economics, Michigan State University, 1982.

Ward, Clement E.; Vernon E. Schneider; and Ramon Lopez. Voting Systems in Agricultural Cooperatives. Washington, D.C.: USDA ACS Coop. Res. Rep. 2, 1979.

Zusman, Pinhas. "Group Choice in an Agricultural Marketing Co-operative." Canadian Journal of Economics 15(1982):220-34.

THINKING ABOUT FARMERS' COOPERATIVES, CONTRACTS, AND ECONOMIC COORDINATION

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In this essay, I am interested in exploring possible roles of farmers' cooperatives in dealing with the fundamental problems of coordinating economic activity in the real world of uncertainty. In a private enterprise economy, coordination takes place across markets and within firms, always, of course, within a set of institutional constraints imposed by governments and custom. Coordination across markets and within firms requires transactions. In both cases, the transactions involve exchanges of claims to benefits and agreements--implicit and explicit contracts. In transactions across markets, explicit prices are central to coordination and contracts tend to be more specific. Transactions within firms involve more general agreements, authority relationships, and implicit prices (i.e., opportunity costs are recognized and dealt with as implicit but contingent prices). Cooperatives represent a third general mode of organizing coordination, combining characteristics of markets and internal (integrated) coordination in ways that are different from either.

The Coordination Problem

In the modern economy, the activities of thousands of people and resources scattered over thousands of miles contribute to producing and distributing a single product such as a loaf of bread. The contributions are made over a period of many years, past contributions being embedded in capital goods, knowledge, institutional structure (including firm organization), and inventories. How to coordinate these contributions, when at each step in the production-distribution sequence information and mechanisms of control are imperfect, is a central economic problem. Production decisions must be made under conditions of uncertainty as to future supplies of inputs and demands for products. The future is inherently uncertain. If information about future input supplies, product demands, and transformation functions were perfect, resources were perfectly mobile and divisible, contracts were perfectly drawn and enforceable, and no firm had power to influence its prices, coordination would be simple. But none of these conditions exists in the real world. Our interest is in mechanisms that effectively coordinate economic activity under real world conditions.

The coordination problem involves at least four levels of aggregation:

1. Coordination within firms (micro-micro coordination).
2. Coordination between individual firms (micro coordination).
3. Coordination of total supply with total demand for commodities or industries at each step in the production-distribution process (macro coordination).

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4. Coordination of aggregate demand with aggregate supply for the economy as a whole (macro-macro coordination).

A theory of coordination needs to address the problems and mechanisms of coordination at each of these levels of aggregation and the interrelationships among the levels. Decisions within firms influence the outcomes of markets, and the prices resulting from market interaction are part of the environment to which firms respond. Price uncertainty is created by uncertainties about future total supplies and demand for inputs and products which are determined by individual firm decisions based on uncertain future prices. Mismatches of aggregate supply and demand similarly affect prices and create price uncertainties. Addressing the economic coordination problem involves examining governance mechanisms at all levels. Cooperatives are one of these mechanisms of coordination.

Integration and Coordination

Before turning to the central question of the potential roles of farmers' cooperatives and relating the roles of cooperatives to the characteristics of markets and transactions, it will be useful to briefly discuss integration in general. Vertical integration is defined as coordinating technically separable activities in the vertical sequence of production and distributing products under the control of an organization by ownership. The incentives for vertical integration include: reducing the costs or problems involved in transactions across markets; costs of search, negotiation, and monitoring; and problems of uncertainty, impacted information, opportunism, and externalities, as discussed in the previous section, and capturing economies of scale in allocating lumpy inputs over a set of activities. Integration also may take place to achieve growth goals of management, as an investment by firms with accumulated funds or by mistake.

Horizontal integration involves combining within an organization multiple production-distribution systems that are technically separable for the same product. Examples are two processing lines or two plants to make tomato paste. Incentives for horizontal integration include potential improvement in the match of supply with demand (macro coordination), potential market power, and generally improved ability to control the environment associated with size and economies of scale.

Scope integration involves combining within one organization the production-distribution of multiple products or services that are technically separable. The conglomerate firm producing butter and lamp shades is an example. Incentives for scope integration include potential of economic power and possible economies of scale, especially in selling. Limited coordination benefits are apparent from scope integration per se. Large conglomerate firms may have the capacity to influence system coordination through the exercise of political and economic power, especially by the use of advertising and merchandising to improve the match between supply and demand.

What then limits the extent of integration? Or what determines how a subsector or economy is organized, its combination of integration and the markets coordinating its economic activity? Given the incentives for integration and the related problems of coordination across markets, why do markets in intermediary products and services persist?[1]

Organizations require bureaucracies, and the larger and more diverse the functions of the organization, the larger and more complex the bureaucracy. Participants in an organization have their own interests and perceptions that may not be congruent with the owners. Organizations have internal transactions costs. Information may be impacted; behavior may be opportunistic, etc. Valuing inputs and allocating overhead costs is difficult and subject to internal political pressure. Organizational slack develops. The incentive to expend effort and pay attention to details and opportunities is generally less in large organizations than for individuals and small firms which are more directly subject to the immediate discipline of a market.

Substantial economies of scale exist in producing particular inputs. It may be less expensive and less risky to acquire inputs across a market than to produce them. A food processor, for example, would have to be very large to achieve economies of scale from ownership of a steel plant to produce the raw material for tin cans. And acquiring a steel plant for such purposes would reduce flexibility and add risk associated with changing preferences and technology for food packaging. The risks would be less for a specialized steelmaker supplying a diverse set of firms. To achieve economies of scale in the production of all inputs used in processing would require a huge, diverse organization with all of the problems of a huge complex bureaucracy.

Capital constraint is an issue. Generating capital internally is a slow process, and investors, to reduce risks, seek to diversify their investments. Managements of very large organizations are capable of making very large mistakes. Integrating into an unfamiliar business has significant costs and risks. Lack of knowledge is a significant barrier to entry as the large number of divestitures indicates. Finally, there is a political constraint on the accumulation of market power.

Farmers' Cooperatives and Integration

A farmers' cooperative consists of an association of farmer patrons, democratically governed, that owns one or more firms from which member-patrons receive benefits (or incur costs) based on patronage rather than stock ownership. The distinction between the cooperative association and the firms owned by the association is an important one.[2] The cooperative appears to be horizontally integrated among members and vertically integrated between members and the firms owned by the cooperative association. However, this is an illusion.

The cooperative association is not a horizontal integration of its members' firms. The member firms are independently owned, represent independent profit centers, and act independently except as they have agreed to own a

firm(s) jointly or have negotiated agreements to act collectively. The association has the potential to affect horizontal coordination, as in the case of a bargaining cooperative, but market power requires a mechanism of collective action to control the purchase or production decisions of independent members.

Nor does a cooperative represent vertical integration between member firms and the patron-owned firm (POF).[3] The members own the POF, but the members remain independent. Neither the association nor the management of the POF control the member farm firms.

Integration within a firm is very different than the relationship between members and their cooperatives. The failure to recognize this difference seems to be a source of confusion among some who attempt to treat a cooperative as an integration of members' firms in applying antitrust laws or in considering the undue price enhancement provision of the Capper-Volstead Act. The cooperative is a third mode of organizing coordination.

Integration usually is defined by ownership. However, ownership through stock ownership of an investor-owned firm (IOF) or membership in a cooperative does not translate directly into control. The separation of ownership and control is a topic with a large literature in economics. The ownership of a firm by the association of members does not imply control by individual members any more than ownership of shares of an IOF implies control of an IOF. In this respect, integration between the member firms and their jointly-owned firm differs from integration within a firm.

The POF is a bureaucratic organization that carries out functions under the direction of a management appointed by a board representing the association. As with any firm, the employees have interests and perceptions of their own which are not completely congruent with those of the owners. And in contrast to an IOF, where owners have a common objective of achieving profits, the owners of a cooperative have divergent interests that reduce the capacity of the board to represent the interests of particular member-owners.[4]

Owners of an IOF influence the firm through the board of directors and by buying and selling stocks. The market for stocks is a major disciplinary force for the IOF, a force that is absent for the cooperative (Staatz, pp. 368-69). The owners of a cooperative firm, in contrast, influence or discipline management through political processes, through purchase of stocks, through joining or exiting the cooperative, and through patronage of the firm. This difference in disciplinary mechanisms is important in analyzing the differences in potential performance of IOFs and cooperatives.

The relationship between members and their cooperative most resembles a contingency contract in market coordination (Staatz, pp. 187-89). Transaction terms are not fixed but are contingent on the patronage rebate, which is influenced by the performance of the firm and extent of patronage. Coordination between members and their cooperative's firm also are influenced by the terms of the membership agreement, which in effect becomes part of the

contingency contract. The explicit and implicit terms of the contract are critical to the performance of the coordination function. More about this later.

Consider the difference between a farmers' cooperative and an IOF owning both the cooperative's firm and the farms of the members. The coordinating transactions would be quite different. The latter would be conducted through bureaucratic relationships, and the former would be similar to those across markets, but with the added potential of the patrons influencing the firm's performance through an elected board. IOFs have integrated farming with farm supply and product marketing, but this integration generally has been limited to small scale. Large-scale integration of these functions has been limited by several factors. Farming is very capital intensive. To acquire the capital necessary for both the farms and, for example, a facility large enough to achieve economies of scale would require a very large investment and involve considerable more risk relative to payoff compared to alternative investments of comparable size. While farms tend to be specialized, there are complementary enterprises; a farmer can combine farming with nonfarm activities. Expanding the scope of the firm to take advantage of complementarities in farming would complicate the bureaucratic problems. More importantly, bureaucratic coordination on a large scale is difficult in farming because of geographic dispersion and the importance of paying attention to details on a day-to-day basis. An employee in a large bureaucracy is not likely to have the same incentives to attend to details and expend effort as an independent farmer whose rewards are immediately related to performance. Generally, a decentralized organization of farming coordinated across markets or through cooperatives has significant advantages over large-scale integration. An important question is the potential advantages of cooperative organization compared with coordination strictly across markets.[5]

The extent of integration of a POF is a different matter. Should a farm supply POF vertically integrate into feed manufacturing or horizontally integrate by acquiring multiple retail outlets? Should a marketing POF vertically integrate into processing or retailing or horizontally integrate by acquiring multiple processing plants? Should a POF integrate in regard to scope by extending ownership to unrelated activities such as building motels? The incentives and limitations of integration are similar for the POF and for IOFs except that to the extent that the firm's objective function is to provide benefits to members related to patronage rather than profits to the firm and that members influence management decisions, a POF will be different than an IOF. Cooperatives are less likely to integrate into unrelated activities or into products that compete with products of members and are more likely to integrate into activities that expand markets for members' products (Staatz, pp. 70-73). Absent effective member control, the POF might be indistinguishable from an IOF in regard to integration propensities except that it operates under a more limited access to capital for expansion.

Two additional modes of organizing coordination will simply be mentioned. Joint ventures between a cooperative and an IOF are an example of coordination across a private treaty market using a contingency contract.

This is similar to integration; performance depends on the detailed provisions of the agreement.

A group of farmers may choose to organize a farm supply or product marketing firm as an IOF, returning benefits to the owners based on some combination of return to capital and patronage and relating voting rights to stock ownership rather than one-member/one-vote. A comparison of such organizations with pure cooperatives and IOFs deserves attention, but it is beyond the scope of this brief essay, except to say that such organizations may have advantages in particular situations.

The explanation for the evolution of the mix of modes of coordination is indeed complex. Comparative performance of alternative modes does not suffice to explain it. At least two additional factors deserve mention. A particular mode of coordination may develop based on inaccurate expectations. Performance of new organizations always is very uncertain. Once a mistake is made, future options are changed. Organizations have a tendency to persist. Similarly, legal advantages and disadvantages may favor one of the modes. It is not valid to assume that whatever pattern of organization evolves will provide the most effective coordination.

Also, there may be a systematic advantage in initiating IOFs compared to cooperatives as coordinating modes because of the greater potential rewards to the initiating entrepreneur. This advantage derives from the fact that benefits from the successful IOF are reflected in the value and dividends of stock that can be captured by the entrepreneur through stock ownership, while no comparable benefits are available from establishing a cooperative. Thus, just the fact that a cooperative is a superior method of coordinating economic activity in terms of transactions costs, etc., does not necessarily lead to the establishment of a cooperative. This does not address the question of comparative transaction costs in establishing these alternatives, which may be substantial and deserving of empirical investigation.

Some Implications of Characteristics of Markets and Transactions

To say that transactions across markets, between members and the POF, and within firms are alternative modes of organizing economic coordination is a simplification. Markets, cooperatives, and IOFs come in great varieties. They adapt to different environments, they adopt different structures and standard operating procedures (SOPs), and these variations influence their coordinating performance.

To think somewhat systematically about markets and cooperatives as alternative modes of coordination, I have identified twelve characteristics of markets, prices, or transactions that seem to me to be particularly relevant to coordination. I briefly discuss the relationship of each to market and cooperatively organized coordination.

It is assumed that the world is uncertain, that participants attempt to reduce this uncertainty for themselves by controlling aspects of their

environment, including influencing the terms of trade, that they seek to reduce transactions costs, and that these motives influence the mode of coordination. I do not assume the counterfactual characteristics of the "perfect" market or accept it as a norm against which other modes or organization are judged. In a world meeting the conditions of the perfect market, a comparison among markets and cooperatives would be irrelevant because performance would be essentially the same with or without cooperatives. However, this comparison is relevant in the real world of uncertainty, transactions costs, bounded rationality, opportunistic behavior, impacted information, externalities, differentiated products, endogenous preferences, lumpy inputs, fixed assets, economies of scale and scope, differential power, and sticky prices. Such characteristics of real world economies complicate the problem of coordination, and they need to be taken into account in comparing alternative coordinating institutions.

Contracts

Explicit and implicit contracts are particularly important in determining coordination performance. Transactions involve contracts or agreements of enormous variety and *complexity, which makes generalization about coordinating mechanisms difficult. Williamson discusses three classes of contracts that have relevance for coordination (Williamson, pp. 233-61). In classical contracting, "... all relevant future contingencies pertaining to the supply of a good or service are described and discounted with respect to both likelihood and futurity" (p. 236). Relationships between the transacting parties other than specified by the agreement are considered irrelevant, and the contract is relatively easy to enforce by legal authority. This type of contracting describes the usual relationship in spot auction markets and is apparently assumed in the perfectly competitive market of economic theory.

Long-term contracting under conditions of uncertainty may be impossible under the classical scheme because complete specification of contingencies would be prohibitively expensive or impossible. This gives rise to neoclassical contracting, which allows some flexibility in the agreement and sets up a process for resolving disputes and evaluating each party's performance with respect to contract provisions. An agreed-upon procedure and third-party arbitrator is more flexible and less expensive than litigation. Pressures to sustain long-term relations involving many transactions has led to what Williamson calls relational contracting, where an array of norms beyond those centered on the exchange come into play in governing the transactions. Contingencies unspecified by contract are settled without conflict based on a more general code and the desire to continue the relationship.

Thinking of contracting in these terms suggests that the distinction between transactions across markets and within firms is not clear-cut. Transactions among employees or units within a firm are difficult to distinguish from relational or even neoclassical contracting. Agency theory is enlightening in this respect as it describes a firm more or less as a contract system. Production contracting in farming as, for example, in the case of broilers, seems closer to governance within a firm than coordination across a spot market. This suggests that more attention needs to be paid to the nature of

contractual relations while avoiding overgeneralization about the differences between transactions within firms and across markets.

In situations that benefit from neoclassical or relational contracting, the owner-patron relationship that characterizes the cooperative seems to provide the potential for advantages in coordination for cooperatives over IOFs. Whether these potentials are realized depends on the SOPs adopted by a cooperative. Because the transaction between an individual member and the cooperative always is contingent on the performance of the cooperative, it is never as simple as is implied by classical contracting. The potential for improved coordination performance through the design of the implicit contracts between members and their cooperatives is an important area for analysis. Some ideas along this line are included in the discussion that follows.

Types of Markets

In thinking about coordination across markets, I find it useful to differentiate six general types of markets. Of major importance for coordination effectiveness is the difference between spot markets, which deal in goods already produced, and forward contract markets, which deal in promises to deliver goods or services in the future. Transactions in goods already produced or in forward contracts can be across markets characterized as auctions, posted price, or private treaty, which yield the six types of markets. Each of these types of markets produces different information and incentives, involves different transactions costs, and thus influences the effectiveness of coordination. To understand the possible roles of cooperatives in coordination, it would be instructive to compare alternative ways of instituting transactions between members and their POF and each of these types of markets. I have suggested some of these comparisons in the following discussion of characteristics of markets and transactions, but they do not constitute the complete and systematic analysis the topic deserves.

What follows is a brief discussion of each of twelve characteristics of markets and transactions that seem to me to be particularly important in influencing the effectiveness of coordination along with brief comments about the possible implications for cooperatives' roles in coordination. My purpose in this section is the narrow one of identifying potential functions or roles for cooperatives, responses they could make to characteristics of markets, and transactions involving problems in coordination. It is not intended to be a comprehensive evaluation of cooperatives' effectiveness in these roles or a comparison between cooperatives and alternative modes of coordination.

Twelve Characteristics:

1. The point of time in the production-distribution sequence when terms of trade are determined. Predictable terms of trade facilitate planning and coordination. Errors in expectations result in errors in planning--too much or too little is invested, produced, distributed, and stored. Within limits, markets in contracts can result in predictable terms of trade, at least for the participants. The length of the contract relative to the length of the

production planning is critical. For example, contracts for hogs longer than the gestation period would reduce errors in planning the number of hogs to breed but would not solve the problem of planning investments in confinement housing that might have a useful life of 20 years. A 20-year contract in an otherwise uncertain world would create added planning problems and risks for the buyer.

Most market transactions in the food system entail immediate or very short-term delivery, thus providing little contribution to planning. Auction markets in contracts are very rare. Most markets in contracts are private treaty markets.

Cooperatives --Cooperatives usually do not have formal contracts specifying future purchases from, or delivery of, products or commodities to their patrons. However, SOPs of the cooperative may offer what amounts to an implicit contract.[6] For example, marketing and processing cooperatives may offer what amounts to a negotiated contingency agreement to accept all that members deliver with specified bonuses and discounts associated with product characteristics and delivery dates. Most importantly, the cooperative guarantees the existence of a market, which reduces the risk of investment and the vulnerability to loss of asset value due to opportunistic behavior by an investor-owned processor (Staatz, pp. 164-67). A cooperative cannot offer a guaranteed price because the price received by a member must depend on the performance of the cooperative, although the cooperative could offer improved price expectations by contracting with its buyers or by hedging on the futures market. The pooling arrangement also may affect price expectations, reducing price variability (Staatz, pp. 189-92).

A cooperative capable of attracting members who produce a large part of the total production of a commodity could facilitate matching supply with demand through binding contracts with members and forward delivery contracts with buyers. Such contracts would necessarily involve contingencies that might be difficult to specify in detail. Here a question is whether the cooperative could provide effective relational contracting. Such contracting would depend on developing trust among members and buyers.

2 The flexibility of prices. The relative flexibility or stickiness of prices is a critical factor in coordination and involves complex relationships. Planning is facilitated by predictable prices and predictability is enhanced by reduced variability. However, in an uncertain world, plans are seldom fulfilled. Yields, competitors' production plans, demand, etc., are not perfectly predicted. Once products are produced, flexible prices are needed to direct these products to their best uses. Market systems vary substantially in the way these two apparently incompatible needs for coordination are reconciled.

Auction markets for immediate delivery with large numbers on both sides of the market provide very flexible prices, adjusting minute to minute to changes in supply or demand and to information about conditions. They are excellent institutions for allocating products already produced, but their volatile prices make planning difficult. Both posted price markets and private treaty markets tend to result in sticky prices, which adjust slowly

to changing conditions. Transactions costs influence the type of market developed at different stages in the food system. For example, posted prices at retail reduce transactions costs, while auctions offer low transactions cost where large quantities of standardized products are exchanged at wholesale levels. Private treaty markets tend to develop where product characteristics are variable and where characteristics are important to a specified user. Contract markets tend to be private treaty, although auctions in contracts are feasible.

A major coordination problem in the food system is created by the mix of types of markets. Posted price markets at retail and private treaty for labor, the largest input in the food system, create sticky prices, requiring greater adjustment in first-handler markets for farm products, increasing the volatility of prices in these markets, 'and thus making planning more difficult and imposing adjustment costs on farmers.

Cooperatives --As previously stated, cooperatives have limited capacity to guarantee forward prices. However, they have the potential to influence production plans through providing information to members, contracting with members, and to influence downstream participants through collective bargaining, contracting, and promotion. As previously suggested, a cooperative representing a large portion of production could improve the match of aggregate production and demand, thus contributing to price stability and coordination.

A patron-owned processor may have a competitive advantage in product markets derived from the contingency nature of raw product transactions with its members. An IOF offering fixed prices either on a spot or forward contract market may assume considerable risk due to uncertain future prices. In a cooperative, members assume this risk and the price of the raw product is more like an internal transfer price than a transaction across a market. Investor-owned processors sometimes attempt to shed this risk by making raw product prices contingent on prices received for finished products. Farmers, however, are reluctant to accept such contracts partly because of their concern about opportunism. Whether growers benefit from the contingent prices of the POF depends on the astuteness of management and the risk premium built into the fixed prices of investor-owned processors. [7]

3 Thinness. A thin market is characterized by a small number of transactions or a very limited capacity to absorb variations in deliveries. An open auction market may be thinly traded because most of the trading in the commodity bypasses the market as private treaty transactions, which may in turn be tied to the auction market quotation. In this case, the problem is the representativeness of the auction market quotations. Much of the information about supplies and demand is obscured by the private treaty transactions, and chance variations in the quantities crossing the auction market may result in price variations unrelated to the quantities actively marketed. Livestock markets with large volumes of direct packer deliveries and eggs are examples.

A second example is markets with limited capacity to absorb day-to-day variations in quantities delivered. City markets in perishable fruits and

vegetables are a specific example. In such markets, two or three too many loads of a particular commodity delivered on a particular day may result in prices below the costs of transporting the commodity to market. Prices can be highly volatile and unpredictable. Improved coordination involves some mechanism for managing the day-to-day flow to market.

Cooperatives--Farmers' cooperatives have several possible roles in improving coordination in thin markets. A cooperative could provide information about private treaty transactions to its members, assisting them in private treaty negotiations. This information would be useful in tying the dispersed private treaty transactions to the auction market. Improving the information on transactions outside the auction should make the auction price more representative of supply-demand conditions. A cooperative would have potential advantages in gaining reliable information compared with a governmental agency or private firm if it were able to generate a sense of community among its members. An additional step would be for members to institute an iterative process of announcing intentions with an agreement among themselves to produce quantities consistent with their final intentions. The iteration procedure would provide the members with information about the aggregate intentions of the group. More effective would be a marketing cooperative that could control the flow of members' products to and among markets. A pooling agreement could further reduce the risks to members under some circumstances.[8]

The success of such a cooperative depends on the market share of the cooperative; the closer to 100 percent, the more effective the cooperative. Because the benefits would tend to accrue to all market participants, the free-rider problem is significant. A cooperative acquiring raw products from members where the product is traded in a thin market, with or without a large share of the market, has a problem in assigning a value to members' products.[9] Thus special attention to the terms of the implicit contingency contract is required in regard to pooling and the assignment of overhead costs.

4 Transparency The transparency of a market refers to the extent to which the terms of all'transactions are open to observation by all potential participants in the market. Open auction markets are transparent to those present, but for those not present, transparency depends on the accuracy and extent of market news reporting. Posted price markets appear to be transparent, but appearance may be deceptive if individual deals are negotiated and if qualities are uncertain. Also, the cost of search reduces transparency in a dispersed market. Private treaty markets are not open to observation without systematic market information reporting. The absence of transparency clearly hinders coordination, increasing transaction costs, uncertainty, and errors in resource allocations.

Cooperatives --Cooperatives may provide an information service where transparency is lacking. Bargaining cooperatives may be used to counteract the lack of open information in private treaty markets. Impacted information may coexist with private treaty markets. Private treaty transactions may involve complex contracts. A cooperative could provide not only information on contract terms and legal advice, but also standardized contracts.

Improved information may be one of the most important outcomes of bargaining, contributing to more effective coordination.

5. Specification. **Specification** coordination refers to: (1) the extent to which characteristics of the product or service transferred across a market are known to the parties and (2) the extent to which preferences about characteristics and costs associated with particular characteristics are communicated between potential participants in the market.

A product or service typically has a large number of characteristics or attributes that add to, or reduce, the desirability of the product in a variety of different uses. The combination of characteristics incorporated in a product affect its cost. The number of identical products produced by a particular producer affects cost as well; economies of scale are related to the size of production runs. Matching characteristics produced with consumer preferences is a horrendous problem fraught with uncertainty (Shaffer; Hirschman).

Spot markets deal in products already produced. Producers selling in these markets have to speculate not only about the bundle of characteristics desired by potential buyers, but also about the products likely to be presented by other suppliers that will affect the demand for their products. The market feeds back information to producers in the form of prices in the case of auction markets and the amount of sales at different prices in posted price markets. Auction markets tend to provide more immediate and more discriminating information than posted price markets, but in both cases the quality of the information is very limited and uncertain. To which of the many characteristics were buyers responding? Was the price or volume of sales related to a particular quality characteristic or to other factors? In spot markets, buyers can respond only to product characteristics presented. The response does not reveal preferences for products with different bundles of characteristics than those currently entering the market. Buyers typically have little incentive to communicate information about more desirable characteristics. The buyer does not know the production possibilities for different bundles of characteristics. Some characteristics of products cannot be observed, and buyers may base their purchases on false expectations, thus sending false messages across the market. That is, a purchase may be taken as an expression of preference for future products of the same characteristics but may have no such meaning.

Research to acquire purchasers' preference information can provide valuable information about desired characteristics, but it also involves uncertainty in translating responses to a limited set of hypothetical questions to the market situation. Such research is often expensive and of limited value to the sponsor because success can be copied without incurring the cost of the research.

The problem of communicating information about des‘ired product characteristics, of course, is complicated in an industrial food system by the fact that many different firms are involved in producing and distributing a single product. The bureaucracies of processing or distribution firms may not have the incentive or capacity to transmit needed information to their

suppliers. An error in the design of a container, for example, can affect the demand for, and the price of, the product in the container.

Consumer and producer markets, of course, are quite different with respect to scale of transactions and have different economics with respect to transactions costs. The posted price market of the large retail store involve very low transactions cost compared to those of a private treaty or auction market performing the retail function. For producers' goods, private treaty and auctions markets offer feasible transaction costs and contracting becomes feasible.[10]

Contracting for a good prior to major production decisions that fix the quantity or characteristics of the good offers a far different potential for product characteristic coordination. In private treaty transactions, contracts can specify product characteristics in detail. The nature of private treaty transactions permits exploration of quality production possibilities and costs. The potential for an information-rich transaction may be restricted by the bilateral negotiating game, however, because each party may perceive it to be in its interest to restrict or distort information.

Contracts also may be exchanged across posted price and auction markets. A processor may, for example, offer a standard contract to farmers on a take-it-or-leave-it basis. The benefits of the exchange of information are lost. Auction markets in contracts with expectation of delivery are rare. Such contracts would necessarily be less variable in product specification than would private treaty transactions, but with modern communications and computers they could, through an iterative process, provide substantial variability in specification and keep the advantages of a large number of participants in an open market.

Cooperatives--In general, the members and management of a cooperative have more incentive to communicate product characteristics information than is common across markets. Members have an incentive to express their preferences, needs, and advice about products and services. Management could be expected to be more responsive to patron-owners than to patrons, especially if the board is successful in establishing an ideology emphasizing service to members as the objective of the POF. Impacted information should be less of a problem than it is in other markets. In Hirschman's terms, the voice option is more likely to be exercised and it is more likely to be effective than for an IOF patron relationship (Hirschman).[11] Nonetheless, costs are involved in exercising voice, members may not see or value the improved performance of the cooperative, and the bureaucracy of the POF may not respond to the potential benefits. Improved coordination through improved specification communication is a potential, not a certainty.

Forward contracting may have substantial potential for improving specification coordination. It is curious that the practice is not more common among cooperatives. Contracts for farm inputs with highly specific characteristics could be handled by supply cooperatives without the risk of stocking inputs that do not meet patrons' preferences, and the search costs to patrons could be reduced. Similarly, contracts between members and a

marketing cooperative could, within the limits of uncertain farm production, improve the match between supply and demand in respect to characteristics.

While an individual farmer cannot afford to do consumer preference research related to characteristics of farm commodities, it may be feasible for a large cooperative to do such research on behalf of its members. An investor-owned marketing agency has little incentive to do such research because it cannot capture the benefits which accrue to farmers. The investor-owned processor is not interested in a particular farm commodity but in its own products. At the same time, marketing cooperatives may be less oriented to consumer preferences because of fixed assets and members' preferences to continue producing commodities with specific characteristics.

6. Contingencies and settlement. What is traded in markets are promises and* rights to goods and services. The transaction usually involves some degree of uncertainty. The promises (contracts) involve contingencies. Effective coordination across markets requires the definition of contingencies and a process for settling in case of failure to meet the terms of the promise. Because a great many uncertainties exist, contracts usually are incomplete and the settlement process becomes important. Aspects of contracts are implicit or recognized by custom. Where the contingencies are complex and uncertain and enforcement difficult and expensive, the market may be an inappropriate coordinating mechanism.

In a spot market, the time between transaction and delivery is short and the promise is to deliver the product as it appears to be. Of course, not all product characteristics are observable. There is, for example, a promise that a fertilizer or pesticide is formulated according to description. There may be an implied warranty that if the product is not as represented, damages may be due. But costs of settlement may be high. The classical system of contracting prevails.

In long-distance trading, exchange is by description with contingencies associated with failure to deliver or accept a shipment. If trading partners behave opportunistically, that is with guile or trickery, transactions costs increase, inhibiting market exchange. Trading may be facilitated by a neoclassical approach to contracting, including the use of third-party inspection and arbitration.

Additional problems arise when trading is in contractsfor goods not yet produced. Because of uncertainties, contingencies must be included in the contracts. The longer the contract period, the more uncertainty and the more important the contingency clauses become. Effective coordination would be served by specifying product characteristics, quantities, terms of trade, timing of delivery, etc. However, many factors beyond the control of the parties affect the ability to meet the terms of a very specific contract. The effects of uncertainty can be mitigated by schedules of bonuses and penalties attached to specific provisions of the contract. Contract prices may be tied to prices in another market, or prices may be established by a formula involving aggregate supply of, and demand for, the product and close substitutes. Skill in contingency contracting is therefore important to effective coordination. As the problems of settling contingencies in

transactions across markets increase, relational contracting, or at the least sophisticated neoclassical contracting, may be required for effective coordination. Bounded rationality and opportunism become more important obstacles to transactions across markets.

Cooperatives--Trading transactions between members and their POF always are contingent on the performance of the cooperative and the SOPs that affect terms of trade and settlement.

SOPs are of great importance in distributing benefits among members and in attracting patronage, which in turn affects the performance of the cooperative (Staatz).

The contingency nature of transactions differentiates the transactions between members and their POF from the usual transaction across markets.[12] In a processing POF, for example, the uncertainty of future finished product prices remains, at least in part, with the individual member, in contrast to the risk being shifted to the buyer, as takes place in the usual auction or posted price market. The extent to which the uncertainty remains with an individual member or is shared by all members depends on pooling and dividend SOPS. At the same time, the transaction differs from a transaction within a firm.

f i r m , a n d price plays a more important coordinating role. The transactions have the characteristics of relational contracting. That is, a set of norms and procedures that are not explicitly included in the transaction agreement come to be mutually acceptable for settling contingencies. A comparison of the cooperative with relational contracting across markets would be instructive.

The cooperative may miss opportunities to improve coordination by failing to have more explicit contracts with its members. The cooperative's performance may depend on the delivery or purchase of predictable quantities, for example. A system of forward delivery contract transactions conceivably could improve the coordination of supply and demand in agricultural production and distribution. Settlement of contingencies would be an important problem in such a system. Could a cooperative organize such a system with specific supply agreements with members and relational contracting with buyers?

7 Personal relationship and trust. as t, indifferent and indiscriminate among customers. This ly is the case in spot markets for highly standardized commodities. However, when exchange involves products with characteristics that are not observable, contracts are incomplete, difficult to enforce, and contain contingencies related to uncertainty. In such a situation, discrimination among trading partners becomes important to participants and to effective coordination. Trust greatly facilitates trade and reduces transactions costs. Knowledge of the producers often carries information about product

characteristics as well as information about the difficulty of settling contract disputes and reliability of fulfilling the implicit and explicit terms of contracts. Opportunism and fear of opportunism restrict contractual agreements. A general lack of trust in an economy leads to more transactions in private treaty markets, barriers to entry, and restricted exchange, limiting the potential benefits from both specialization and scale economies. Relational contracting, especially, relies on trust.

Cooperatives --Trust can make or break a cooperative. Because of the contingent nature of trading transactions, a farmer must have faith that the board and management will provide a fair and honest settlement of the implicit agreement. Otherwise he or she will not participate. On the other hand, where contingency contracting is important to effective coordination, a cooperative may have an advantage over market transactions because the member has access to political influence and information inside the organization as well as market-like influences. Access to information about the internal accounts is critical to contingency contracting where the contingency involves gross margins or finished product prices, for example.

Trust in a cooperative may be related to the size of the organization because a member may perceive that his or her political influence and access to information would be nil in a very large cooperative. Trust may be enhanced by successfully establishing an ideology of service to members within the cooperative's firm and by providing information to members.

A cooperative is not immune from opportunistic behavior by members or employees. In some instances, an IOF may be more effective in dealing with opportunism than a cooperative because of the greater reluctance to impose sanctions on a member-owner than on an ordinary trading partner.

8. Frequency of transactions. Uncertainty and the potential for opportunism increase when long-term contracting is needed to facilitate coordination. An opportunistic participant is disciplined when he or she depends on repeated transactions; the dissatisfied customer does not return as long as he or she has an alternative. In the case of frequent transactions, learning takes place and search effort can be spread over a number of transactions. Relational contracting is fostered by repeated transactions.

Cooperatives --A cooperative may be a desirable alternative to a market for farmers where the goods or services provided involve infrequent but repeated transactions for a particular farmer, especially where a nonstandardized product is involved. The cooperative would act as the farmer's agent, thus reducing search costs and uncertainty.

Axelrod provides an interesting insight into the relationship between repeated transactions and cooperation, defined narrowly as not defecting in a prisoner's dilemma, which is similar to not behaving opportunistically. A critical factor promoting cooperation is the fact that a subsequent transaction is expected. If the current transaction is the last, defection is likely. This suggests that cooperative policy promoting continued patronage by members, including barriers to exit, would discourage opportunistic behavior and facilitate contingency contracting under

uncertainty. It also suggests that such cooperatives might have an advantage over markets in coordination requiring future delivery agreements.

9. Asset specificity. A particularly difficult coordination problem arises when transactions involve assets that are highly specific to those transactions. Once made, the value of the asset depends on its supplying goods and services for a particular user, or its value may depend on the continued availability of the supply of particular inputs. Without alternative uses, the salvage value of the asset is low compared to its acquisition price. The investment may be in specialized plant and equipment or in specialized skills.

Take, for example, the case of a tree fruit useful only for processing that can be transported only a short distance without loss of qualities desired for processing. At the same time, processing it requires specialized facilities that would have little value in alternative uses once they are fixed in a particular location. Not only is the farm investment in trees large, specialized, fixed, and long-term, but specialized equipment and skills also are required. Before making such investments, farmers would want an assured market at prices sufficient to provide a return on the investment. A prospective processor, at the same time, would want an assured supply at prices it could afford to pay based on prices it can get for the processed product. The solution is either some form of vertical integration or long-term contracts without which the investments are not likely to be made. If they are not made, the economic opportunity will remain unexploited, depriving participants of potential profits and consumers of a desirable product. If either the growers or processor are expected to behave opportunistically, contracting is not likely to be acceptable. The processor, for example, may have an incentive to encourage excess capacity in growing to assure supplies in years when output may be reduced due to weather, etc. Thus the contract would need to deal with both price and quantity. But guaranteeing both price and quantity makes the processor highly vulnerable to changes in demand for its product. A means of sharing the risk is needed. Complex contracting with trust and enforcement mechanisms seems essential.

Now assume that either the growers have alternative markets or the processor has alternative uses for its facilities. Contract enforcement would be more important and difficult. By behaving opportunistically, the trading partner with the alternatives could extract the value of the fixed assets of the other partner (Staatz, pp. 164-70). While these may be extreme examples, a great number of examples of transactions involving assets that are fixed and specialized in varying degrees exist in intermediate markets in the food system.

Cooperatives --The cooperative mode of coordination is particularly adapted to deal with the problem of asset specificity. Because of the uncertainties and potential for very profitable opportunism, effective coordination across markets is difficult. In anticipation of the problems, investments in assets highly specific to particular transactions may not be made, eliminating potential markets for farmers and desirable products for consumers. Integration by an IOF to solve the problem could require very large

investments in farm assets and the problems of bureaucratic management of farms and related risks. A cooperative solves these problems. However, if the transaction specific asset lies in the POF, and if members have' alternatives,. long-term contracts between members and the cooperative to assure use of the asset at levels sufficient to achieve scale economies may be necessary or at least desirable. Otherwise a member may find it individually advantageous to withdraw, imposing costs on other members. A sequential process where each withdrawal increases the incentive for subsequent withdrawals could destroy the value of the asset. The usual membership agreement and investment, if relatively small, might not be sufficient to protect the value of the asset.

The other side of the coin is that the cooperative may be more reluctant to adjust to new technologies or changing market conditions than would an IOF in an attempt to protect the value of member assets. To the extent that members are isolated from the consequences of failure to adjust to changing conditions, coordination of supply with demand may be impeded.

10 Externalities. Externalities exist when economic actions result in benefits or costs to third parties that do not enter the private accounts of the decisionmaking unit. The recipients of these consequences sometimes are referred to as free or unwilling riders. What is important for our purposes is that market transactions frequently fail to take into account important third-party consequences, thus reducing the effectiveness of economic coordination. The remedy, if there is one, is either a change in property rights or integration, bringing the consequences within a firm or other organization. Externalities are pervasive. It is neither practical nor desirable to eliminate all externalities.[13] Economic theorists frequently have concluded that pecuniary externalities can be ignored. However, this is a gross generalization and simplification. Pecuniary externalities influence behavior, and it is difficult to identify purely pecuniary effects in the real world.

Externalities create a significant problem in the coordination of supply with demand in farm commodity subsectors. For example, when individual farmers increase production of a commodity with an inelastic demand, the revenue of other farmers is reduced. This might not be a matter of social concern if the farmers increasing production were simply more efficient than other farmers and, in fact, marginal revenue from the increased production exceeded marginal costs. But what if the increased production is based on false expectations of prices and marginal revenue turns out to be less than marginal cost? All farmers suffer the consequences of the mistakes. Not only that, but such behavior increases price uncertainty, which will influence future production decisions. This is not simply a pecuniary externality that does not matter. Forward contracting with wide participation could reduce the problem.

Cooperatives --Cooperatives have the potential to deal with some externality problems. They can make it possible to capture some benefits or avoid some costs not possible in coordination across atomistic markets. Contracting in general also has potential for reducing externalities.

For example, the costs of promoting a product for an individual farmer would exceed the benefits to the farmer. The benefits, if any, would accrue to all producers of the product. In contrast, a cooperative could initiate a quality control, product identification, and promotion program jointly financed by members who would collectively capture the benefits. Consumers would benefit as well from the reliable improved quality made possible by the quality control and product identification.[14] Cooperatives with broad-based participation also may be able to reduce the externality problem associated with the failure to match supply with demand through the use of member and buyer contracts.

11. Structure. Market structure refers to the size and number of firms competing in a market, market share by largest firms, and conditions of entry. Structure is a market characteristic that is important to coordination performance because it is associated with market power or the capacity to influence terms of trade and trading relationships. Market structure not only influences coordination, but also is influenced by the nature of the coordination problem as firms seek to reduce or mitigate the consequences of uncertainty.

In The New Industrial State, Galbraith[15] divides the economy into the planning sector and the market sector. The planning sector is made up of the large firms in the economy that have market power. They have the capacity to influence their prices. It is a sector of administered prices. The market sector involves smaller firms that are in competitive markets and are basically price-takers.

In the modern industrial economy, very large investments are required to take advantage of economies of scale and scope related to technology, distribution, merchandising, and organizing a skilled work force of specialists including management and scientific-technical personnel. To protect these large investments, and even to venture to make them, managements of these firms seek to reduce uncertainty by controlling their economic environment. They engage in long-term planning and seek to implement the plans. First of all, they seek size and high market shares to enhance their potential for control and influence. They seek to protect themselves from the uncertainty of capital markets by generating capital from earnings made possible by their ability to administer prices based on market power. They seek to protect themselves from uncertainty of input markets through contracts, personnel relations, and the exercise of oligopsonistic market power. They seek to reduce uncertainty of demand for their products through advertising, merchandising, and contracts. They seek to reduce uncertainty of regulation and the variations in the value of money through political influence, including the strategic location of plants in many congressional districts.

Large firms are necessarily bureaucratic. This fact, when combined with all their efforts to protect against uncertainty, leads to very sticky prices for their products, especially on the down side.[16] Decisionmaking involves SOPs based on collective decisions, thus tending to reduce flexibility. Clearly the behavior of the firms in the planning sector contributes to the predictability of their own prices and reduces uncertainty in some of their

market relationships, especially through contractual arrangements. Private treaty markets among the large firms reduce uncertainty and are rich in coordinating information. Retail posted price markets dominated by planning sector firms are likely to be slow to adjust to changing conditions of supply of raw product, but at the same time to be-very risky for new entrants, even though prices are attractive. This risk is due to the potential response of large firms designed to protect their market share.

The planning and control efforts of large firms contribute to important aspects of coordination, largely at the micro-micro and micro levels and to a lesser extent at the macro level. However, these efforts exacerbate the coordination-planning problems at the macro-macro level and within subsectors that are coordinated across a series of markets, some of which are atomistically structured and others dominated by planning sector firms. They shift the burden of adjustment to industries that rely on coordination across atomistic markets, such as those for farm products.

There is at least a hypothesis with substantial supporting evidence that rigidities in the planning sector result in unemployed resources, most noticeably labor, especially at low points in the business cycle. A plausible, at least partial, explanation of the business cycle is that individual firms overinvest, not knowing the plans of competitors and having excessively optimistic expectations of demand. Then, in response to failure in effective demand, they restrict output rather than adjusting prices. This process has substantial spillover consequences for the firms outside of the planning sector.

Similarly, in subsectors with a mix of atomistic and concentrated markets, the adjustment to changing conditions falls much more heavily on the firms buying and selling in atomistic markets (or at least where one side of the market consists of a very large number of small firms). This is the case for many subsectors that include farmers. Farm input markets are concentrated, as are many of the markets coordinating activity of the industries supplying firms using farm-produced inputs. This imposes added uncertainty, volatility, and adjustment problems on the farming industries. Note the frequent failure of posted retail prices to reflect changes in supply at the farm level.

Conditions of entry and uncertainty affect both short-run and long-run coordination. Uncertainty and fear of reactions by other firms inhibit investment by prospective entrants, thus tending to protect firms in concentrated markets. Because of uncertainty, fear, and the nature of scale economies, niches that would otherwise be profitable to fill by investment in plant and equipment are left empty, often to the disadvantage of firms in subsector. For example, one processing plant might profitably serve a farming area where two would be unprofitable due to the nature of economies of scale. The plant may remain unbuilt because of the fear either that another firm might by mistake enter the market or that sufficient supplies of raw products are not assured.

Cooperatives --Cooperatives may reduce concentration in the markets of a farm commodity subsector by entry. Even the threat of entry may change behavior

of existing firms in concentrated markets, contributing to improved coordination (see Rhodes). The cooperative may be a creditable threat of entry when entry by an IOF is unlikely due to the difference in benefits available to the members of a cooperative compared to those available to stockholders. A farmers' cooperative also may profitably influence consumers' demand through promotion and merchandising where such efforts would not be profitable for an individual farmer, thus contributing to adjusting demand to existing supply. Such efforts are not profitable for individual farmers because the benefits occur to all producers of the commodity. The cooperative does not solve the free-rider problem but may reduce it. A cooperative also may fill an empty niche for a processing plant supplying a market for farm products or supplies of farm inputs by assuring a supply or purchases through explicit or implicit contracts. This role for cooperatives is especially important in situations involving high fixed and specialized investments because of the potential of appropriating the value of the fixed assets once the investment is made (Staatz, pp. 164-70).

The arguments on structure support the view of the role of cooperatives as the "competitive yardstick" advocated by Nourse. They also suggest that the cooperative has advantages as a coordinating mode in oligopolistic markets.

12 Elasticities. Elasticities of supply and demand are important characteristics of markets influencing economic coordination. The neat and simple supply and demand curves of static economic models are of a different character in a dynamic uncertain world. The difference in short-run and long-run elasticity of supply is well recognized. But the problems of coordination in the real world involve constant adjustment. Assets are neither completely fixed nor completely variable. Supply curves are not reversible, because every change in price affects expectations and investments that alter future supply curves. The introduction of time also alters the concept of the demand curve, which also varies with the length of run. In the very short run, for example, a change in price may result in changes in inventory positions with no change in consumption while, in the long run, a price change can result in changes in preferences altering future demand.

Price variability can significantly affect future supply and demand. Suppose, for example, that a price increases as a result of planning decisions in a previous period. The higher price may result not only in additional investments in the production of the commodity, thus shifting the supply curve, but also may cause consumers to find substitutes, resulting in new preferences and shifting the demand curve for the original commodity to the left. In this case, the quantity supplied would be greater, and the quantity demanded would be less, at the original price, and if the original price equated marginal cost and marginal revenue, the new market clearing price could be below average costs of production. The point is that prices not only affect the quantity supplied and taken in the short run, but at the same time change the longer-run supply and demand curves, affecting what will be supplied and taken in future periods. Price elasticities are a function of past prices, which complicates the coordination problem.

The farm problem sometimes is described as a chronic mismatch of supply and demand. At least a part of the problem arises from the nature of supply and demand elasticities as they interact in a dynamic, uncertain world. Given these conditions, spot markets do not provide an effective mechanism for industry-wide coordination of supply and demand.

Cooperatives --Again a market characteristic that is common for farm products indicates the need for a coordinating institution other than a spot market to deal with the macro coordination problem of matching supply and demand for specific commodities. Also, as suggested before, forward contracting provides the potential for improving macro coordination if a sufficient market share can be included and the problems of contingency contracting can be solved. An important question is whether farmers' cooperatives can be effectively organized to provide this coordinating function. Would they have advantages over a contracting system that operated across an electronic market organized by a private firm or a governmental agency? The discussion of market characteristics indicates the need for such a contracting system, and the cooperative is an institution available to farmers to deal with this problem of major importance to them. It is important to distinguish farmer collective action through cooperatives to achieve improved macro coordination and collective action designed to extract monopoly advantage. Without control of production, monopoly profits are limited to those available through possible discrimination among markets. A cooperative-managed forward contracting system with high levels of participation could achieve improved macro coordination without extracting monopoly profits. This fact supports the case for a policy to facilitate the performance of this function by cooperatives. The design of such a system is beyond the scope of this paper.

Conclusion

Micro-Micro Coordination

The POF does not seem to offer inherent advantages with respect to coordination performance within the firm as long as the firm is operating in highly competitive markets. The marketdisciplines all firms to seek effective mechanisms of internal coordination. Even so, directors representing patrons have potential access to more knowledge about the consequences that internal coordination processes have for service to patrons and may have more incen ve to influence these processes than directors representing investors.[ES] The case is different for firms operating in less than competitive markets for such firms have a surplus which may be divided among the participants in the form of profits, compensation, or slack performance. The POF has a unique group of participants with standing in the firm's policymaking process--the patron-owners. They have an incentive to press for reduction of slack to provide better prices and services to patrons. Of course, they may or may not exercise their influence. Effective policymaking requires dedicated directors with knowledge of bureaucratic organization and behavior, among other things. At the same time, the absence of a market for the stock of a POF eliminates the pressure on management to attend to the price of the stock, including investment analysis and corporate takeovers.

Groups of patron-members also may influence internal coordination to their advantage by affecting internal transfer prices or the allocation of overhead costs. This is a major problem to be solved, complicating the job of management and directors and potentially creating conflict among members (Staatz). Nonetheless, a reasonable conclusion is that cooperatives have a role in improving the internal coordination of firms operating in markets that permit a significant level of organizational slack.

Micro Coordination

The cooperative mode of organizing firm-to-firm transactions may be more or less effective than coordination across a market, depending on the SOPs of the cooperative and the characteristics of the market alternative. The potential for more effective coordination may be unrealized. If the POF operates to simply maximize its net revenue of the POF, its role in micro coordination may differ little from an IOF. However, given the conditions in the real world, the cooperative mode of organization has potential for more effective micro coordination.

More specific forward agreements between members and the POF seem to offer significant potential. For example, supply cooperatives could reduce inventory and delivery costs and mistakes in ordering, as well as improve the timely availability of exactly specified farm inputs by instituting advanced order systems. Advanced specification of product characteristics, quantities, and delivery schedules improves coordination for processing and marketing. Where transaction specific assets are involved in either supply or marketing, long-term agreements may make investments feasible that would not be made at all without them. The more extensive use of contracts between members and the cooperative would seem to make it possible to capture more of the advantages of the vertically integrated firm while maintaining the advantages of decentralized decisionmaking. Procedures for settlement of agreements made under uncertain conditions are critical to forward contracting systems. A combination of careful specification of contingencies and trust are required.

Because the outcome of all transactions between members and the cooperative is contingent on the performance of the cooperative, trust is a more important factor in the cooperative relationship than in transactions across a market. A critical factor in the performance of a cooperative, therefore, is the development of an organizational ideology emphasizing mutual responsibility and trustworthiness.

Macro Coordination

Cooperatives have a significant potential role in coordinating the total supply of a commodity with total demand at prices reflecting costs of production and consumers' preferences. Spot markets may efficiently allocate commodities that already are produced among alternative uses, but they do not provide a mechanism for effective macro coordination. Effective macro coordination requires a mechanism to provide reliable information on future supply, demand, and prices prior to important production decisions. A forward delivery contract market system was suggested with cooperatives

managing the system and, most specifically, providing a mechanism for enforcing and settling contingent contracts.

Marketing and bargaining cooperatives may originate with an incentive to improve macro coordination. The policy problem is to differentiate between macro coordination and monopolistic pricing. Open membership limits the potential for monopolistic practice and places the emphasis of the cooperative on macro coordination. A cooperative-managed forward contract system addresses the problem of macro coordination and provides no threat of monopoly pricing, even with a rule requiring participation in the system.

The roles of farmers' cooperatives in macro coordination deserves a good deal more attention. Cooperatives may buffer the price signals associated with changing market demand on technology, slowing the adjustments of members to the changing conditions. Failure to adjust may be detrimental to the POF and members alike. On the other hand, the cooperative may provide a more stable environment for farmers, thus contributing to a more orderly and less painful planned adjustment.[18]

Macro-Macro Coordination

Volatile agricultural product supplies and prices complicate the problem of coordinating aggregate demand and supply. Instability of the value of the currency, interest rates, and exchange rates in turn complicate the problem of food system coordination. For example, food prices are an important component in the cost of living index, and many contracts and programs are tied to this index. Improvements in macro coordination in the food system, reducing the volatility of prices associated with mistakes in production decisions, would contribute to improved macro-macro coordination for the economy, which in turn would reduce the adverse effects that instability in the aggregate economy has on the food system.

Notes

1. See Coase for the pioneer discussion of the question.

2. I thank Eileen van Ravenswaay for initially calling my attention to the importance of this distinction.

3. I will use the term POF for the firm or firms owned by an association of member-patrons, and cooperative to refer to the combination of association and its firms or operating units.

4. I recognize that IOF directors have some differences in objectives, such as payment of dividends vs. stock appreciation or long-run vs. short-run profits. I am arguing that the range of objectives for the firm is significantly different for a POF than an IOF.

5. There are, of course, examples of successful IOF integration involving several stages of production and distribution. Cooperatives also face problems accumulating capital.

6. Marketing and bargaining cooperatives may have formal contracts specifying the cooperative as the sole marketing agent and setting forth other terms, but they seldom specify quantities and terms prior to production commitments.

7. Patron-owned processors frequently are said to break the product market price because they are not committed to a raw product price. This suggests that the commitment to market all of the members' products along with contingent pricing may put downward pressure on prices.

8. It will depend on the design of the pooling agreement and the differences in price variability among commodities in the pool. Pooling can shift risks among members, adding to the instability of revenues for some members.

9. The value of the finished product provides a guideline, of course, but without a meaningful raw product price the problem of allocating costs among products becomes critical.

10. Contracting at the consumer end of the food chain might be feasible in terms of transactions costs through consumer cooperatives. Other possibilities also exist.

11. The voice option is one of attempting to influence an organization's performance through direct communication or political action, compared with the exit option, which is simply to not purchase, sell, or belong to the organization.

12. Note, however, that similar contingencies can be included in transactions across markets. For example, a processor may offer to pay on the basis of finished product prices, becoming essentially a custom processor.

13. See Schmid for an elaborate treatment of this topic.

14. The cooperative is one of several means of dealing with this externality/free-rider problem. Other possibilities are through marketing orders and possibly through contracts between a group of growers and firms marketing their products. Some type of collective action is required.

15. This section uses ideas from the Calbraith analysis, but is not to be taken as a description of his analysis.

16. See Okun for a comprehensive discussion of sticky prices.

17. This may not be true of inside directors of an IOF. There are many examples to the contrary. The potential feedback from member to director exists but may not be utilized.

18. Donald Street, in his review of this paper, suggested this to be an important question.

References

Axelrod, Robert. The Evolution of Cooperation. New York: Basic 'Books, 1981.

Coase, R. H. "The Nature of the Firm." Economica n.s. 4(1937):386-405. Reprinted in Readings in Price Theory, ed. G. Stigler and K. Boulding, pp. 331-51. Homewood, Ill.: Richard D. Irwin, 1952.

Galbraith, J. K. The New Industrial State. Boston: Houghton Mifflin Co., 1967.

Hirschman, Albert 0. Exit, Voice and Loyalty. Cambridge, Mass.: Harvard University Press, 1970.

Okun, Arthur M. Prices and Quantities: A Macroeconomic Analysis. Washington, D.C.: Brookings Institution, 1981.

Rhodes, V. James. "Cooperatives and Contestable/Substainable Markets." In this volume.

Schmid, A. Allan. Property. Power and Public Choice. New York: Praeger, 1978.

Shaffer, James D. "Preference Articulation and Food System Performance." In Future Frontiers in Agricultural Marketing Research, ed. P. Farris, pp. 224-45. Ames, Iowa: Iowa State University Press, 1983.

Staatz, John M. "A Theoretical Perspective on the Behavior of Farmers' Cooperatives." Ph.D. dissertation, Michigan State University, 1984.

Williamson, Oliver F. "Transaction-Cost Economics: The Governance of Contractual Relations." Journal of Law and Economics 22(1979):233-61.

FARMERS' INCENTIVES TO TARE COLLECTIVE ACTION VIA COOPERATIVES: A TRANSACTION COST APPROACH

John M. Staatz*

This paper uses concepts from transaction cost economics to examine two questions: (a) Under what conditions do farmers benefit from collective action? and (b) Under what conditions is that collective action likely to take the form of a farmer-owned cooperative firm?[1] The transaction cost approach hypothesizes that the structure that an economic enterprise develops in a particular environment reflects the enterprise's attempt to minimize its production and transaction costs. Organizational forms that are most successful in reducing these costs in a given environment tend to become dominant there (Williamson 1981). By examining the conditions under which collective action via cooperatives offers advantages to farmers, the transaction cost approach can therefore be used to highlight the situations in which farmer cooperatives are most likely to arise as well as the situations in which cooperatives may be at a competitive disadvantage compared with investor-owned firms (IOFs).[2] The incentives to maintain a cooperative once it is formed may differ from the incentives that gave rise to its formation. This paper discusses only the incentives to form a cooperative; for a discussion of the incentives to maintain a cooperative once it is formed, see Staatz (1984, pp. 206-8) and LeVay.

The paper is divided into seven sections. The first briefly describes the transaction cost approach to analyzing the structure of organizations, and the second through fifth discuss four basic principles of that approach: the asset fixity principle, the uncertainty principle, the externality principle, and the hierarchical decomposition principle. The asset fixity principle receives particular emphasis because it underlies many of the traditional arguments for farmer cooperatives. The sixth section discusses how cooperative action may be used to redistribute rights in farmers' favor rather than simply to reduce transaction costs within a given set of property rights. The seventh section summarizes the major arguments of the paper.

The Transaction Cost Approach

The transaction cost approach, as developed by Coase; Williamson; and Ouchi, focuses on how the characteristics of a transaction affect the costs of handling it through markets, bureaucracies, and other forms of organization. A transaction occurs whenever "a good or service is transferred across a technologically separable interface** (Williamson 1981, p. 1544). Transaction costs include the costs of gathering and processing the information needed to carry out a transaction, of reaching decisions, of negotiating contracts, and of policing and enforcing those contracts.[3] The transaction cost approach argues that the organizational form or "governance structure" that minimizes the sum of production and transaction costs for a given activity will have a competitive advantage and hence tend to dominate that activity.

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A shortcoming of the transaction cost approach is its tendency to take cost structures as given, paying little attention to the ability of different organizational forms to change the distribution of property rights and hence the definition of "efficiency" (Bromley; McNeil). The approach adopted here attempts to broaden the transaction cost approach to look at the design of an organization or association not simply in terms of optimizing within a given set of property rights, but also in terms of the ability of different designs to change the distribution of rights in favor of those controlling the organization or association. Within this broadened approach, the paper examines the traditional arguments for farmer cooperation, outlining the conditions under which agricultural cooperatives may provide benefits to their members that are unavailable or more costly elsewhere.

Williamson (1981) argued that four principles for efficient organizational design determine the type of organizational structure that will tend to dominate a particular line of economic activity (where efficiency is defined as the ability to minimize transactions costs): the asset fixity principle, the uncertainty principle, the externality principle, and the hierarchical decomposition principle. As will later become apparent, most traditional justifications for farmer cooperatives, such as the competitive yardstick argument, can be subsumed under these four principles.

The Asset Fixity Principle

The asset fixity principle states that as assets become more specialized or "specific," autonomous market contracting becomes a progressively less efficient means of allocating them (Williamson 1981, p. 1548). An asset becomes more specific to a particular use or user as the cost of transferring the asset to alternative uses increases. This cost may reflect technical characteristics of the asset itself, the spatial dispersion of production, or poorly functioning factor markets. As an asset becomes more specific, its resale or salvage value diverges from its acquisition value. As long as the value of the asset in use lies between the asset's acquisition and resale or salvage value, the asset will remain fixed in its current use; the owner will have no incentive to invest or disinvest in the asset in response to product price changes (Johnson).

Asset Fixity and Opportunism

The divergence between the acquisition and resale or salvage value of an asset gives rise to rents that are potentially appropriable through market transactions if insufficient competition in the market permits one of the parties to the transaction to act opportunistically (Klein, Crawford, and Alchian; Staatz 1984, chap. 2). Hence, the combination of small numbers in the product market combined with asset fixity, which itself is often a function of poorly functioning factor markets, can lead to situations to which farmers are at considerable risk in their dealings with their trading partners.[4]

For example, consider a farmer who invests in specialized fruit production equipment and trees to supply a processing firm that enjoys some degree of

local monopoly. Assume that the annual rental-equivalent price of those assets (calculated with respect to their acquisition price) is $300,000 and that the farmer incurs $100,000 in variable costs per year. The farmer made these investments based on the processor's promise to pay $500,000 per year for his or her fruit, yielding the farmer a profit of $100,000. Further assume that the most those assets can yield in their next best alternative use is a gross revenue of $100,000 per year. Once the farmer has invested in the specialized assets, the processor may be tempted to renege on the agreement and strategically lower the price because it realizes that as long as it offers at least $200,000 it will still pay the farmer to deliver the fruit to it, even though its action imposes a capital loss of up to $200,000 on the farmer.

Obviously, the processor cannot habitually act in this way because if it does the farmer will be both unable and unwilling to maintain his or her investment in fruit production. Nonetheless, if a large proportion of the farmer's production costs are sunk at the time of the transaction, he or she is particularly vulnerable to this sort of short-term opportunistic behavior by his or her trading partner. Farmers may attempt to counteract this opportunism by forming an association to: (a) bargain collectively with the processor and threaten strikes if contract terms are ignored or (b) lobby for government action to ensure the sanctity of contracts. In many instances, however, even with a strong farmer association, it may be more costly for farmers to try to enforce contracts with another firm than to internalize the transaction by integrating forward via the creation of their own cooperative firm. The incentives for farmers to integrate vertically via a cooperative firm to avoid opportunistic behavior are greatest where the proportion of sunk costs to total costs at the time of the transaction is high and the product is highly perishable, making its transfer to alternative markets on short notice very difficult. Fruits, certain vegetables, and dairy products are examples.

If an IOF is threatened by potential entry of competing firms, it may forego short-run opportunistic behavior to maintain its market position (i.e., it may practice limit pricing). This implies that the market share of cooperatives would be smaller in rapidly expanding markets, where the threat of entry of competing IOFs is greater, than in markets where demand is static or declining. In static or declining markets, IOFs may have little to lose by acting opportunistically. Such behavior may therefore create incentives for farmers to integrate forward via cooperatives in these markets. This may partly explain why U.S. farmer cooperative firms historically have expanded their memberships and market shares during recessions, when markets for agricultural products have typically stagnated or shrunk (Heflebower, pp. 45, 76, and 77).[5]

An IOF may itself face opportunistic behavior on the part of farmers, particularly if the IOF has a large number of specialized assets at risk and farmers have the option of reneging on their contract obligations and dealing with other firms. Fear of such opportunistic behavior may make private investors reluctant to undertake certain types of socially beneficial agribusiness activities that also would be privately profitable if opportunism were absent. Forms of vertically integrated ownership, such as

farmer cooperative firms, may, by attenuating such opportunism, help fill these important "empty niches."[6]

Asset Fixity and the Exercise of Market Power

Baumol, Panzar, and Willig, in their theory of contestable markets, argue that the immobility of assets, rather than industry concentration per se, allows the exercise of market power.[7] They stress that for market power to arise assets must be immobile on both sides of the market. Although the immobility of assets in farming creates the potential for transferring rents between farmers and their trading partners, the ability to capture these rents depends on assets being immobile in the trading partners' businesses as well. In other words, if barriers to exit are sufficiently high, they serve to deter entry even where positive rents could be earned by entering the market. This barrier to entry allows the farmers' trading partner to act opportunistically.

Immobility of assets (including human capital) may reflect poorly functioning factor markets, high costs of transferring resources due to other reasons such as transport costs, and a high degree of asset specificity. This suggests that the poorer the integration of markets and the more highly specific the assets on both sides of the market, the greater the scope for opportunistic appropriation of rents, and hence the greater the likelihood of cooperatives or other forms of vertical integration by farmers. This is another reason why agricultural cooperatives attract increased membership and expand their activities during hard times, when alternative employment opportunities for farmers and their assets are few and hence exit from farming is difficult. It also partially explains the higher incidence of cooperatives in subsectors such as dairy and fruit, in which assets on both sides of the market tend to be highly specialized (milking parlors, orchards, and processing plants), than in other subsectors where assets are more substitutable among uses.[8]

The analysis also suggests that as product and factor markets become less fragmented, the asset fixity argument for the creation of farmer cooperative firms becomes less compelling. If, however, greater market integration is accompanied by increased asset specificity (including human capital specificity), justification for vertical integration may still remain.

The asset fixity principle is involved in two of the most common rationales for farmer cooperative firms and associations: the need to build countervailing power and the need to preserve market access.

Countervailing Power

One of the most common justifications for farmer cooperation is that through collective action farmers are able to counterbalance the market power of their trading partners, leading to more equitable and efficient market outcomes (Galbraith). Although this argument arises most often with respect to cooperative associations, such as farmer bargaining associations, it applies to farmer cooperative firms as well. Cooperative associations or firms use their countervailing power to raise farm incomes in two ways:

through redistributing existing income in the farmers' favor and through increasing the efficiency of the economic system.

Countervailing Power and Income Distribution--Advocates of collective action by farmers have long argued that markets in which farmers face highly concentrated input, marketing, and processing industries generate a fundamentally unjust distribution of income, both in terms of the income received by farmers as a whole compared to other participants in the economy and in terms of the inequality of incomes among farmers that results from merchants playing one farmer off against another. By uniting in a bargaining association, farmers may be able to redistribute income in their favor if the association can effectively control enough of the supply to influence prices and force IOFs to treat all members of the association equally.[4]

Much of the potential of farmer cooperatives to use countervailing power to redistribute income lies in the ability of these associations to limit the appropriation of rents by farmers' trading partners. The creation of a farmers' collective bargaining association or a farmer-owned firm may limit the scope for such opportunistic behavior by reducing the ability of an IOF to act as a discriminating monopsonist (through forcing the firm to treat all farmers equally) and by increasing the actual or potential competition facing the IOF.[10] In addition to redistributing income in farmers' favor, the reduction in the opportunistic appropriation of rents also may affect the level of investment in agriculture, as discussed later.

Supporters of cooperative firms sometimes argue that in addition to redistributing income in farmers' favor, a system that includes cooperatives results in a more desirable regional distribution of income than a system dominated entirely by IOFs. Large IOFs, it is argued, extract profits from farming communities and channel them to metropolitan financial centers rather than reinvesting locally. In contrast, say these advocates of collective action, cooperative firms rebate net margins to patrons who invest them locally, leading to higher local multipliers. The formation of cooperative firms therefore may appeal to farmers not only as a means of increasing farm income but also as a way of strengthening rural communities and redistributing power in society.

Countervailing Power and Economic Efficiency--The promise of increased economic efficiency through countervailing power also may induce farmers to form cooperative associations or firms and the state to support their creation.[11] Cooperative bargaining associations may increase efficiency by transforming the market relationship between farmers and their trading partners from one approaching simple monopoly or monopsony to one approaching bilateral monopoly. (See Henderson and Quandt, pp. 244-49.) If farmers form a cooperative marketing or supply firm to compete directly with IOFs instead of simply bargaining collectively, such competition may improve economic efficiency by compelling the IOFs to expand their output and increase their X-efficiency (Leibenstein). Such competition also may reduce market segmentation because the stockholder-customers of cooperatives may pressure management to provide information, such as open formulas for feed and fertilizers, that aids the customers in making buying decisions, even though providing such information does not directly profit the cooperative firm.[12]

Perhaps the most important way farmer cooperative firms may increase economic efficiency is by decreasing the threat of opportunism in the face of fixed assets, thereby encouraging investment in specialized assets in farming and marketing facilities that can increase productivity. This advantage of cooperatives may be particularly significant where the minimum efficient size of operation in marketing and processing is large relative to the market and hence the threat of monopoly or monopsony is very real.

Preservation of Market Options

The argument that agricultural cooperative firms are needed to preserve the market options of farmers, particularly when IOFs exit a market, is explicable largely in terms of the asset fixity principle. The prospect of suffering large capital losses on illiquid farm assets should market access be lost often motivates farmers to purchase investor-owned processing or supply facilities that are closing because of poor earnings and convert these facilities into cooperative firms. It is sometimes argued that farmers can afford to operate marketing or farm supply facilities that IOFs have abandoned in favor of more profitable investments elsewhere because farmers take into account the joint profitability of farming and the marketing or farm supply operations, not simply the profitability of marketing or input supply alone. Whereas an IOF can exit the industry without having to take into account the costs its departure imposes on its farmer-clients, cooperative firms, because of their integrated nature, do take those costs into account. Implicit in this argument is the idea that if IOFs did take the joint profitability of farming and their marketing or farm-supply activities into account, the IOFs would find it attractive to remain in the industry.

This argument by itself is too facile. If the joint farming-input supply (or marketing) operation is profitable but marketing or input supply alone is not, why could not farmers and the IOF renegotiate their contracts, redistributing some of the profits from farming so that the IOF could stay in business? Indeed, if pricing of farm products is competitive, such a redistribution of profits should take place automatically through the market. There are several possibilities why this redistribution of profits may not occur:

1. If there is no collective bargaining by farmers (or if such efforts are not effective--e.g., because of free-rider problems), if markets for farm products are competitive, if cost structures differ among the farms served by the IOF, and if the IOF cannot price discriminate among its farmer customers, then competition among farmers will redistribute rents only up to the level of the rents previously earned by marginal producers.[13] Inframarginal producers still may earn rents at the competitive price, and these farmers stand to lose those rents if the IOF exits the market.

2. If, instead of pricing according to a competitive market, farmers bargain collectively with the IOF, they may refuse to make price concessions because they do not believe the IOF is in serious financial trouble, a belief engendered by an unwillingness of the IOF

to open its books to the farmers. In this case, an advantage of unified ownership of farming and marketing or input supply facilities is an improved flow of information among system participants about the financial health of the different operations.

3. In collective bargaining with farmers, IOFs often have to commit themselves to a raw product price before they know what prices they will receive for their processed products. If agricultural production and hence supplies and prices of products are volatile, the IOF can incur heavy losses, yet be severely limited in its ability to renegotiate its contracts with growers. Given highly volatile markets, it is difficult for farmers to discern ex ante whether an IOF asking for concessions is genuinely in trouble or is simply attempting to act opportunistically.

4. There may be no possible redistribution of profits between farmers and the IOF that would simultaneously satisfy both parties' requirements for profitability, yet the overall profitability of the integrated operation may be acceptable to farmers but not to the IOF. Farmers may be willing to accept a lower overall rate of return on investment than is the IOF to capture the nonmonetary rewards of farming, be assured secure input and output markets, or because farmers have fewer alternative investments open to them than do IOFs due to imperfections and transaction costs in the capital market.

5. There may be efficiencies in running input supply or marketing facilities as cooperatives rather than as IOFs. These potential efficiencies are discussed later.

The argument that farmers form cooperative firms to avoid capital losses that would accrue if market access were lost suggests, as did the countervailing power argument, that cooperatives would be more prevalent where farmers have a large number of specialized assets at risk. This partly explains why historically cooperative firms in the United States have been most prevalent in those areas where farmers were highly specialized in a few activities.[14]

Development of New Farm Activities

Another consequence of the asset fixity principle is that cooperative firms may be more likely to encourage the development of new crops and farming techniques than are IOFs, particularly where the IOFs are restricted from vertically integrating into farming. A marketing or processing IOF may be reluctant to invest in teaching farmers new production techniques because the farmers can potentially use their new skills to produce products for a competing firm. Absent slavery, it may be very difficult for the IOF to compel a farmer to sell exclusively to the firm for a long enough period to amortize the firm's investment in specialized human capital in the farmer. There is therefore an incentive to move toward unified ownership of farming and processing to reduce this potential for opportunism. If permitted, IOFs may integrate backward into farming;[15] alternatively, farmers may integrate forward into processing. If forward integration takes place via a cooperative firm and if farmers' return on their investment in the firm is

contingent on their continued patronage (see Staatz 1984, chap. 2), then they may be less inclined to act opportunistically toward the cooperative firm than they would be toward an IOF. This greater loyalty to the cooperative would increase the cooperative's incentive to train farmers in new production techniques. Ranade reports that in India, where land ownership ceilings prevent multinational processing firms from integrating backward into farming, multinationals are extremely reluctant to engage in farmer extension work, while cooperative processors are heavily engaged in these activities.

The Uncertainty Principle

The uncertainty principle states that the greater the uncertainty surrounding a transaction the less likely the transaction is to be efficiently mediated by autonomous market contracting (Williamson 1979b). As uncertainty increases, so does the cost of renegotiating contracts; as unforeseen contingencies arise, so does the potential for opportunistic behavior. An increase in uncertainty therefore creates incentives to shift from institutions like the spot market to contingent contracts and vertical integration. Because farmer cooperative firms combine elements of both vertical integration and contingency contracting,[16] they may offer more ways of dealing with uncertainty than either IOFs or bargaining associations.

Flexibility in Pricing

Because a farmer cooperative operates at cost, the prices it charges or pays farmers are contingent on the firm's earnings. Typically, contingent pricing in cooperative firms is accomplished using patronage refunds. In some lines of business, such as fruit and vegetable processing, farmer cooperative firms have extended contingency pricing to the point where payment for the crop may be spread out for a year or longer following the harvest, with the amount of the total payment contingent on the earnings of the pool in which the crop participates.

Contingent pricing has several advantages in an uncertain environment. It helps firms on both sides of the market avoid the costly mistakes of committing themselves to prices that are either too high or too low in light of changing and not fully known supply and demand conditions. It also renders unnecessary the costly renegotiation of contracts should one party feel it has been treated unfairly in light of the evolving market situation. In the presence of imperfect capital markets, it also allows firms greater flexibility in the timing of their sales. For example, Hamm (pp. 478 ff.) describes how investor-owned processors in the canned fruit and vegetable industry often have to offer special prices to distributors early in the processing season to generate the cash flow necessary to pay farmers for their crops. Cooperative processors, which are not constrained to pay farmers immediately for their crop, have greater marketing flexibility.

In recent years, many investor-owned agricultural processing firms have moved to contingent pricing of raw agricultural products similar to that practiced by cooperatives (Chase-Lansdale). Nonetheless, contingency contracting is likely to operate more smoothly in a cooperative firm. Because farmers own

the firm, have access to its financial accounts, and can discipline the manager through the board of directors, they are less likely to believe that the cooperative is using contingency contracting to act opportunistically toward them. In contrast, unless contingency contracts between farmers and IOFs are based on a formula (rather than a promise to "pay what we can afford**) and permit farmers to verify the IOF's earnings, they may give rise to disputes that are costly to adjudicate.

Reduction of Risk Through Pooling

A commonly cited advantage of agricultural cooperatives is their ability to reduce the variability of farmers' incomes through the pooling of grower returns and expenses across products, time, and space. Pooling may lead to some reduction in risk for individual farmers because fluctuations in the returns for their commodities are counterbalanced by offsetting fluctuations in the returns for other commodities in the pool.[17] This income stabilization function may become increasingly important to farmers as they specialize because in specializing they lose the income stabilization imparted by on-farm diversification.

Although cooperative pooling may provide an income insurance function, for it to be an incentive to establish cooperatives, this form of insurance has to be cheaper than other ways farmers have of stabilizing their income, such as on-farm diversification and reliance on the capital or futures markets. This is more likely to have been true in the past than it is currently. In the past, farmers may have preferred pooling as a means of stabilizing income for at least three reasons. First, the uncertainties in agricultural production and the fragmentation of rural capital markets may have caused lenders to charge a large premium when lending to farmers. Second, pooling often involved fewer transaction costs at the level of the individual farmer than other forms of income insurance. Whereas gaining income stability through the capital or futures markets requires the farmer to undertake several transactions, such as taking out and repaying loans and buying and selling contracts, in pooling the buying and selling decisions are centralized at the level of the cooperative's management. This advantage of pooling probably has been reduced as cooperatives themselves have increasingly turned to hedging in an attempt to stabilize member returns. Third, farmers who believed that the demand for their crop was declining may have seen pooling as a way of transferring income to themselves from producers of more remunerative crops. If a pool includes a broad array of products, substantial income transfers can occur as returns from highly profitable crops subsidize producers of low-return crops. The extent to which such transfers can be maintained, however, is circumscribed by pressures from producers of high-value products to limit pools to a narrow range of crops having similar demand characteristics and to distinguish between different qualities within a pool through a system of premiums and discounts.

Historically, many cooperatives have fluctuated between widely and narrowly defined pools, as management has tried to balance the economies of size in marketing permitted by broad pools against the pressures to limit income redistribution within the cooperative through pooling. In recent years, many

cooperatives have moved to more narrowly defined pools (Staatz 1984, chap. 7).

If the income stabilization gained through pooling has served as an incentive to form farmer cooperatives, one would expect pooling to be most prevalent in cooperatives handling highly perishable products whose prices fluctuate widely (and hence generate very unstable income streams) and for which there are no organized futures markets. Cooperatives handling storable commodities like grains or perishable products like livestock that can be traded on the futures market might operate more on a simple buy-sell basis because their members have the option, not open to producers of other highly perishable products, of trying to achieve some degree of income stability through intertemporal arbitrage of their raw product or through relying on the futures market. This hypothesis is consistent with the experience of U.S. agricultural marketing cooperatives: Most major fruit and vegetable processing cooperatives operate on a pooling basis while most grain and livestock cooperatives simply buy and resell the products of the members.

The Externality Principle

The externality principle states that a firm has an incentive to integrate vertically when participants in adjacent market stages impose negative externalities on the firm (Williamson 1981, pp. 1549-50).

Preservation of Product Quality

A major externality arises when participants in adjacent market stages intentionally or unintentionally debase a firm's inputs or branded products. For example, if a company produces a high-quality perishable product that requires special handling in subsequent stages of the distribution system, negligent handling of the product by distributors can damage the company's reputation with consumers. Because it is often easier to control product quality within the firm than across market boundaries, the company producing the product may vertically integrate to gain tighter control over the distribution system. For example, during the early 1900s California citrus growers perceived that the erratic quality of their products in eastern markets was limiting the demand for oranges and lemons. Much of the early work of the California Fruit Growers Exchange (later Sunkist) was aimed at improving the distribution channels for citrus, partly through vertical integration, to ensure that citrus reaching eastern markets was of consistently high quality (Kirkman).

On the input side, farmers also may have an incentive to integrate vertically, particularly when new inputs, such as fertilizer, improved seeds, and insecticides, are being introduced whose characteristics are difficult to determine ex ante. In such situations, the scope for opportunistic behavior is large. When such inputs are first being introduced, even ethical dealers may not devote full attention to quality control because in the short run it is difficult to demand a premium price for higher quality products when the higher quality is not immediately apparent to the buyer. Concern about building long-term business relationships tempers the tendency to shirk on

product quality; nonetheless, if the costs of entry into and exit from the input supply business are low, incentives for fly-by-night behavior remain. In such situations, the cheapest way for farmers to guard against such opportunism may be to integrate vertically into the input supply business through a grower-owned firm. For example, Southern States Cooperative, a large supply cooperative in the southeastern United States, was formed in 1923 in response to problems that farmers had with the poor quality seed sold by private dealers at that time.[18]

Agricultural processing firms attempting to build a strong brand name may face the same problem of assuring the quality of their inputs, particularly their raw agricultural inputs. The problem may be most acute when the processor is encouraging the production of a new crop, and farmers, unfamiliar with the techniques necessary to produce a suitable product, need close supervision. The cheapest way for the processor to assure product quality may be to integrate vertically into farming or to use detailed contracts to require farmers to follow specific production practices. Contracting leads to contract enforcement costs, which may be lower for cooperative firms than for IOFs because cooperative firms potentially have more ways of punishing members who fail to live up to their contracts than do IOFs. Not only can a cooperative include the same noncompliance clauses in its contracts as does an IOF, but members who act opportunistically toward their cooperative may face social sanctions from their fellow farmers as well. In addition, a cooperative can make a member's return on equity in the organization contingent on fulfilling the terms of the contract.[19]

Provision of Public Goods

Many of the **competitive yardstick" activities of farmer cooperative firms, such as their leadership in introducing open formula feeds, can be viewed as public goods. Farmers, faced with unsatisfactory performance by IOFs, may form a cooperative firm whose purpose is to force the IOFs, through competition, to improve their service to farmers. If successful in enforcing competition, the cooperative generates benefits that it does not capture itself but which accrue to the farmer-stockholders, as well as to other farmers in the area. No independent IOF has an incentive to generate such positive externalities (although the logic of a competitive market often forces such behavior); it is the integrated nature of farmer cooperatives that leads to their being formed specifically for this purpose.[20]

The Hierarchial Decomposition Principle

Earlier sections of this paper have argued that where asset fixity is present, firms have an incentive to integrate vertically to avoid opportunistic behavior by their trading partners. This section uses the hierarchical decomposition principle to examine why such integration is more likely to take the firm of farmers vertically integrating into other types of agribusinesses via cooperative firms than IOFs vertically integrating into farming.

Simply transferring a transaction from the market to the internal bureaucracy of a firm does not guarantee a reduction in transaction costs. Although internalization of the transaction eliminates previously incurred selling costs, these are replaced by the costs of mediating the transaction within the firm. For vertical integration to result in a net savings, the firm must be organized internally in a way that allows it to handle the transaction efficiently. Williamson (1981, p.1550) argues that this is best accomplished by following the hierarchical decomposition principle, which he states as follows:

> Internal organization should be designed in such a way as to effect quasi-independence between the parts, the high frequency dynamics (operating activities) and low frequency dynamics (strategic planning) should be clearly distinguished, and incentives should be aligned within and between components so as to promote both local and global effectiveness.

Decomposing the firm's activities into relatively independent subunits helps prevent top management from being swamped with day-to-day operational duties, promotes an orderly flow of information within the firm, and helps managers within a division create an effective set of incentives for their subordinates by making division employees primarily responsible to their division manager, not a myriad of others, as might occur in a less hierarchical organization.

The separation of responsibilities for daily operational decisions, particularly at the farm level, from longer-term strategic planning and marketing decisions would be particularly important for a firm attempting to integrate vertically into farming, as many farm-level managerial decisions are highly time- and site-specific. Unless environmental conditions on the farm can be tightly controlled (as, for example, in poultry production), vertical integration into farming may require a higher degree of farm-manager autonomy than most IOFs are willing to delegate.

A farmer cooperative firm, on the other hand, represents a looser form of vertical integration than a vertically integrated IOF, resembling in many ways a contingency contract.[21] Stockholders in the cooperative firm agree to eschew competition among themselves in their marketing and input supply activities but continue to make the rest of their decisions independently. Cooperative firms therefore allow their members to capture many of the advantages of large-scale marketing, input production, and strategic planning while still permitting farmers to make most of their farm-level decisions themselves. Thus, while there are often strong reasons for vertically integrating between farming and certain marketing and input supply activities, the more decentralized nature of cooperatives make them a more efficient means of carrying out that integration than an IOF.

Cooperatives as a Means of Redistributing Rights

Farmers often have acted collectively in an attempt to redistribute property rights in society, not simply to reduce transaction costs within a given

distribution of rights. Such collective action usually has taken the form of cooperative associations rather than firms. Because organizing collective action to redistribute rights often involves free-rider problems, however, a cooperative association may attempt to finance its political activities through sales of appropriable goods to its members (Olson). For example, most farm supply cooperatives in the United States were started by farmer organizations that originally were formed for other purposes, mainly political lobbying (Heflebower, p. 75). Farmer cooperative firms that provide their members with goods such as farm supplies as well as lobbying may be an effective means of organizing for political action in those instances where farmers have a strong economic interest at stake, such as in the design of commodity policies, and where laws concerning how these firms spend their net earnings are lax.

Political Activity of Cooperatives

Cooperative associations attempt to redistribute rights not only through the exercise of countervailing power but through direct involvement in the political system as well. Particularly in those areas of agricultural production where public involvement is large, for example because of public health concerns, farmers may feel the need to organize politically to make their voice heard in public decisionmaking bodies. Once organized for this purpose, a cooperative association can be used at low cost to lobby for other issues, such as improved terms of trade. (For example, consider U.S. dairy cooperatives.) As direct government involvement in the agricultural economy increases, lobbying may become the most important function of many cooperatives. In the words of the manager of a large dairy cooperative interviewed by the author:

> We can increase returns to our members in two ways: through improving the efficiency of our distribution system for milk and through political action. Increasing efficiency adds pennies to our members' milk checks while political action adds dollars. We allocate our resources accordingly.

Cooperative associations also may be used to channel resources to farmers after the rights to those resources have been won through political action. For instance, tobacco and peanut cooperatives in the United States serve largely as mechanisms to administer price support programs for these commodities. Many dairy, fruit, and vegetable cooperatives implement the provisions of marketing orders, some of which permit price discrimination and other manipulations of supply. In Scandinavia, agricultural cooperatives take on many of the functions of a public agency, helping to coordinate government farm programs and equilibrate the supply and demand for agricultural products (Ollila).

Cooperatives and the Democratic Ideal

Farmer cooperative associations, with their emphasis on member involvement and voting on a basis other than capital contribution, historically have often been formed as part of a broader attempt to promote democratic values and wider political participation in society, particularly in situations

where other social organizations were highly autocratic. Early cooperative organizers in the United States saw themselves as part of a larger social movement aimed at redistributing power in society, and much of the early growth of farmer cooperatives, and hence their current competitive position in U.S. agriculture, is attributable to the strength of the populist movement of the late 19th and early 20th centuries. Neopopulist authors such as Kravitz continue to emphasize the importance of democratic cooperation not only as an end in itself, but also as a way of combating the concentration of wealth and power they see as inherent in capitalism. Many cooperative supporters also stress the importance of cooperatives as "training grounds for democracy,'* in which members gain skills they later use in local governments and other organizations (see, e.g., Wills, pp. 25 and 28).

Although cooperation as a goal in itself may have been an important element in the founding of some agricultural cooperative associations and firms, it is unlikely by itself to sustain them, even when they have members with a strong ideological commitment to cooperatives. This is particularly true where the level of competition between cooperatives and IOFs is intense, perhaps due to the previous success of the cooperatives, and where there are alternative outlets for democratic participation, such as running for the school board. As the manager of one cooperative firm put it, "currently cooperative loyalty is worth about two cents per bushel."

Summary

Many of the potential benefits farmer cooperative associations and firms offer their members derive from the fixity of assets, both physical and human, in farming and other types of agribusiness. Asset fixity in farming generates rents, which farmers' trading partners can potentially capture by acting opportunistically, provided that asset fixity in the trading partners' business creates barriers to entry or exit that permit the exercise of market power. Asset fixity therefore underlies the arguments that cooperatives are necessary to provide farmers with market power and to preserve their access to markets. This suggests that farmer cooperatives are more likely to arise and convey greater benefits to their members where: (a) Assets on both sides of the market are highly specialized and/or (b) product and factor markets are fragmented, leading to a divergence between the values of the asset in its current use and its value in alternative uses. It also suggests that cooperatives will tend to be more prominent in declining markets than in expanding markets because in declining markets the long-term consequences to farmers' trading partners of acting opportunistically are less severe than in expanding markets, in which the threat of entry of competing firms is higher.

Because of asset fixity, cooperative firms may offer certain advantages over IOFs during the early stages of agricultural specialization. Farmer-stockholders have fewer incentives to act opportunistically toward their own cooperative firm than they do toward an IOF (provided that their return from the cooperative is contingent on their continued patronage); therefore, the cooperative firm has more of an incentive than an IOF to invest in training farmers in new production techniques.

The potential for opportunistic appropriation of rents from farmers is accentuated by the riskiness inherent in agricultural markets. Cooperative firms may offer farmers certain advantages in dealing with risk, primarily through the firms' ability to practice contingency pricing via patronage refunds and to offer members some degree of revenue insurance through pooling. This suggests that pooling will be more prevalent in subsectors like fruit and vegetables, where production and prices are more volatile and other risk management tools such as the futures market are unavailable, than they will be in subsectors like grain, where risk may not be as great and there are alternative ways of managing it.

Farmers also may vertically integrate via cooperative firms to internalize externalities imposed on them by their trading partners. On the output side, farmers' trading partners may pay insufficient attention to maintaining the quality of farm products, particularly highly perishable ones, as they move through the marketing system, thereby depressing farm-level demand for these products. On the input side, farmers may have an incentive to integrate backward when they have no simple way of ascertaining the quality of purchased inputs, such as by simple inspection or by relying on the sellers' reputation. Particularly in the early stages of the industrialization of agriculture, when purchased inputs are just becoming important in farming and input suppliers' reputations are not well established, farmers may have a strong incentive to integrate vertically via cooperative firms to assure input quality.

Farmers also may have an incentive to integrate vertically to provide themselves with goods and services that no IOF has an incentive to produce due to their public good nature. This is particularly true of the "competitive yardstick" services of farmer cooperative firms, the benefits of which accrue not to the cooperative firm as such but to the farmer-members.

In their internal organization, farmer cooperative firms may offer certain efficiencies over IOFs that help offset cooperative firms' possibly higher decision costs.[22] In particular, the cooperative structure allows farmer-members to make certain location-specific farm-level decisions individually while allowing other decisions to be made collectively. Therefore, if there are incentives to vertically integrate farming with other stages of production, cooperatives may be a more flexible means of achieving that integration than IOFs, in which central management may be reluctant to decentralize a large number of farm-level decisions.

Farmers do not form or join cooperatives simply to reduce transaction costs; an additional motivation may be to try to redistribute rights in the farmers' favor. Particularly where farmer-members have strong common interests, as in single-commodity organizations, farmer cooperative associations may be an important means by which farmers can unite to take political action. Such an association may evolve into a firm because a cooperative firm also can provide its members with appropriable goods and services as well as a means of organizing political action, thereby overcoming many of the free-rider problems inherent in political organizations (Olson).

Most of the cost savings outlined in this paper could accrue not only to a farmer cooperative but also to an IOF that was involved in agribusiness and owned primarily by farmers. In many societies, however, the ability of a farmer organization to attract an initial membership and win concessions from the political system may depend on its being perceived as a democratic instrument of self help, aimed at tempering the alleged rapaciousness of capitalism. In this sense, it may be true, as Kravitz claims, that the process of cooperation is inseparable from the results of cooperation.

Notes

1. van Ravenswaay discusses the need to distinguish between a cooperative association (i.e., an organization to promote collective action by farmers, such as a bargaining association or a lobbying group) and the firm owned by a cooperative association.

2. The transaction cost approach could be used to compare farmer-owned cooperatives with other forms of economic enterprise as well, such as worker-owned firms. Due to space limitations, this paper only presents comparisons between farmer-owned cooperatives and IOFs.

3. Williamson (1981) pointed out that all transaction costs derive from a combination of bounded rationality (which reflects both imperfect information and a limited capacity to analyze it) and opportunism, which he defines as *'self-interest seeking with guile." Given imperfect information about the future, all contracts are necessarily incomplete. If people were never opportunistic, however, incomplete contracts would not lead to contract enforcement problems; contracts would simply state that if unforeseen contingencies arose the parties would act in a manner acceptable to all.

4. See Johnson and Quance for a detailed discussion of the factors that contribute to asset fixity in agriculture.

5. Declining markets, leading to an increase in cooperatives' activities, may result from changing consumer preferences as well as from recessions. For example, during the 1950s and 1960s, when demand for canned fruits and vegetables was growing, the market share of investor-owned fruit and vegetable processors was high. With declining demand in the 1970s and 1980s, farmer cooperatives have come to dominate the processing market.

   IOFs may have another important advantage in markets that are expanding: the ability to respond rapidly to emerging market opportunities. Cooperatives, with their higher costs of collective decisionmaking, may be less adept at seizing such opportunities.

6. See the section on the hierarchical decomposition principle for a discussion of why vertical integration by farmers into other agribusinesses is more likely than vertical integration by IOFs into farming.

7. For concise summaries of this argument, see Baumol (1982a, 1982b) and Rhodes.

8. Heflebower, in reviewing the history of farmer cooperative firms in the United States, concluded that, "Cooperative marketing has developed most vigorously where farmers specialize in one or a few products and have substantial investment that cannot be diverted to other use" (pp. 72-73). For more recent evidence, see Wilkins.

9 There is strong debate over whether bargaining associations can effectively influence supply. See, for example, Baron.

10 Implicit in the creation of a bargaining association is the threat that the association may form a firm to compete with the IOFs if they do not bargain in good faith. For example, the California Canning Peach Association, a bargaining cooperative, was instrumental in founding California Canners and Growers (Cal Can), which until 1983 was one of the largest fruit and vegetable processing cooperatives in the United States. Cal Can was founded in part because investor-owned processors were cancelling the contracts of farmers who participated actively in the bargaining association.

11 Most farmers are interested in how cooperatives affect overall economic efficiency only to the extent that such improved efficiency results in more favorable net farm revenues. Supporters of agricultural cooperatives, however, have often argued that the efficiency-improving effects of cooperatives' countervailing power justify state support of farmer cooperation.

12 In the United States, farmer cooperatives pioneered the use of open formula feeds and fertilizers (Heflebower, pp. 78-82). Cooperatives may, nonetheless, have incentives to differentiate their products, both through advertising and member relations programs, to increase member loyalty. Indeed, cooperatives often stress their member orientation as a distinctive quality of their service.

13. A marginal producer is defined here as the highest cost producer among those who collectively generate the minimum total volume of patronage necessary for the IOF to stay in business.

14. There is substantial evidence on this point. For dairy, grains, and poultry, see Heflebower (pp. 44, 52, and 71). For vegetables, see Hamm (p. 501).

15. Around 1900, many of the large national fruit and vegetable processors in the United States were vertically integrated into farming, in part to assure the quality of their raw product inputs. After the human capital to produce these products had been built up and sufficiently amortized, the firms sold their farming operations and met their raw product needs through contracting with farmers.

16. See Shaffer, "Thinking About Farmers' Cooperatives, Contracts, and Economic Coordination," in this volume.

17. There is no guarantee that pooling will stabilize returns to all participants in the pool. Producers of "stable" crops may find their returns destabilized by pooling.

18 As an alternative to forming their own firm, farmers may unite in an association to lobby for greater direct government regulation of investor-owned input supply firms to ensure the quality of their products. Whether this approach is more cost effective than ensuring product quality through creation of a farmer cooperative firm depends in part on how open the political system is to farmers. For a discussion of the historical experience in the United States, see Heflebower (pp. 78-82).

19 Staatz, "The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences," in this volume.

20 The public good nature of many of the activities of farmer cooperatives leads to free-rider problems, which are analyzed in Staatz, "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives," in this volume.

21. See Shaffer, "Thinking About Farmers' Cooperatives, Contracts, and Economic Coordination," in this volume.

22. See Staatz, "The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences,'* in this volume.

References

Baron, P. J. "Why Cooperation in Agricultural Marketing?" Journal of Agricultural Economics 29(1978):109-17.

Baumol, William J. "Contestable Markets, Antitrust, and Regulation." Wharton Magazine, Fall 1982a, pp. 23-30.

_____ *'Contestable Markets: An Uprising in the Theory of Industry Structure.** 'American Economic Review 72(1982b):1-15.

Baumol, William J.; John C. Panzar; and Robert D. Willig. Contestable Markets and the Theory of Industry Structure. New York: Harcourt Brace Jovanovich, 1982.

Bromley, Daniel W. "Land and Water Problems: An Institutional Perspective." American Journal of Agricultural Economics 64(1982):834-44.

Coase, R. H. "The Nature of the Firm." Economica n.s. 4(1937):386-405. Reprinted in Readings in Price Theory, ed. George G. Stigler and Kenneth-E.

Boulding, pp. 331-51. Homewood, Ill.: Richard D. Irwin for American Economic Association, 1952.

Chase-Lansdale, Wilson Compton. "The Political Economy of Farmer Bargaining: Cooperative and Proprietary Processor Responses to Farmer Bargaining." Ph.D. dissertation, Michigan State University, 1980.

Galbraith, John Kenneth. American Capitalism: The Concept of Countervailing Power, rev. ed. Boston: Houghton Mifflin Co., 1956.

Hamm, Larry G. "Food Distributor Procurement Practices: Their Implications for Food System Structure and Coordination.*' Ph.D. dissertation, Michigan State University, 1981.

Heflebower, Richard B. Cooperatives and Mutuals in the Market System. Madison, Wis.: University of Wisconsin Press, 1980.

Henderson, James M., and Richard E. Quandt. Microeconomic Theory, 2nd ed. New York: McGraw-Hill Book Co., 1971.

Hirschman, Albert 0. Essays in Trespassing: Economics to Politics and Beyond. New York: Cambridge University Press, 1981.

Johnson, Glenn L. "The State of Agricultural Supply Analysis." Journal of Farm Economics 42(1960):435-52.

Johnson, Glenn L., and C. Leroy Quance. The Overproduction Trap in United States Agriculture. Baltimore: Johns Hopkins University Press for Resources for the Future, 1972.

Kirkman, C. H. The Sunkist Adventure. Washington, D.C.: USDA FCS Information 94, 1975.

Klein, Benjamin; Robert G. Crawford; and Armen A. Alchian. "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process." Journal of Law and Economics 21(1978):297-326.

Kravitz, Linda. Who's Minding the Co-OP? A Report on Farmer Control of Farmer Cooperatives. Washington, D.C.: Agribusiness Accountability Project, 1974.

Leibenstein, Harvey. "Allocative Efficiency vs. 'X-Efficiency."' American Economic Review 56(1966):392-415.

LeVay, Clare. "Agricultural Co-operative Theory: A Review." Journal of Agricultural Economics 34(1983):1-44.

McNiel, Kenneth. "Understanding Organizational Power: Building on the Weberian Legacy." Administrative Science Quarterly 23(1978):65-90.

Ollila, Petri. "Member Influence in Cooperatives: Contributions of Scandinavian Studies to Research Conducted in the United States.*' Master's Plan B paper, Michigan State University, 1983.

Olson, Mancur, Jr. The Logic of Collective Action. New York: Schocken Books, 1968.

Ouchi, William G. "Markets, Bureaucracies, and Clans." Administrative Science Quarterly 25(1980):129-41.

Ranade, Chandra. "Agricultural Cooperatives in India." Seminar presented at Dept. of Agricultural Economics, Michigan State University, Oct. 26, 1983.

Rhodes, V. James. "Cooperatives and Contestable/Sustainable Markets." In this volume.

Shaffer, James D. "Notes for a More Comprehensive Theory of Farmer Owned Cooperative System." Cooperative Theory Working Pap. 1, Dept. of Agricultural Economics, Michigan State University, 1982.

_____ "Thinking About Farmers' Cooperatives, Contracts, and Economic Coordination:*' In this volume.

Staatz, John M. "The Cooperative as a Coalition: A Game-Theoretic Approach." American Journal of Agricultural Economics 65(1983):1083-89.

_____ "A Theoretical Perspective on the Behavior of Farmers' Cooperatives:" Ph.D. dissertation, Michigan State University, 1984.

_____ "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives:" In this volume.

_____ "The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences." In this volume.

van Ravenswaay, Eileen 0. "Organization of Decision Making in Agricultural Cooperatives." Unpublished paper, Dept. of Agricultural Economics, Michigan State University, 1985.

Wilkins, Paul C. "Marketing, Farm Supply Cooperatives Serve More than Half United States Farmers." Farmer Cooperatives, Jan. 1983, pp. 12-13.

Williamson, Oliver E. "The Vertical Integration of Production: Market Failure Considerations." American Economic Review 61(1971):112-13.

_____ Markets and Hierarchies: Analysis and Antitrust Implications: New York: Free Press, 1975.

_____. "On the Governance of the Modern Corporation.'* Hofstra Law Review 8(1979a):63-78.

_____ "Transaction Cost Economics: The Governance of Contractual Relations." *Journal of Law and Economics 22(1979b):233-61.

_____ "The Modern Corporation: Origins, Evolution, Attributes." Journal of Economic Literature 19(1981):1537-568.

Wills, Walter J. Randolph Service Company: Its Economic Impact. Washington, D.C.: USDA ACS Res. Rep. 18, 1981.

COOPERATIVES AND CONTESTABLE/SUSTAINABLE MARKETS

V. James Rhodes*

A primary reason for the organization of cooperatives by farmers has been perceived market failures. A conviction that the local farm supply business was exploiting a monopoly position or that the network of livestock markets and dealers was hopelessly inefficient often has been the rationale for establishing a cooperative. Historically there has been much acceptance of E. G. Nourse's dictum that the goal of the cooperative is to serve as a competitive yardstick--a goad to investor-owned firm (IOF) competitors to keep their costs and profits in line.

Some new developments in theory by such illustrious economists as Baumol give new emphasis to the implications of low barriers to entry and exit (Baumol, Panzar, and Willig). This literature argues that in certain conditions defined as contestable markets any type of market structure yields highly competitive results. This paper examines some of the implications of those theoretical developments for the theory of the large cooperative and for the application of antitrust laws to cooperatives.

A key element in the new literature is the idea of a "contestable market." A contestable market is one that is easily entered by new competitors. A "perfectly contestable market" has two characteristics: (1) Entrants have no disadvantages on either the cost or demand sides as compared to the incumbents and (2) exit can be costless if the entrant were to find the market unprofitable. The implications are obvious. In markets in which entrants can pounce on above-competitive profits or inefficient cost structures, those types of market failures cannot persist. Degree of market concentration does not matter if the incumbents must operate in fear of being overrun by numerous entrants. Public policy measures then focus on promoting ease of entry--and exit--rather than on degree of structural concentration.

The narrow focus of this theory must be emphasized. Its market failures arise from lack of competition. Any market failures arising from the inherent uncertainty of future events are ignored. Shaffer argues that the unique characteristics of cooperatives give them advantages in dealing with certain types of real world uncertainty. Such advantages are ignored in this analysis because the contestable markets analysis ignores them. Cooperatives are treated here solely in terms of their usefulness as a competitive yardstick.

Thus, in perfectly contestable markets, there is no special need or opportunity for cooperatives. Regardless of the fewness of IOFs serving the farm supply or marketing needs of farmers, there would be no market failures of the type that typically have called forth cooperatives.

The potential entrants serve as well or even better than cooperatives as the competitive yardstick. Of course, incumbent cooperatives certainly could continue as long as they competed effectively. Why would cooperatives ever

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have entered such a market? Presumably for historical reasons. Perhaps the market once was not contestable or was perceived that way by farmers or the farm organization that organized the cooperative.

Given the redundancy of cooperatives in perfectly contestable markets, shall we conclude that such markets are rare in agribusiness or that cooperatives no longer are needed? While a full and complete answer would require much research, it is immediately clear--and Baumol, Panzar, and Willig agree--that the assumptions for perfect contestability are demanding indeed. The traditional literature on entry has stressed the difficulties to an entrant of breaking through the web of customer allegiances to the incumbents' array of differentiated products. It appears that a perfectly contestable market must have virtually no product differentiation. Also, in a perfectly contestable market, the incumbents must have no cost advantage due to secret or patented processes or sole access to scarce resources.

Large economies of scale may limit the number of potential entrants, but they are not in themselves disadvantageous to entrants that can raise the necessary capital. Nevertheless, generally it has been argued that any entrant will hesitate to commit large capital resources if they cannot be retrieved readily. Solution of the capital retrieval problem is the essence of the costless exit assumption of perfectly contestable markets. Its proponents argue the importance of the degree to which capital is **"sunk"** in a market, i.e., the extent to which it cannot be salvaged readily through depreciation or removal to other markets or sale (at reasonably full recovery) to other firms. Their favorite example seems to be in the airlines. Planes, the largest capital item in airlines, can be moved readily from a new route (market) to other routes if that market proves to be disappointing to the entrant. The capital costs in airlines are high but the sunk costs in any given market are much lower. Consequently, airlines have moved briskly into--and sometimes out of--new markets in the recent era of deregulation.

Without significant sunk costs, the entrant is freer to switch rather than continue to fight. Incumbents find it impossible to defend above-competitive profits[1] from the hit-and-run tactics of the completely mobile entrant. On the other hand, if there will be important sunk costs, an entrant must assess the risks of taking on incumbents that may choose to fight. Incumbents can likely protect some extra profits from less mobile would-be aggressors, because the latter realize that the post-entry environment might be so inhospitable as to prevent the recovery of their sunk costs.

Contestable Agribusiness Markets

How well do the markets for agricultural commodities and farm supplies fit the conditions for perfectly contestable markets? Product differentiation does play a rather limited role in many agricultural markets because of the homogeneous nature of farm commodities and some farm inputs. Patents and the high costs of R and D deter entry into the manufacture of many farm chemical pesticides and heavy farm machinery but are not important in many other farm supplies. Fixed costs appear quite pervasive in both manufacture and

distribution of supplies and in commodity marketing. However, fixed costs are not necessarily sunk, so generalizations about sunk costs should be made cautiously. There is likely a continuum within agricultural markets with a few markets that are quite contestable (very low barriers to entry and exit), a few markets that have high barriers to entry and exit, and most markets somewhere in between.

The likely least contestable **markets--**the manufacture of tractors and complex equipments and pesticides--are markets that cooperatives have not been able to enter. Ironically, the easiest markets for cooperatives to enter are the most contestable **ones--**in which cooperatives have the least to offer as competitive yardsticks. Historically, the economic accomplishments of cooperatives have been greatest in those markets of moderate barriers--where the rewards have been worth seeking and have not been so protected that cooperatives could not achieve them. Some parts of agriculture are more vulnerable to even short-run exercise of market power than are others. Producers of highly perishable commodities are especially vulnerable to even temporary exploitation of market power by buyers. Consequently, cooperatives have been important in fluid milk handling for example.

Sustainable Market Structures

Baumol, Panzar, and Willig also introduce the concept of a "sustainable" industry structure. That is the set of firms that can supply most economically the desired industry output at a competitive price. Included are the requirements that each firm be at equilibrium and that there exist no incentive for entry. One begins by asking what is the minimum number of firms that can satisfy these conditions. In some markets, one firm may be the answer. Obviously, if one firm can supply industry demand at its minimum average costs, then two or more firms (with access to similar production functions) can do no better and must do worse if all the firms have the same textbook, U-shaped average cost curves. In fact, with significant fixed costs and a U-shaped average cost curve, one firm overloaded to some point to the right of its minimal average costs still can supply an industry more cheaply than can two underutilized firms. With the requisite information on the shape of the cost functions, one can readily determine the number of firms that provide any given output at minimum total industry costs.

Sustainability is a necessary condition for equilibrium in a perfectly contestable market. However, in markets that are imperfectly contestable, sustainability is not a necessary condition for equilibrium. For example, an efficient set of firms may enjoy higher-than-competitive profits behind an effective barrier to entry. Even an inefficient set of firms may do the same. Obviously, there are limits to the size of the profits and/or the degree of inefficiency that any given entry barrier can protect. While there is no necessity for sustainability in many real-world markets in which cooperatives may operate, the concept is useful in exploring various market possibilities for cooperatives.

Imperfectly Contestable Agricultural Markets

We turn now to imperfectly contestable agricultural markets. Structure is of little theoretical interest in perfectly contestable markets because performance is essentially perfectly competitive regardless of structure. In imperfectly contestable markets, structure makes a difference.

Natural Monopoly Markets

Consider first those markets in which a single firm is the most efficient structure. Bressler's classic studies of milk distribution in the 1950s focused professional attention on this type of natural monopoly market. Entry is not necessarily difficult, although it could be (patents, huge economies of scale, R and D costs, sole access to raw materials). Two or more firms may be competing in this market for various historical reasons. If social policy permits, a single firm eventually is likely to survive in this market because it is the most efficient industry configuration.

Under certain conditions, a cooperative is the most desirable monopoly (monopsony) in this type of agricultural market. By the imperfectly contestable assumption, the incumbent is not disciplined completely by potential entrants; it has some leeway to be inefficient and/or to enjoy above-competitive profits. If the cooperative monopoly can match the efficiency of the IOF, then it will benefit both consumers and farmers more than would an IOF monopoly. The reasons are argued in another paper (Rhodes 1983). To summarize the argument: Much of above-competitive earnings of the cooperative go to farmer-members and the latter tend to respond with larger output, benefiting consumers. This view is opposite the pessimistic scenario that a cooperative provides the direction that makes farmers into an effective output-controlling cartel. That scenario assumes that the cooperative can direct farmers and that all farmers are ready to go along with a cartel so that it has no free riders. Neither assumption is likely to be met.

Thus a cooperative monopoly may be socially desirable provided it is as efficient as an IOF counterpart. If the cooperative is substantially less efficient, the IOF may be socially more desirable.

Assuming the social desirability of the cooperative monopoly, is it likely to exist? If the earnings of an incumbent cooperative within the oligopoly behind the entry barrier re substantial, the cooperative gradually may grow to the monopoly position.[4] If there is no cooperative within the incumbent oligopoly, or monopoly, can a cooperative enter successfully? While one would hesitate to predict for any specific real-world case, because of all the uncertainties of managerial decisions and rivalrous reactions, the probabilities are on the side of the cooperative challenging the incumbent, if the entry barrier is surmountable. This type of market failure has been the traditional incentive for the organization of a cooperative.

The reasons already have been developed as to why sunk costs give pause to the prudent challenger. These reasons apply more strongly to an IOF than to a cooperative. A challenger fears being met by reduced margins--the farm

supply retailers start selling at lower prices and margins or the elevators start paying farmers more for grain and suffering reduced margins. These reactions to an entering IOF may mean substantial operating losses for an entrant and eventually an abandonment of its sunk capital. In contrast, these reactions to a farmer cooperative would help farmers as buyers or sellers even more than they hurt the margins of the cooperative. Farmers can well afford to subsidize the operations of the cooperative that has become such an effective competitive yardstick. Thus the cooperative challenger logically has less fear about incumbent reactions than does the IOF challenger. It must be admitted, however, that cooperative members may take a view more short-sighted and more self-oriented than is implied by this scenario. Their attitude may vary by the commodity produced. Those producers of perishables may count their vulnerability so high that they take the long view.

Suppose that a cooperative has successfully become the only firm in this market. It is easy to visualize some farmers organizing a second cooperative in the name of competition "to keep the cooperative management on its toes." Such an effort would be wasteful of resources because only one firm is sustainable in this market. However, some members may benefit from intercooperative competition if it can be maintained.[3]

In sum, provided the cooperative suffers no inefficiencies because it is a cooperative, it is socially desirable that it be the firm in natural monopoly markets. If entry barriers are too high, a cooperative may not be able to enter. However, a cooperative has some advantages as an entrant. If the cooperative is one of two or more incumbents in a natural monopoly market, it is a bit more likely to emerge as the sole survivor.

Natural Duopoly Markets

Suppose that two firms in a market are the most efficient structure. Possible natural duopoly configurations are two IOFs, or two cooperatives, or one of each. Farmers, for reasons enunciated earlier, would prefer one of the latter two structures. Assuming moderate to high entry barriers, the nature of the duopolistic interaction affects performance. The presence of a cooperative need not necessarily pressure down earnings. Presumably, diseconomies of scale prevent either rival from a serious attempt to grab the entire market or even a much larger market share. Diseconomies of scale is a limitation often not present in duopoly models, but it follows from the assumption that two firms are more efficient than one firm in this market. Without further assumptions, it is impossible to project the type of duopoly rivalry and performance. To the extent that the duopoly performs like a monopoly, the two-cooperative structure would be most preferable socially and the two IOF configurations would be least preferable. To the extent that the duopoly performs in a highly competitive way, there is no social preference among the three configurations of IOFs and cooperatives.

A natural duopoly market does not automatically have precisely two firms. One strong firm might be able to obtain monopoly control for a time. More probably, three or more firms might try to operate in this market. By assumption, only a duopoly structure is likely to be sustainable in a

long-run sense. Few things could be less useful to farmers than for them to try to maintain three or more cooperatives in this market. Likewise, the governing boards of two incumbent cooperatives should not permit aggressive attempts by either cooperative's management to grow at the other cooperative's expense. Such aggression would be costly to farmers in the short run and carries no promise of social benefits. Of course, normal competition between the cooperatives would be useful. The concern here is with the aggressive, vindictive competition that sometimes occurs between cooperatives.

Natural Three- to Nine-Firm Markets

Assuming that firms in some kinds of markets have average costs with a flat-bottomed section, the efficient number of firms in a market is no longer determinate. For example, three "large firms" (operating at the maximum outputs on their flat bottoms) may produce as efficiently as nine "small firms" (operating at the minimum outputs on their flat bottoms). In this case, other combinations such as one large and six small firms also would be an efficient configuration. While these assumptions may seem contrived, it appears quite possible that many oligopoly situations are of this type in which various small-number structures could be equally efficient. Particularly successful differentiation of products or services may be the key to the firms that survive or that become "large."

As in the natural duopoly, market performance may range from competitive to monopolistic (within the limits allowed by entry barriers). Farmers would likely feel the need for a cooperative competitive yardstick. One or more cooperatives of various sizes might exist. The same points made previously apply to the type of competition useful between cooperative competitors. It again is possible, although not as likely, that farmers would be organizing more cooperatives to obtain more competition when the more useful approach might be to merge small cooperative incumbents. If entry barriers are not very high, any overly optimistic assessment of opportunities may lead to the to farmers in the short run and carries no entry of too many firms (IOF and cooperatives). When there are too many firms, one or more will be operating at an output lower than permits minimal average costs. Such firms are motivated to "slug it out" for a larger, more efficient market share. The outcome is an initial underutilization of resources and the eventual loss of sunk costs for some of the contenders.

Vertically integrated processors may have economies of scale that lead to several firms in the national processing market but that encourages geographical monopsony in the assembly of farm raw materials. It would be economically sensible for farmer-members to divide up the assembly areas of their cooperatives to obtain the most efficient cooperative system. f course, farmers would have no means to guide the assembly of IOF competitors, so cooperatives would likely face one or more IOFs in their assembly territories. Such cooperative collusion would raise policy questions. It hardly could be detrimental to consumers. The key question might be one of impact on IOF competitors. Would the cost savings from a national cooperative assembly plan be sufficient to drive the IOFs out of the processing market? If so, perhaps assembly should become a monopoly of a set

of cooperatives that then dealt at arm's length with all processors--cooperative and IOF. That alternative might be feasible for some commodities and not others depending on the impact of vertical integration on transaction costs.

Natural Many-Firm Markets

Agribusiness markets in which many firms compete in exactly the same market are not common. Food service firms in larger cities is an example. Cheese plants in the Lake States may be another.

The existence of many firms suggests low entry and exit barriers and fairly (but not perfectly) contestable markets. Even though economies of scale are likely not very large, the average cost curves may have a flat section so that the most efficient number of firms is indeterminate. Both the many-firm structure and low entry barriers suggest quite competitive market performance. Consequently, cooperatives have no unique role as competitive yardsticks. Cooperatives may exist and may yield modest returns and satisfaction to their members, but their beneficial externalities are virtually nil.

Cooperatives and Economies of Scope

Baumol, Panzar, and Willig define economies of scope as those cost reductions arising from simultaneous production of several products and/or services in a firm, as compared to production of each by a separate firm. They show that economies of scope are a necessary and sufficient condition for multiproduct firms in perfectly contestable markets. Where economies of scope do not exist, then a specialized entrant will take sales away from a higher-cost, multiproduct firm. Where economies of scope do exist, the multiproduct firms outcompete the specialized firms.

The extent of economies of scope is an empirical question. While observation seems to elicit some obvious examples, generalizations should be made cautiously. Economies of scope often arise from common use of an input--a facility and/or a staff--that is used to produce one product and can produce another as well at little or no extra cost. The combination of farm supplies and grain marketing in local cooperatives appears an obvious example. In contrast, livestock and milk marketing's specialized needs have kept them as specialized activities and ordinarily in separate firms.

The nature of economies of scope at the regional level of cooperatives is less clear. Milk marketing is generally specialized, but there are exceptions. Most regional cooperatives perform multiple services and produce multiple products. Some of those regionals appear to be trending toward fewer products, but some are becoming more conglomerate. Much the same diversity as to situation and trends is evident in the IOF competitors. In perfectly contestable markets, we could be confident that efficiency prevails among the various observed configurations of specialized and multiproduct firms. In imperfectly contestable markets, efficiency may not be the only

determinant of firm configurations. One wonders what role that economies of scope are playing in the organization of regional cooperatives.

Summary

Any new theory generally causes a look at economic relationships in some slightly different perspective. The theory may be useful in causing us to ask new questions or in leading to better answers to old questions. At the same time, we must remember that the theory rests on extreme assumptions and has been subjected to searching criticism (Shepherd).

Some of the new developments in the theory of contestable markets have been used to reconsider the role of agricultural cooperatives. The conclusions must be very tentative because empirical research has not been done to answer the new questions as to how contestable are agribusiness markets. The literature presumably has the most to contribute where markets are perfectly contestable. It is doubted that many agribusiness markets are perfectly or even highly contestable.[4] Nevertheless, a study of deviations from perfect contestability leads to some insights.

The sustainability concept focuses on low production costs as being the key to long-term competitive success. This model has more to offer in the long term (say 1 to 3 decades) than in the short term. Much of the previous discussion of cooperative-IOF competition implicitly accepts the crucial role of comparative costs. While product differentiation is fairly minor in many areas in which agricultural cooperatives compete, it ordinarily does exist and its influence has been understated in the previous analysis. A higher cost firm with a superior product may out-compete its rivals. This analysis also largely ignores the important impacts that uncertainty has on firm behavior. For example, uncertainty often deters entry that would have been profitable, while it also may sometimes lead to unprofitable entry. By ignoring uncertainty, we ignore the contributions cooperatives make to farmer-members in dealing with various kinds of uncertainty. Thus the previous analysis possibly is biased toward a more restrictive role for cooperatives than would result from a more realistic theoretical model. The analysis may have more bearing on buy-sell grain marketing and farm supply cooperatives than on those cooperatives marketing perishables or specialty crops.

The sustainability concept also focuses attention on the configuration of firms that can provide the desired industry output at minimum costs. This analysis emphasizes the social wastefulness of too many competitors. It warns farmers that, for example, more farm supply firms are not necessarily better. To achieve the most economical farm supplies or the best market prices for their commodities, farmers often may need to merge cooperatives rather than encouraging competition among them. This approach focuses attention on the need for empirical research on the shapes of cost curves. Some of the more useful generalizations depend knowing whether the market is a natural monopoly, a natural duopoly, or is capable of sustaining several firms.

Notes

1. Although Baumol, Panzar, and Willig do not note the possibility, even normal competitive profits could be endangered by completely mobile entrants that have a slightly optimistic expectation about potential profits.

2. That scenario is developed in Rhodes 1983.

3. See Rhodes, 'Competition Among Cooperatives," in this volume.

4. Connor et al. argue that markets in food manufacturing are not perfectly contestable.

References

Baumol, William J.; John C. Panzar; and Robert D. Willig. Contestable Markets and the Theory of Industry Structure. New York: Harcourt Brace Jovanovich, 1982.

Connor, John, et al. The Food Manufacturing Industries: Structure, Strategies, Performance, and Policies. Lexington, Mass.: D. C. Heath and co., 1985.

Rhodes, V. James. "The Large Agricultural Cooperative as a Competitor." American Journal of Agricultural Economics 65(1983):1090-98.

_____. *Competition Among Cooperatives.** In this volume.

Shaffer, James D. "Thinking About Farmers' Cooperatives, Contracts, and Economic Coordination." In this volume.

Shepherd, William G. "'Contestability' vs. Competition.** American Economic Review 74(1984):572-87.

A GAME-THEORETIC ANALYSIS OF DECISIONMAKING IN FARMER COOPERATIVES

John M. Staatz*

Most formal models of the economic behavior of farmer cooperatives picture that behavior as deriving from the optimization of a single objective function by a single agent (as in the Helmberger and Hoos (1962) model), by a group of agents with identical goals (as in the Phillips model), or from simple, nonstrategic majority-rule voting of the membership (as in the Zusman model). Models incorporating voting assume that the distribution of members' preferences is single-peaked and no logrolling (interdependent voting) between issues takes place; therefore, no voting paradoxes arise, and the cooperative's objective is determined by the preferences of the median member. With few exceptions, formal models fail to address the issue of group choice in cooperatives whose members have at least partially divergent goals and engage in strategic behavior.

However, cooperatives face many decisions in which members' preferences cannot be assumed to be homogeneous. Examples include the pricing of different services to members, including the possibility of differential pricing based on members' patronage; the choice of what products and services to offer members; location of facilities; and the allocation of overhead costs and pool receipts. Furthermore, the preferences of management and the board of directors on many of these issues may differ from those of the rank-and-file membership. Although both the cooperative management literature and many cooperative theorists have informally discussed cooperative decisionmaking in the context of heterogeneous preferences, there is a need to develop models that explicitly address this issue and, in so doing, suggest alternative ways for cooperatives to deal with group choice.

The purpose of this paper is to discuss how game theory can be used to analyze many of the issues involving group choice in farmer cooperatives. The aim of the paper is not to develop a comprehensive theory of the behavior of farmer cooperatives in the market place but to focus on the relatively neglected issues related to group choice, which have become increasingly important as farmer cooperatives have grown and diversified in recent years. As in any theoretical paper, the purpose is not to "prove" certain relationships (that can only be done through empirical work) but to suggest hypotheses regarding them that can guide future policy and research.

Game theory addresses the issue of group choice when the preferences of the members of a group are at least partially conflicting. A major area investigated by game theory is that of nonzero-sum games, that is, games in which the interests of the members of a group, while usually not entirely coincident, are not diametrically opposed. As will become evident, most decisions in farmer cooperatives are nonzero-sum.[1]

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Two general types of group behavior are analyzable using the theory of nonzero-sum games. The first occurs when, because of high communication costs, unenforceability of contracts, lack of trust, or other reasons, members of the group eschew joint strategies and act independently; this behavior involves a noncooperative game. The second arises when members of the group can communicate and make binding commitments with one another; these situations are analyzable using the theory of cooperative games. In cooperative games, there are gains from joint action by a potential coalition of players, but the players must bargain among themselves about how the net benefits of the joint action are to be shared. Failure to agree on an allocation of net benefits among players prevents the coalition from forming (Roth). Many decisions in farmer cooperatives, such as how to allocate joint costs and pool receipts among producers of different products, can be modeled using cooperative games. Others, such as how to ensure member loyalty in a "competitive yardstick*' cooperative, more closely resemble noncooperative games because in these situations cooperative participants face individual incentives to act independently although the group as a whole would benefit from collective action.

This paper is organized into four sections. The first section discusses the application of the theory of cooperative games to the modeling of certain types of decisions in farmer cooperatives, such as how to price services to a heterogeneous membership. The second section investigates how other situations facing farmer cooperatives, such as how to maintain member loyalty and member discipline over management, can be analyzed using concepts from the theory of noncooperative games, particularly the prisoner's dilemma. The analysis in the first and second sections is based on several restrictive assumptions inherent in game theory, and the third section analyzes how relaxing those assumptions modifies the results derived earlier. A final section briefly summarizes the major conclusions of the paper.

Cooperative Behavior as a Cooperative Game

Although the preferences of different participants in a farmer cooperative are seldom strictly opposed, neither are they identical. Cooperative participants, therefore, face two interrelated questions: (1) Can the participants identify and agree on a set of objectives yielding benefits of joint action? (2) And can an allocation of the benefits and costs of this action be found that maintains the incentives of each group to participate in the activity? "The mere existence of potential gains does not necessarily mean that they can be realized. There is the problem of building an organization with sufficient cohesion to withstand the disintegrating forces arising out of conflicting interests" (Helmberger and Hoos 1965, p. 184).

The theory of cooperative games addresses the issue of group choice when the preferences of the members of a group are at least partially conflicting. Viewing the allocation of benefits and costs in a cooperative as a cooperative game focuses attention on the following questions: (1) How do the policies of a cooperative regarding the allocation of benefits and costs among the membership affect the payoffs (both pecuniary and nonpecuniary) to various potential coalitions within the cooperative? (2) And how do these

payoffs affect the willingness of various coalitions to remain active in the cooperative, as opposed to taking their business elsewhere?

Types of Bargaining Issues

In farmer cooperatives, many potential bargaining situations, such as those portrayed in the theory of cooperative games, arise. Bargaining issues between the three main actors in farmer cooperatives (farmer-members, management, and the board of directors) generally fall into one of five categories: (a) selection of products and services to be handled by the cooperative, including the choice of product quality; (b) allocation of revenues and pricing of services; (c) joint cost allocation; (d) financing of the cooperative; and (e) constitutional issues, which influence the distribution of power and decisionmaking authority within the cooperative.[2] For example, the pricing of goods and services to members can be conceived of as a bargaining game between two groups of members: those whom the cooperative can serve at relatively low per-unit costs or who have attractive market alternatives outside of the cooperative (e.g., large farmers) and those whom it is more costly to serve or who have few attractive noncooperative alternatives (e.g., small farmers). The low-cost patrons argue for differential pricing of goods and services based on the cost of service or on *'meeting the competition," while the higher-cost patrons argue for uniform pricing.

Similarly, the issue of what proportion of the cooperative's net earnings should be retained rather than rebated to members can be viewed as a bargaining game involving management and possibly the board, on the one hand, and farmer-members on the other. Management, and perhaps the board, interested in promoting growth of the cooperative may lobby for a high level of retained earnings to finance that growth while farmer-members, particularly those nearing retirement and having only a limited ability to redeem their equity in the cooperative, may argue that net earnings should be rebated to the members as cash.[3] Murray (1983a, 1983b, 1983c) examined this bargaining issue in detail in the context of British cooperatives, although not from a game-theoretic perspective.

Constitutional issues can be viewed as bargaining games that occur among various cooperative participants at the time of the writing of the cooperative's bylaws. In deciding how to vote on constitutional issues, the various participants have to project how their net returns from the cooperative will be affected by the cooperative's adoption of different organizational structures.[4]

Representing; the Gains from Joint Action: The Characteristic Function

A basic assumption underlying the analysis in this paper is that farmers engage in collective action via cooperatives because there are efficiencies in certain joint, as opposed to individual, actions. These efficiencies are represented in game-theoretic terms by a superadditive characteristic function. A characteristic function shows the minimum level of payoffs that any potential coalition of players can guarantee itself. Superadditivity of

the **characteristic function means that a single coalition of all the players ("the grand coalition**) can always guarantee itself a higher level of payoff** than can two or more disjoint subcoalitions that in total involve all the players. Mathematically, superadditivity of the characteristic function is expressed as follows:

For any two disjoint sets K and L in the set N (K,L ⊆ N, K ∩ L = 0, the characteristic function V is superadditive if

(1) V(K) + V(L) c V(K u L),

that is, if the sum of the characteristic functions of K and L is a proper subset of the characteristic function of their union. This means that K and L can always gain at least as much in total by working together as they can by working separately. This does not, however, mean that K and L will work together. For joint action to occur, not only must the total payoff to K and L be greater than the sum of the payoffs that would result from their individual actions, but both K's and L's individual shares of the joint "pie" must be greater than the payoffs each could achieve by acting independently.

In applying game theory to farmer cooperatives, one often can equate superadditivity of the characteristic function with subadditivity of the cost function. In the context of farmer cooperatives, subadditivity of a cost function means that it is cheaper to provide some service to the members of a cooperative as whole than to provide it to them individually or in subgroups. Subadditivity of a cost function is expressed mathematically as follows:

For any K,L ⊆ N, K n L = 0, the cost function is subadditive if

(2) $C(q^k) + C(q^l) \geq C(q^k + ql)$

where

C(q) is the cost of producing quantity q of the service;

q^k is the quantity of the service demanded by K; and

q^l is the quantity of the service demanded by L.

For reasons that will become apparent later, it is important to distinguish between a subadditive cost function and economies of scale. Economies of scale exist when the cost function is homogeneous of degree less than one, that is, when average cost declines monotonically throughout the range of production. The existence of economies of scale (declining average cost) is neither a necessary nor a sufficient condition for a cost function to be subadditive. In particular, a subadditive cost function can exhibit increasing average cost over a certain range of output. It is subadditivity of the cost function rather than economies of scale that makes joint provision of a service to a group more economical than providing the service to individual subunits of the group.[5]

An Example of a Cooperative Game: Cost Allocation Among a Heterogeneous Membership

An example will illustrate how the theory of cooperative games can illuminate some of the trade-offs facing participants making decisions in farmer cooperatives. This example examines cost allocation (pricing of services) in a farmer cooperative serving a heterogeneous membership and draws on a general analytic approach outlined by Faulhaber. The example assumes that farmers are profit maximizers and hence evaluate payoffs purely in monetary terms. The third section of this paper relaxes this assumption.

Consider a cooperative that provides a service to a heterogeneous set of members $N = (1, 2, \ldots n)$. For example, the members may differ in the crops they grow, their size of operations, or their time preference for money. Assume:

(a) There are economies in the joint provision of the service to the membership, i.e., the cost function for producing the service is subadditive: for any disjoint subsets S and T in the set N ($S,T \subseteq N$, $S \cap T = \emptyset$),

$$C(q^{s+t}) \leq C(q^s) + C(q^t)$$

where $C(q^i)$ is the cost of providing the quantity of services q^i to group i. For example, $C(q^s)$ is the total cost S would incur providing q^s of the service to itself; $C(q^{s+t})$ is the total cost at which S and T could jointly provide $(q^s + q^t)$ of the service. [6]

(b) Farmers in group i have only the option of purchasing q^i from the cooperative or exiting the cooperative to obtain q^i in another way, either from an investor-owned firm (IOF) or by forming another cooperative by themselves or with other disaffected members. (Allowing each group to vary its patronage with the cooperative would expand the number of strategies open to each player but would not change the basic results of the game-theoretic analysis.)

(c) For $S,T \subseteq N$, $S \cap T = 0$, the cross-elasticity of demand between q^s and q^t is zero.

The cost function for providing the service to each possible coalition in N, combined with the prices at which the service can be obtained outside the cooperative, can be used to define a characteristic function, $v(q^s)$, which shows the minimum payoff (i.e., the minimum cost of obtaining q^s) that each group S contained in N can guarantee itself, either by acting alone or by forming coalitions with other groups within or outside the cooperative. [7]

The board and management of the cooperative must decide how to allocate the cost of producing the services among the membership. Subadditivity of the cost function implies joint costs, and hence any allocation will be in some sense arbitrary (Clark). This does not mean, however, that management can allocate costs in any way it chooses; it must take into account the effect of its allocations on members' incentives to remain in the organization. If the

cost allocated to group S, $A(q^S)$, is greater than $v(q^S)$, the minimum cost that S can guarantee itself, then S has an incentive to leave the cooperative. Hence, for a cost allocation to be stable (not induce defection), the following condition must be met:

$$(3)\quad A(q^S) \leq v(q^S) \;\forall\; S \subseteq N.$$

If, in addition, the cooperative is constrained to break even, returning any surplus above cost to members, the following condition must also be met:[8]

$$(4)\quad \sum_{s \in n} A(q^S) = C(q^n).$$

Expressions (3) and (4) together define the core of the game, the set of feasible allocations that give all participants an incentive to remain within the organization. Hence, these expressions are called the "core constraints."

More than one set of cost allocations may lie within the core, and bargaining occurs within the cooperative over which set of cost allocations should be imposed. In reality, the characteristic function, $v(q^S)$, that embodies both the cooperative's cost function and the players' external market opportunities, is likely to be known only very imprecisely so the bargaining will take place in an atmosphere of uncertainty. Cooperative members sometimes may try to influence the cost allocation decisions of the board and management by issuing implicit threats and counterthreats as each group tries to obtain the best possible allocation for itself while at the same time ensuring that other members still have an incentive to remain in the cooperative.

The ability of a member or group of members[9] to obtain concessions from other members of the cooperative depends on two factors: the costs the member could impose on other members if he or she were to exit the cooperative (this determines the bargaining threat to others in the organization) and the other players' perception of the costs the member would impose on himself or herself if he or she were to leave (this determines how seriously the threat is taken).

The potential harm, h_o, member S can impose on others in the cooperative can be measured by how much the remaining members' cost of obtaining the cooperatively produced service would increase if S were to leave the organization:

$$(5)\quad h_o = [C(q^{n-s})/q^{n-s} - C(q^n)/q^n]\, q^{n-s}.$$

With S in the organization, the remaining n-s members can hope to obtain their q^{n-s} units of service at a unit cost of $C(q^n)/q^n$, the average cost of production for the grand coalition. (As will become apparent later, this hope is not always realized even if the grand coalition does form.) This unit cost would rise to $C(q^{n-s})/q^{n-s}$ if S were to leave the organization.

Similarly, the harm S would impose on himself or herself by exiting, h_s, can be measured by how S's cost of obtaining the service would increase if they left the organization:

$$(6)\quad h_s = v(q^s) - [C(q^n)/q^n]\ q^s.$$

Equation (5) states that, ceteris paribus, the more strongly subadditive the cooperative's cost function is with respect to a member's output, the stronger that member's bargaining position. Large members in cooperatives with strongly subadditive cost functions have substantial bargaining power; small members in cooperatives with constant costs have practically none.[10] This suggests that cooperatives composed of a few large members may face more disruptive, threat-filled bargaining over allocation of costs and benefits than cooperatives with many small members. Cooperatives with a few large members face an allocation problem similar to the problem of allocating costs and benefits in a cartel (Kuhn).

Equation (6) suggests that a member's threat of exit will be taken more seriously, the smaller the perceived cost to the member of leaving the cooperative. For example, a member's ability to extract concessions from the cooperative would be lower if he or she faced stiff penalties for defection (e.g., forfeiture of accrued retains) than if not.

In the bargaining process, a member may argue that he or she should bear only the incremental cost of providing services to them, i.e., for $S \subseteq N$,

$$(7)\quad A(q^s) = C(q^n) - C(q^{n-s})\ \forall\ S \subseteq N.$$

Paying according to incremental costs may appear fair and is the rule that would result from a linear programming approach to pricing cooperative services (see Hardie). Unfortunately, such an allocation scheme may not always be stable.

Assume that the cooperative is composed of four groups of members, B, S, G, and P. For example, the cooperative might provide processing and marketing services to producers of Beans, Spinach, Grapes, and Peaches. Assume that the cooperative has the following subadditive cost function (zeros can be added to the figures to lend more realism):

$$(8)\ C(q^b) = C(q^s) = C(q^g) = C(q^p) = \$300$$

$$(9)\ C(q^{b+s}) = C(q^{g+p}) = \$410$$

$$(10)\ C(q^{b+g}) = C(q^{b+p}) = C(q^{s+g}) = C(q^{s+p}) = \$500$$

$$(11)\ C(q^{b+s+g}) = \$600$$

$$(12)\ C(q^{b+s+p}) = C(q^{b+g+p}) = C(q^{s+g+p}) = \$650$$

$$(13)\ C(q^{b+s+g+p}) = \$810.$$

A cost function like this might arise in the following way. If each group of producers built its own processing plant, each could process its product at a cost of $300. If the vegetable growers (B and S) jointly processed their products they could do so at a total cost of $410, as could the fruit growers (G and P) if they processed jointly. There also would be some savings if one group of vegetable growers (e.g., B) combined with one group of fruit growers (e.g., G) for joint processing. Their total cost of production, $500, would be higher than that of the joint fruit or the joint vegetable operations, however, due to their inability to share certain costs that are joint in those operations (e.g., the cost of syrup in an integrated fruit canning operation). Assume that if three products are processed jointly, the cooperative has to expand its warehouse. Suppose that this can be done on land immediately behind the current plant that would otherwise be used for burying or burning peach pits. If peaches are not processed by the cooperative, this poses no problem, and the combined cost of processing and marketing beans, spinach, and grapes becomes $600. If, however, peaches are processed, the pits have to be hauled away, raising the price of processing any three-product combination including peaches to $650. Finally, assume that even with hauling away the peach pits, all four products can be jointly processed in a single plant for $810.

Because of the subadditivity of the cost function, there are potential joint benefits from processing all four products in a single plant. The board and management are faced with determining a set of cost allocations, $A(q^i)$, that will cover the $810 total cost of producing the service for all members while still giving all members an incentive to remain in the organization.

Note that charging all members the same cost for the service is infeasible; if each were charged the average cost of $202.50, B, S, and G would have an incentive to form their own cooperative and produce the service for a total cost of $600, or an average cost of $200. Some sort of differential pricing is required to hold the coalition together, in which P is forced to pay more than the average cost and B, S, and G pay less.[11]

Will pricing according to incremental cost work? The incremental-cost pricing rule (7) and the break-even constraint (4) imply that:

$$(14)\quad A(q^b) + A(q^s) + A(q^g) + A(q^p) = \$810$$

$$(15)\quad A(q^i) \geq \$110 \text{ V } i$$

$$(16)\quad A(q^b) + A(q^s) \geq \$300$$

$$(17)\quad A(q^g) + A(q^p) \geq \$350.$$

Applying the incremental cost rule $A(q^i) \geq \$110$ may not lead to a stable coalition. For example, the allocations $A(q^b) = A(q^s) = \$120$ and $A(q^g) = A(qp) = \$285$ satisfy both (14) and (15), yet under this set of allocations G and P have a clear incentive to break away from the cooperative because they could jointly produce the service for $410, an average cost to them of $205. The existence of costs that are joint among a proper subset of players (rather than being purely attributable or joint among all players)

implies the need to test whether that subset, as well as the individual players, are paying their full incremental cost (Faulhaber).

In certain instances where the average cost of producing the service first decreases then rises, there may be no stable allocation of costs (the core may be empty). For example, if equations (11) and (12) are replaced with

$$(11a)\quad C(q^{b+s+g}) = C(q^{b+s+p}) = C(q^{b+g+p}) = C(q^{s+g+p}) = \$600$$

(that is, if peach pits can be disposed of at no cost in the three-product plant), then the binding core constraints become:

$$(18)\quad A(q^b) + A(q^s) + A(q^g) \leq \$600$$

$$(19)\quad A(q^b) + A(q^s) + A(q^p) \leq \$600$$

$$(20)\quad A(q^b) + A(q^g) + A(q^p) \leq \$600$$

$$(21)\quad A(q^s) + A(q^g) + A(q^p) \leq \$600 \text{ and}$$

$$(14)\quad A(q^b) + A(q^s) + A(q^g) + A(q^p) = \$810.$$

Adding (18) through (21) yields

$$3[A(q^b) + A(q^s) + A(q^g) + A(q^p)] \leq \$2,400,$$

or

$$(22)\quad A(q^b) + A(q^s) + A(q^g) + A(q^p) \leq \$800$$

which contradicts (14). Hence, although there are economies in the joint provision of the service to all participants, given this cost function, the core constraints are such that there is no possible cost allocation that does not give someone the incentive to leave the cooperative.

This model illustrates the following points:

(1) In certain circumstances, differential pricing of services to members is necessary to preserve the stability of the cooperative. The differential pricing must reflect both how a member's patronage affects the cooperative's cost function (this is just an extension of the service at cost principle) and the member's strategic opportunities for obtaining the service outside the cooperative.[12] This suggests that large members in cooperatives with strongly subadditive cost functions may be particularly successful in extracting price concessions from the cooperative. However, small members may oppose granting price concessions to larger members for fear the concessions will simply reinforce the competitive advantages of larger operations. In addition, income tax provisions (e.g., section 521) may limit the degree to which cooperatives can price discriminate among their members.

(2) Even if a cooperative does decide to price discriminate among members, if there are costs that are joint among a proper subset of members, the

cooperative cannot simply adopt an incremental cost rule for setting prices as this can give some members incentives to leave the organization. Thus setting their own cooperative and produce the service for a total cost allocations can be a complex process, and it is problematic whether a feasible allocation could be determined on a simple one-member/one-vote basis.

(3) Although differential pricing of services to members may be necessary to preserve the stability of cooperatives that have highly heterogeneous memberships, instituting such pricing usually requires a vote of the board, which, if elected on a one-member/one-vote basis, may be controlled by smaller-volume patrons. If small patrons steadfastly oppose differential pricing, large members may exit the cooperative unless voting rules are changed to increase the political power of the larger patrons. Caves and Petersen (appendix A, p. 1) report some evidence that such a reallocation of political power has occurred in cooperatives with heterogeneous memberships, noting that the one-member/one-vote rule prevails in only 71 percent of large, predominately federated cooperatives (whose members are likely to be diverse) compared with 92 percent of local cooperatives.

(4) In situations where a cooperative's average cost of providing a joint service first decreases then increases, there may be no allocation of costs that gives everyone an incentive to stay in the organization. This suggests that cooperatives need to be very careful in deciding when to expand their membership and/or their mix of activities, expanding only when there are clear synergies that allow the organization to hold down its average costs. The impossibility of finding a stable allocation of costs among a heterogeneous membership may prevent cooperatives from "doing all things for all people."

(5) If the core of the game is not empty, there may be more than one feasible allocation of costs, and the management and the board must somehow choose a fair allocation. The model presented here simply states that the final allocation must lie within the core; it does not specify where within the core the optimal allocation lies. In other words, although game-theoretic considerations establish a feasible region within which prices must be set, costs allocated, or product mix determined, exactly where within that region the final decision falls may depend on factors such as the internal politics of the cooperative or the board's conception of what a "fair" solution should be. Game theorists have proposed alternative solution concepts for choosing among different allocations within a core, with each solution concept embodying a different concept of fairness (see Staatz 1984, appendix C). For instance, the Shapley value approach, which allocates to each coalition its "average marginal cost,"[13] would in the this example lead to the following cost allocation:

$$A(q^b) = A(q^s) = A(q^g) = \$198.33, \text{ and}$$

$$A(q^p) = \$215.00.$$

Examination of these solution concepts may be useful in helping to determine equitable cost allocations.

(6) Failure to choose an allocation that lies within the core can lead members to exit the cooperative. Game-theoretic analysis could help management predict which allocations would induce defection and which would not. In determining the cost functions facing cooperative participants (which in turn largely determine their characteristic functions), economic engineering approaches may be particularly useful (see French).

(7) The model suggests that if dissatisfied members do not leave the cooperative, bargaining over allocations of costs and benefits can be intense and bruising. Reality, however, may not be so harsh. Participants are likely to know only very imprecisely the costs (payoffs) of the alternatives open to them, and the board and management may be able to influence their estimates of those costs (e.g., through member relations programs). In this sense, uncertainty about what is in one's best interest may reduce conflict in the cooperative. To the extent that-members receive nonpecuniary benefits from remaining in the cooperative, bargaining over the allocation of monetary benefits and costs in the organization may also be muted. These possibilities are examined in the third section of this paper.

(8) Another important way in which management and the board can facilitate agreement on allocation of costs and benefits is through devising ways to convert apparent zero-sum games among the membership into nonzero-sum games, thus expanding the potential core of the game. For example, allocation of receipts from a marketing pool among producers of different commodities (say, X, Y, and Z) may appear to be a zero-sum game if viewed in the context of a single year; whatever is gained by producers of X is lost to the producers of Y and Z. However, if the producers can be convinced to take a multiyear perspective, the game becomes nonzero-sum. Unless management or the board has strict control over potential supplies, allocating excessive returns to X may lead (via the supply response for X) to excessive inventories of X in coming years, reducing the net returns available for distribution among all producers in subsequent years. A more "balanced" allocation in the current year may lead to improved profit possibilities for all producers in subsequent years, implying joint gains from a coordinated allocation strategy. Documenting the possible consequences of adopting extreme bargaining positions may be an important way in which management can facilitate agreement. Another way of converting zero-sum games to nonzero-sum games is by "logrolling"--tying the negotiation of one issue to another, so that the scope for trade-offs, given divergent member preferences, is expanded (Raiffa; Buchanan and Tullock, chaps. 10-11).

Cooperative Behavior as a Noncooperative Game: Prisoner's Dilemmas in Farmer Cooperatives

In certain circumstances, participant behavior in a farmer cooperative more nearly resembles a noncooperative game, particularly a prisoner's dilemma.[14] In a prisoner's dilemma, the "rational" pursuit of individual self-interest leads to a Pareto-inferior outcome.

Formally, a prisoner's dilemma is defined as a game that has a payoff matrix of the form shown in figure l(a). Each player has two possible strategies,

Figure l--Payoff matrices for a prisoner's dilemma

		Player B: A	Player B: B
Player A	C	(a_{11}, b_{11})	(a_{12}, b_{21})
	D	(a_{21}, b_{12})	(a_{22}, b_{22})

where $a_{21} > a_{11} > a_{22} > a_{12}$ and $b_{21} > b_{11} > b_{22} > b_{12}$

(a) Generalized form of the game, with payoffs in expected utility

		Player B: A	Player B: B
Player A	C	(8,8)	(4, 10)
	D	(10,4)	(5,6)

(b) Numerical example, with payoffs in expected utility

cooperating with the other player (C) or defecting (D) and acting independently.[15] Although the payoffs to each player are higher if they both cooperate (strategy pair C,C) than if they both defect (strategy pair D,D), the incentives facing the players are such that each has an individual incentive to defect although each knows that their opponent is acting similarly. For example, in the prisoner's dilemma illustrated in figure l(b), the payoff to player A always is higher if he or she defects, no matter which strategy player B selects. If B chooses to cooperate, A's payoff increases from 8 to 10 if he or she defects rather than cooperates. If B chooses to defect, A's payoff increases from 4 to 5 if he or she also defects. B faces a similar set of incentives. If both players defect, however, they are both worse off than they would have been if they had both cooperated, as they receive payoffs of (5,6) instead of (8,8).[16]

Two characteristics of a prisoner's dilemma lead to this Pareto-inferior result. First, the players are unable to communicate with one another and make binding commitments regarding mutually advantageous joint strategies. Second, the prisoner's dilemma usually is pictured as an isolated game, played only once by the participants. The behavior of the players in this game is in no way linked to their behavior in other games--the players have no concerns about developing or preserving their reputations as reliable partners, etc. However, if players face recurrent prisoner's dilemmas, patterns of cooperation among the players may evolve. This has been shown both experimentally and theoretically (Raiffa, pp. 123-26; Schotter).[17]

A wide variety of situations in farmer cooperatives, ranging from pricing and output decisions to problems of inducing members to participate adequately in the governance of the cooperative, appear at times to resemble prisoner's dilemmas. For example, given an inelastic demand for its product, a cooperative's revenues would increase if the cooperative restricted output; yet because the organization's net earnings are rebated to its members in proportion to their individual production, each member has an incentive to expand output, thereby undercutting the cooperative's attempt to restrict supply. Provision of certain public goods by cooperatives--more competitive input and output markets, lobbying, and so on--also may resemble a prisoner's dilemma (see Staatz 1984, chap. 4).[18] As with all public goods, a free-rider problem exists: An individual need not join or patronize the cooperative to enjoy all these benefits. However, failure to patronize the cooperative may lead to a long-term decline in the organization's ability to provide these goods, Rhodes (1978) also has suggested that farmer-members often may fail to oversee and discipline cooperative management adequately due to a free-rider problem:

> Seldom does any cooperative member have an economic self-interest for trying to discipline management. His potential costs exceed his potential benefits. While all members together may have an economic incentive, the rational choice is for each individual to hope the others make the effort while he reaps the benefits. (p. 223)

However, the usefulness of the static prisoner's dilemma model to analyze cooperative loyalty, the output decisions of farmer cooperatives, and problems of disciplining management is problematic because the standard

prisoner's dilemma is pictured as a one-time game in which players are given the choice of cooperating or defecting and in which there are clear individual incentives to defect. Because they play the game only once, players are not concerned with maintaining their reputations as reliable partners; even if they defect they will not face retribution from their partners in subsequent periods. In reality, farmers do not face a one-time decision of whether to join and support a cooperative (or to support its decisions); that choice is continually before them. Reputations clearly do matter; cooperatives may expel habitually "noncooperative" members even if doing so imposes some short-term cost on the remaining members.

If a single-period game (called a constituent game) is infinitely iterated, a new game is defined (called a supergame), in which the payoffs are the net present values of the stream of payoffs from the constituent games. Several authors (e.g., Taylor; Schotter; Axelrod and Hamilton) have shown that even if the constituent game is a prisoner's dilemma, the supergame need not be.[19] The result depends critically on five elements:

1. The length of the supergame (the supergame must be of infinite duration or at least of a duration unknown in advance to the players);

2. the reaction of the players to a defection by one of their number;

3. the rates of time preference by the players;

4. the relative size of the payoffs for defection and cooperation in the constituent game; and

5. the number of players in the game.

A supergame of known duration composed of constitu t games that are prisoner's dilemma is itself a prisoner's dilemma.[SF] Similarly, the supergame will be a prisoner's dilemma if players who do not defect fail to punish in subsequent iterations of the game those who do; unconditional cooperation in a prisoner's dilemma supergame is never an equilibrium strategy.[21] In addition, even if there is punishment for defection, the supergame still may be a prisoner's dilemma if players have sufficiently high discount rates; given a high discount rate, the gain to a player in the current period from defection may be greater than the discounted value of the punishments consequently inflicted. Related to this are the relative size of the payoffs for cooperation and defection in the constituent game. The higher the return to defection relative to cooperation in the constituent game, ceteris paribus, the more likely the supergame is to be a prisoner's dilemma. Finally, the larger the number of players, the more likely it is that a supergame composed of prisoner's dilemma constituent games will itself be a prisoner's dilemma. For conditional cooperation to be a rational behavior in an n-person prisoner's dilemma supergame, each player must know how many other players cooperated in the previous iteration of the game and each cooperating player's discount rate must lie below a certain level (Taylor, chap. 3 and pp. 92-93). Both conditions are more likely to prevail in a small group than in a large one.

If the problem of maintaining loyalty to a farmer cooperative (or to its price and output decisions) is truly a prisoner's dilemma supergame, then the previous analysis suggests the following hypotheses:

(1) Cooperative loyalty is greater among those who will be farming for an indefinite period compared to those who are close to leaving farming, provided there is no way for the individual leaving farming to continue to benefit from the existence of the cooperative (e.g., through capitalization of the value of the cooperative into the value of the member's land, through a "pension" provided by the retirement of the member's accrued equity in the organization, or through utility derived from supporting a cooperative with which one has had a long association or from passing on a viable farming operation to the member's heirs).[22] If those leaving farming will have no further payoffs from the cooperative once they leave, they have no incentive to remain loyal to it as they near their retirement; in the short run, defection is always the dominant strategy.

(2) Cooperative loyalty increases as the penalties for disloyalty are increased. Although this is hardly a surprising hypothesis, it is sometimes ignored by cooperative-practitioners. If cooperatives do indeed provide public goods, then theory suggests that it may be too easy for members to leave cooperatives. Although managers of cooperatives sometimes express astonishment that members who have substantial investments in a cooperative are not more loyal to the organization, in many instances the member's return on investment is only weakly conditional on continued patronage.[23] Cooperative members may rationally regard their investment in the organization as a sunk cost and therefore not take it into account in making current decisions. This implies that cooperative loyalty might be increased by making the return on past investment more conditional on current patronage. Doing so also might increase the use of member voice relative to exit in disciplining management (Hirschman).

(3) A farmer's cooperative loyalty decreases as he or she becomes more leveraged. Highly leveraged farmers are likely at times to face severe cash-flow difficulties and therefore have a high discount rate. As agriculture relies increasingly on purchased inputs and, as a consequence, farm borrowing increases, one would therefore expect a secular decline in cooperative loyalty. In addition, the widespread notion that young farmers as a group display less cooperative loyalty than older farmers may in part be attributable to younger farmers being more highly leveraged than their older counterparts. In a cash flow bind, many young farmers may not be able to afford cooperative loyalty if more favorable prices or credit terms are available elsewhere.[24]

(4) Cooperative loyalty is greater in small cooperatives than in large ones. It is more likely that members of a cooperative will develop concerns for the welfare of their co-members if the group is small and they get to know each other intimately. Developing a degree of altruism regarding the payoffs to the other players in a game can transform it from a prisoner's dilemma to a game that does not have a Pareto-inferior outcome.

Some Qualifications to the Game-Theoretic Analysis: The Roles of Transaction Costs and Ideology

Although game-theoretic analyses generate many intriguing hypotheses regarding farmer cooperatives, such analyses are built on several restrictive assumptions. Game theory assumes that all players know: (a) the rules of the game, (b) all the other players' preferences, and (c) the relationship between all the players' actions and the outcomes of the game (or at least a probability distribution for those outcomes). Knowledge of the relationship between actions and consequences implies that players have perfect foresight (at least up to a probability distribution) and that in cooperative games players can instantly and effortlessly evaluate the payoffs from joining all possible coalitions and engaging in all possible strategies open to them. Game theory further assumes that players face no other transaction costs in carrying out their strategies, such as the costs of building coalitions and enforcing agreements, and that the preferences of all players are immutable. These assumptions are patently unrealistic. This section analyzes how substituting more realistic assumptions regarding information costs, actors' knowledge and computational abilities, other transaction costs, and the possibility of changing players' preferences through the inculcation of a "cooperative ideology" modifies the game-theoretic analysis presented in the first two sections. The first part of this section discusses how imperfect knowledge and transaction costs affect the conclusions drawn from the theory of cooperative games while the second part examines how the conclusions derived from the theory of noncooperative games (especially the prisoner's dilemma) are modified once one takes into account the efforts of farmer cooperatives to influence the preferences of their members.

Limitations of the Perfect Knowledge Assumption

Shubik has shown that the costs of gathering, storing, and processing information and negotiating an agreement in an n-person cooperative game all increase in proportion to a number raised to the nth power. For example, in a two-person cooperative game in which each player has 10 alternative strategies, each player must evaluate 100 (10^4) possible outcomes of the game. If the number of players increases to 10, the number of possible outcomes to be evaluated increases to 100,000,000,000 (10^{10}). Even if a player could gather, without cost, information on all these possible alternatives, evaluate them, and store the results, he or she also would have to negotiate potential agreements with all possible coalitions, the number of which also increases as a power of n. The costs of doing all this seriously draw into question whether bargaining situations involving more than two players really resemble the scenarios portrayed by the theory of cooperative games. In Shubik's words, "By attaching even slight costs to the acts of storing, gathering, and processing information, any firm can compute that cost of getting anything like complete information will be astronomical" (pp. 148-49).

Shubik concluded that because of these information costs, players often act noncooperatively, eschewing negotiation with one another over joint strategies in favor of the informationally more efficient strategy of acting

independently. Cooperative games, he argued, are thus replaced by the noncooperative games that underlie them.

Whereas Shubik argued that information costs reduced the scope for agreement in cooperative games from that predicted by theory, Schotter and Schwodiauer (p. 509) hold just the opposite view. Because of transaction costs, they argue, it is unlikely that all possible coalitions that might block an imputation will form; hence the core (the zone of agreement) will be larger than theory suggests.

In farmer cooperatives, both the outcome predicted by Shubik and that predicted by Schotter and Schwodiauer appear to occur depending on the circumstances. In many instances (e.g., pricing of products), members do not vote on every alternative open to them; rather the cooperative establishes a rule (e.g., that fertilizer will sell for $x per ton subject to a possible price adjustment via a patronage refund) that provides each member with a low-cost set of expectations regarding the outcome of the cooperative's actions. Given this set of expectations, the members can then each act independently as they would in a competitive market. They act, in other words, as they would in a noncooperative game in which the price of fertilizer was given exogenously.

In other circumstances, particularly those concerning major decisions for the cooperative such as whether to merge with another cooperative, the members do negotiate with one another and vote. However, they do not consider all the alternatives open to the cooperative, however, only a select few. Although the game still is cooperative, it is a much simpler game than that predicted by theory.

Determining who establishes the rules in these noncooperative games and who selects the alternatives to be considered in the (simplified) cooperative games is important to understanding the behavior of farmer cooperatives. The rules determine what the "independent" actors in a noncooperative game have to take into account in planning their behavior and hence how they interact with one another. Similarly, the agenda that is established in a bargaining (cooperative game) situation largely conditions the outcome of that bargaining.

Because of information costs and other transaction costs, the highly elaborated bargaining game predicted by the theory discussed in the first section is replaced by two interlinked games. The first, a cooperative (bargaining) game, can be called a constitutional game. In it, the rules of the cooperative are established, including pricing rules, rules that determine who sets the agenda for subsequent bargaining issues among the members, and so on. Even in the constitutional game, not all alternatives are considered; limits imposed by the external environment (competition in the industry, laws governing the structure of farmer cooperatives, and so on) and the knowledge and imagination of the members determine the alternatives considered. The second, or consequent game, consists of the noncooperative game or the simplified cooperative game already discussed. In this game, the cooperative members either act independently, taking the rules or prices determined earlier as given (as in the fertilizer example) or bargain over a

restricted set of alternatives that was delimited in the preceding constitutional game.

Stating that the fully elaborated game predicted by theory is replaced by a constitutional game and a consequent game is simply another way of saying that in the presence of transaction costs there are economies in moving from decisionmaking based on direct democracy (the fully elaborated game) to a system of representative governance (the two subgames) (Staatz 1984, pp. 147-48; Buchanan and Tullock, p. 6). In such a system, the outcome of the constitutional game largely conditions the outcome of the consequent game. Therefore, understanding the behavior of a particular farmer cooperative requires an understanding of its rules for making rules and how these influence who participates in the governance of the cooperative.

It is reasonable to assume that members decide whether to participate in a cooperative's governance based on their perceptions of the costs and benefits to them of participating. The existence of transaction costs implies that participation will be concentrated among members having an intense interest in particular issues decided by the cooperative while those having a more diffuse interest will abstain, even if in aggregate they could gain a great deal from participation. The reason for this is that the transaction cost of participating in the cooperative's governance is likely to exceed an individual's potential gain from participating if he or she has only a diffuse interest in the issues being decided by the cooperative. Such individuals therefore do not become involved in the cooperative's governance although in aggregate they may represent a majority of the members.

For example, consider a cooperative that is deciding among three options: to expand its current plant at site 1, to build a new plant at site 2, or to keep its current plant at site 1 with no expansion. Expansion requires an additional subscription of capital from the members; therefore, the board will not undertake the expansion unless members express strong support for such action. Furthermore, assume that the projected net revenues from expanding the plant at the two alternative sites are comparable so that there is no clear-cut financial advantage to expanding in one site relative to the other. Therefore, the board decides that if the members are willing to finance the expansion, the board will choose the plant location based primarily on the input it receives from members. The membership consists of two groups. One group, C, has a concentrated interest in keeping or expanding the plant at site 1 while a second group, D, has a slight (diffused) preference for building a new plant at site 2. If the board hears only from members of C, it will expand the plant at site 1; if it hears only from members of D, it will build a new plant at site 2; if it hears from neither group, it will keep the current plant at site 1 unmodified; and if it hears from both groups, it will decide on the plant location through a process that gives each group a 50 percent chance of getting its most preferred alternative.

Members of C and D must decide whether to lobby for their preferred alternatives. Let the expected payoffs to individual members of C and D in the absence of transaction costs be those shown in figure 2(a). In this situation, the dominant strategy for each member is to lobby; no matter what

Figure 2--**Payoffs** for political action in-the cooperative--concentrated and diffused interests

		Member D: Not Lobby	Member D: Lobby
Member C	Not Lobby	(10,5)	(3,7)
	Lobby	(15,5)	(9,6)

(a) Payoffs without transaction costs

		Member D: Not Lobby	Member D: Lobby
Member C	Not Lobby	(10,5)	(3,4)
	Lobby	(12,5)	(6,3)

(b) Payoffs after deducting transaction costs

the opponent does, the member's payoff is always higher if he or she lobbies. The equilibrium outcome therefore is lobbying by both C and D, with C's expected payoff equal to 9 and D's expected payoff equal to 6.

Now suppose that the cost of lobbying for each -group is 3. Deducting this cost from the payoffs involving lobbying yields the payoff matrix shown in figure 2(b). In this situation, lobbying is still the dominant strategy for C--no matter what D does, C's payoff is always higher if he or she lobbies. However, D's dominant strategy now becomes not lobbying. As a result of transaction costs, the equilibrium outcome now involves only C's lobbying; hence C's most preferred outcome (expansion of the plant on site 1) occurs. Thus the existence of transaction costs reinforces the tendency of members with concentrated interests to dominate cooperative governance.[25]

This tendency is further reinforced by the value of the information generated by the cooperative during its operations. Information about developments in a subsector is valuable to farmers in that subsector and often is costly to obtain. When such information is costly, one motivation to participate in the governance of a cooperative is the prospect of gaining access to information on the subsector generated by the cooperative's management during the course of its operations.[26] The value of this information to an individual is greater the larger is his or her investment in the subsector and the poorer are his or her alternative sources of information. Large farmers, therefore, may have a C and D in the greater incentive to run for the board, to serve on cooperative committees, and so on, than do small farmers, particularly if information on developments in the subsector are not readily available from other sources.

Another consequence of transaction costs is a tendency for decisions in a cooperative, once made, to be relatively stable. Whereas game theory predicts that bargainers will recontract in an eyewink should any of them perceive the least advantage in some new course of action, in reality decisions are unlikely to be revised unless the gains from revising them clearly outweigh the transaction costs of organizing to do so. Therefore, the existence of transactions costs protects the utility of those who have the initial right to decide an issue in the organization.

Cooperative Ideology and the Modification of Member Preferences

Game theory assumes that each player has an unchanging set of preferences. However, much of the activity in farmer cooperatives is aimed precisely at changing the preferences of the participants in the organization to modify their behavior. One of the main ways in which this is done is through attempting to inculcate a "cooperative ideology" into farmer-members, members of the board, and members of management.

In many instances, the incentives facing individual participants in farmer cooperatives may induce them to behave in a way that is inconsistent with the welfare of the cooperative as a whole. Individual farmers may expand production when farmer-members as a group would benefit if output were restricted; farmers may act as free riders with respect to the cooperative's competitive yardstick activities, leading to a long-term decline in the

cooperative's ability to carry out those activities; managers may attempt to conceal their activities from the board through manipulation of information; and individual board members may attempt to use their positions to feather their own nests rather than to improve the welfare of the members.[27] Such a divergence between individual and group incentives is not unique to cooperatives; it is faced to some degree by all organizations. As an adaptive response to this problem, most organizations attempt to inculcate an organizational ideology--a set of shared norms and beliefs--that tend to reduce the divergence between individual and group goals (Roberts).

In terms of the game-theoretic model, the function of cooperative ideology is twofold. First, it aims at altering players' perceptions of the payoffs of the constituent games that they play. (Game theory assumes that players evaluate these payoffs in terms of utility, not just money.) Specifically, cooperative ideology, which is fostered both through formal programs, such as member relations activities and board and management training sessions, and informal socialization processes, attempts to:

(1) Change farmer-members' expectations regarding the pecuniary payoffs that would be available to them with and without the cooperative. Member relations programs often stress the importance of cooperatives in enforcing competition and suggest that if they are not supported farmers will be much worse off in the future.

(2) Influence participants' marginal rates of substitution between the pecuniary and nonpecuniary benefits they derive from membership in the cooperative. Cooperative ideology often stresses cooperation as a goal in and of itself, being as worthy of a person's efforts as striving for material advantage. At the same time, this ideology tries to reduce the marginal utility that members of the organization receive from pecuniary benefits they receive "unethically"--for example, from using their position of authority in the cooperative to benefit themselves financially at the expense of others in the organization.

(3) Induce a degree of altruism in players' evaluation of the payoffs from the constituent games, that is, broaden a player's evaluation of the outcome of a game to include not only how well he or she fares personally but also how well his or her cohorts make out. Cultivating concern for others in the cooperative may help overcome potential prisoner's dilemmas. This can perhaps be seen best through an example. Suppose that initially the payoff matrix facing two typical cooperative members is that shown in figure 3(a), which represents a prisoner's dilemma. Both player 1 and player 2 can choose between cooperating (C) and defecting (D), and each has a clear incentive to defect. However, when both defect, the outcome (1,1) is mutually less preferred than the outcome (5,4) that would have been obtained had they both cooperated. Now suppose that through the inculcation of a new ideology each player develops a degree of altruism, viewing his or her payoffs in utility as the average payoff in the original game to both himself or herself and his or her cohort. This results in a transformed game having the payoff matrix shown in figure 3(b). In this game, mutual cooperation is the equilibrium outcome. That is, through the introduction of a sufficient degree of

Figure 3--Transformation of a prisoner's dilemma through introduction of a degree of altruism

		Player 2 A	Player 2 B
Player 1	C	(5,4)	(0,7)
	D	(7,0)	(1,1)

(a) Original game

		Player 2 A	Player 2 B
Player 1	C	(4.5,4.5)	(3.5,3.5)
	D	(3.5,3.5)	(1,1)

(b) Transformed game

altruism, the game is transformed from a prisoner's dilemma into a game in which cooperation spontaneously occurs.[28]

The second major aim of cooperative ideology is to decrease the discount rate members use to compare the payoffs from sequential constituent games in supergames. As mentioned before, the higher the discount rate the more likely it is that a supergame composed of constituent games that are prisoner's dilemmas will itself be a prisoner's dilemma. For example, members with high discount rates often are "unable to afford cooperative loyalty" --therefore much of the socialization process in cooperatives aims at trying to get farmer-members and board members to take a long view of the cooperative's activities. By reducing the member's discount rate, cooperative ideology discourages short-term opportunistic behavior in favor of long-term support for mutual cooperation.

If ideology is an adaptive response by an organization to the problems it faces, then that ideology needs to evolve as the problems change. An ideology that is incongruent with the problems faced by an organization is ultimately maladaptive. But because ideology that has been incorporated into an individual's set of values seems so "natural" and self apparent, the need for its change often is perceived only gradually and therefore the ideology is likely to change very slowly. Attempts to change elements of an organization's ideology rapidly may meet bitter resistance from certain participants, as has occurred in some cooperatives when differential pricing of services to members was proposed, although, as demonstrated in the first section, such pricing is sometimes necessary to preserve the viability of the cooperative.

Summary and Conclusions

Game theory, with its emphasis on decisionmaking under conditions of mutual interdependence and on the allocations of costs and benefits from joint activity, is particularly suited to examining the behavior of participants in farmer cooperatives. Many decisions in these cooperatives resemble the bargaining situations analyzed by the theory of cooperative games, where joint action yields mutual benefits but where players must agree on how to share those benefits before the joint action can be undertaken. Other decisions facing participants in farmer cooperatives, particularly those in which agreements among the participants are difficult to enforce, more closely resemble noncooperative games, especially the prisoner's dilemma supergame. Although the examples in this paper have focused mainly on the pricing decisions of cooperatives, game theory offers insights into a broad array of issues involving collective choice in cooperatives, ranging from the financing practices of the firm to member control over management (see Staatz 1984, chap. 5).

The game-theoretic approach developed in this paper stresses that farmer cooperatives cannot always singlemindedly pursue the simple objectives posited in earlier models of cooperative behavior, such as maximization of total member profits or maximization of per-unit cooperative surplus, because doing so may result in a distribution of member benefits that creates

incentives for certain members to leave the organization. For a similar reason, a cooperative may not be able to serve everyone; tensions over cross-subsidies among a highly diverse membership may prove too disruptive. Rules such as "equal treatment for all" may in certain circumstances result in no service for anyone as they precipitate the disintegration of the organization.

The game-theoretic approach also emphasizes that apparently irrational behavior by cooperatives may result from individual participants rationally pursuing their own self-interest. For example, consider intercooperative competition. Farmer cooperatives often fiercely compete with one another, even when they are owned by the same farmers (Ratchford; Swank). Although greater collaboration would seem to be in the long-term interest of the farmer stockholders, competition persists because individual incentives push managers, board members, and stockholders to encourage it. Although managers and board members may desire some reduction in intercooperative competition, they are likely to oppose taking collaboration to its logical extreme, merger, unless they are assured that they will retain positions of authority in the new organization. Farmer-members may prefer intercooperative competition for several reasons. If competing cooperatives cross-subsidize certain services (particularly if different cooperatives subsidize different services), then members can act as "cherry pickers," buying from each cooperative its subsidized services and purchasing the other services (those that provide the subsidies) somewhere else. Second, if the cooperatives' equities are not freely redeemable, then members, particularly those nearing retirement, may have no way in the short run of gaining access to their accrued investment in the cooperative except through pressuring management to liquidate some of the cooperative's assets, the proceeds from which would be distributed to current patrons.[29] One way of liquidating a cooperative is to push it into ruinous price wars, which generate short-term gains to the members in the form of more favorable prices at the expense of the long-term viability of the organization. Third, members who feel distant from the board and management, particularly in large cooperatives, may feel that intercooperative competition is the only way in which the board and management can be effectively disciplined. These members might prefer better direct member control of the board and management to ensure the firm's efficiency (but then again they might not, given the individual costs of monitoring the organization), but lacking direct member control, intercooperative competition may be seen as the only way to keep the people at the top on their toes. The game-theoretic approach stresses that if "wasteful" intercooperative competition is to be reduced, the incentives facing individual participants in the cooperatives must be changed.

Introducing transaction costs and the possibility that participants' preferences can be changed through the inculcation of "cooperative ideology** modifies some of the conclusions of the game-theoretic analysis and stresses the need to understand the rules for making rules in farmer cooperatives. It also stresses the important role that socialization processes and member relations programs may play in successful farmer cooperatives. However, many of the major conclusions of the game-theoretic analysis remain valid. The concept of the core continues to be particularly important: To prevent a proposed allocation of costs and benefits in a farmer cooperative from

inducing defection, careful attention has to be given to the payoffs facing individual members.[30]

Furthermore, the game-theoretic approach emphasizes that in certain circumstances what is good for the individual cooperative participant (farmer-member, board member, or manager) may not be good for the organization as a whole; this often is due to the free-rider problem inherent in many of the activities undertaken by cooperatives. Therefore, if cooperatives are to succeed in fulfilling what is often an important social role, there may be a need to develop rules that limit individual choice within the organization to prevent it from being undermined. This is a delicate task because if taken to an extreme it would eliminate member exit as a means of disciplining the board and management. Nonetheless, this analysis shows that unfettered individualism in cooperatives may leave all members worse off than if defecting from the cooperative were more costly in the short run.

Notes

1. For formal definitions of the game-theoretic terms used in this paper, see Luce and Raiffa; Bacharach; Taylor; or Staatz 1984, appendix C.

2. For a compilation of these bargaining issues, see Staatz 1984, pp. 226-32.

3. If, however, retained earnings are used to retire member equities rather than to finance growth of the cooperative, older members may prefer a high level of retained earnings.

4. The best-known application of game theory to analyzing the choice of constitutional issues is Buchanan and Tullock's The Calculus of Consent, especially chaps. 11 and 12. There is a fundamental difference between the type of game analyzed by Buchanan and Tullock and those discussed here. Buchanan and Tullock analyzed constitutional choice in a democratic entity from which exit was essentially impossible; therefore, the criterion for group choice in their model was majority rule. Exit is possible from farmer cooperatives; farmer-members who strongly disagree with some collective action taken by the organization (e.g., its pricing practices) are free to leave the organization. The criterion for group choice in these games, like that in all "classical" bargaining games (Roth), is therefore unanimity; if all members of a potential coalition are not at least as well off as they could be in some other arrangement, the coalition will not form.

5. For a detailed discussion of the relationship between subadditivity of a cost function and economies of scale, see Baumol, Panzar, and Willig, chap. 7.

6. The cost functions presented in this section represent the cost to a given group (coalition) of farm firms of obtaining a particular service. Hence, the cost function represents the cooperative's cost of

producing the service plus any additional costs incurred by the member firms in gaining access to the service.

Because the cost function is subadditive, the model applies only to situations where reducing the size of the cooperative or its range of services would result in an increase in costs for the remaining members or for providing the remaining services. The model does not apply to situations where a cooperative's elimination of unprofitable lines of activities leaves the remaining patrons better off. In that situation, the dilemmas outlined here do not arise; pressure both from the patrons who generate positive net margins for the cooperative and from the competitive environment may lead management to eliminate the unprofitable activities.

7. Payoffs usually are pictured in game-theoretic models as payments to players while here they are payments by players. Formally, the correspondence to standard theory can be made by changing signs (i.e., payoffs become negative revenues) and thereby reversing the direction of all inequalities.

8 In farmer cooperatives, the entire surplus above cost is not returned to the members as cash; some is kept as operating reserves. The decision on how much of the surplus to pay out as cash is itself a bargaining issue that can be analyzed using a game-theoretic model (see Staatz 1984, pp. 253-63).

9 In the following paragraphs, the term "member" should be interpreted as signifying either a single member of a group or members acting as a coalition.

10 This conclusion is strengthened even further if we assume that small farmers are more risk-averse than large farmers. If large farmers are less risk-averse, they would be more willing to gamble in the bargaining process than would small farmers and would therefore drive a harder bargain, particularly if (as game theory assumes) the larger farmers are aware of the small farmers' utility functions, including their risk preferences (see Harsanyi).

11 Here is where the distinction made earlier between economies of scale and a subadditive cost function becomes important. Because the cost function is subadditive, it is cheaper to process all four products in a single plant, but because the average cost of processing does not decline monotonically throughout the range of production, farmer-members cannot simply be charged the firm's average cost.

12. In this example, external market opportunities were not analyzed; the cooperative's cost function alone defined the characteristic function. Including external market opportunities in the analysis would have shrunk the core (reduced the scope for agreement within the cooperative).

13. The Shapley value for an individual coalition (player) i is defined as

$$\phi(v_i) = \sum_{K \subset I} \frac{(n-k)!(k-1)!}{n!} [v(K) - v(K-\{i\})]$$

where

n = number of players in the game,

k = number of players in coalition K,

v(K) is the characteristic function for coalition K, and

v(K-{i}) is the characteristic function for the coalition made up of all members of K who are not also members of i.

The expression [v(K) - v(K-{i})] represents the marginal contribution of player i to coalition K. The expression

$$\frac{(n-k)!(k-1)!}{n!}$$

represents the probability that in a random build-up of the grand coalition of n players, player i will join in the coalition in the kth position. Summing the product of these expressions over all K yields the average of player i's possible marginal contributions. For further details, see Schotter and Schwodiauer or Luce and Raiffa, pp. 245-52.

14. In certain other situations, the behavior of participants resembles another type of noncooperative game, the *'coordination problem." For details and an example, see Staatz 1984, pp. 270-75.

15. Figure 1 illustrates a two-player prisoner's dilemma. Prisoner's dilemmas can also be defined for more than two players (see Taylor).

16. When there is one strategy in a game (such as defection in the prisoner's dilemma) that gives a player a higher payoff no matter what the other players do, that strategy is said to be dominant.

17. See the discussion of "supergames" later.

18. For a review of the arguments that the provision of public goods in general represents a prisoner's dilemma, see Taylor, chap. 1.

19. For a mathematical demonstration, see Staatz 1984, pp. 407-14.

20. If a player knew in advance that the nth iteration was the last, he or she would have a clear incentive to defect in that iteration because in any single-constituent game defection is the dominant strategy. The (n-1)th iteration would then become in effect the last game, but here again the same argument for defection would apply, and so on, all the way back to the first iteration.

21. Unconditional cooperation in a prisoner's dilemma supergame is defined as cooperating no matter how the other players have behaved in previous iterations of the game. Conditional cooperation is defined as cooperating only as long as the other players, or some critical number of them, continue to cooperate; if they defect, the other player defects (for some period) in subsequent iterations of the game.

22. For details, see Staatz, "The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences,'* in this volume.

23. See Staatz, "The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences," in this volume.

24. When the author suggested this hypothesis to a cooperative manager, he replied, "But in the long run they can't afford cooperative disloyalty." His reply neatly illustrates the prisoner's dilemma. Some evidence of the importance of cash flow considerations in determining cooperative loyalty emerged from interviews with farmers. Several fruit and vegetable farmers reported selling crops produced on their own land to their cooperatives and crops produced on rented land to IOFs. In the presence of imperfect capital markets, the farmers needed the immediate payment for the crop provided by the IOFs to pay their land rent; for crops produced on their own land, they could afford to accept the deferred payment typical of fruit and vegetable processing cooperatives.

25. If the cost of lobbying for each group rose above 6, it would no longer even pay C to lobby, and a new equilibrium would occur in which neither party would lobby and the old plant would remain at site 1. This illustrates a further point discussed later: High transaction costs, by reducing the likelihood that a cooperative frequently will change its existing policies, protect the utility of those favored by existing policies (in this case, members of C, who prefer that the plant remain at site 1).

26. Several board members interviewed by the author cited access to such information as a major benefit of serving on the board.

27. For details, see Staatz 1984, chap. 6.

28. For a more detailed analysis, see Taylor, chap. 4.

29. This is the "horizon problem" discussed in Staatz, "The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences," in this volume.

30. Low price is but one component of the benefits (payoffs) available from a cooperative (see Staatz, "Farmers Incentives to Take Collective Action via Cooperatives: A Transaction-Cost Approach," in this volume). Quality of service and provision of certain public goods (e.g., lobbying, enforcement of competition) have traditionally been major benefits of cooperatives. Nonetheless, prices are important as the recent emergence of "superlocal" or "miniregional" supply cooperatives

in the Midwest demonstrates. These are large local cooperatives that have defected from their regionals to deal directly with suppliers because the prices available from the suppliers were substantially below those available from the regionals

References

Axelrod, Robert, and William D. Hamilton. "The Evolution of Cooperation." Science, Mar. 27, 1981, pp. 1390-96.

Bacharach, Michael. Economics and the Theory of Games. Boulder, Colo.: Westview Press, 1977.

Baumol, William J.; John C. Panzar; and Robert D. Willig. Contestable Markets and the Theory of Industry Structure. New York: Harcourt Brace Jovanovich, 1982.

Buchanan, James M., and Gordon Tullock. The Calculus of Consent. Ann Arbor, Mich.: University of Michigan Press, 1962.

Caves, Richard E., and Bruce C. Petersen. '*Cooperatives' Share in Farm Industries: Organizational and Policy Factors." Harvard Institute of Economic Research Discussion Pap. 974, Mar. 1983.

Clark, John Maurice. Studies in the Economics of Overhead Costs. Chicago: University of Chicago Press, 1923.

Faulhaber, Gerald R. "Cross-Subsidization: Pricing in Public Enterprises." American Economic Review 65(1975):966-77.

French, Ben C. "The Analysis of Production in Agricultural Marketing: Models, Methods and Progress." In A Survey of Agricultural Economics Literature, vol. 1, ed. Lee R. Martin, pp. 90-206. Minneapolis: University of Minnesota Press for the American Agricultural Economics Association, 1977.

Hardie, Ian W. "Shadow Prices as Member Returns for a Marketing Cooperative." American Journal of Agricultural Economics 51(1969):818-33.

Harsanyi, John C. "Approaches to the Bargaining Problem Before and After the Theory of Games: A Critical Discussion of Zuethen's, Hicks' and Nash's Theories." Econometrica 24(1956):144-57.

Helmberger, Peter G., and Sidney Hoos. "Cooperative Enterprise and Organization Theory.'* Journal of Farm Economics 44(1962):275-90.

_____ Cooperative Bargaining in Agriculture. Berkeley, Calif.: University of California Division of Agricultural Sciences, 1965.

Hirschman, Albert 0. Exit, Voice and Loyalty. Cambridge, Mass: Harvard University Press, 1970.

Kuhn, Alfred. "Osuukunnan kiinteijo (stabiliteetti), Olemassaolon turvaaminen ja voitonjako-peliteoreettinen malli." [The Stability, Preservation, and Profit Allocation of a Cooperative: A Game-Theoretic Model]. In Osuustoimannan Teoriaa Ja Käytäntöä, ed. Alice Wesphalen, pp. 23-93. Dept. of Cooperatives, University of Helsinki, 1974. Translated from "Theorie und Praxis der Kooperation." Schriften zur Kooperationsforschung. A. Studien Band 3 (1972). Summarized by Ollila.

Lopez, Rigoberto A., and Thomas A. Spreen. "A Conceptual Analysis of Processing Cooperatives.*' Paper presented at annual meeting of the American Agricultural Economics Association, West Lafayette, Ind., Aug. 1, 1983.

Luce, R. D. and H. Raiffa. Games and Decisions. New York: John Wiley and Sons, 1957.

Murray, Gordon C. "Management Strategies for Corporate Control in British Agricultural Co-operatives--Part 1." Agricultural Administration 14(1983a): 51-63.

_____. "Management Strategies for Corporate Control in British Agricultural Co-operatives--Part 2." Agricultural Administration 14(1983b): 81-94.

_____. "Towards an Agricultural Co-operative Classification.*' Journal of Agricultural Economics 34(1983c):51-61.

Ollila, Petri. "Member Influence in Cooperatives: Contributions of Scandinavian Studies to Research Conducted in the United States." Master's Plan B paper, Michigan State University, 1983.

Phillips, Richard. 'Economic Nature of the Cooperative Association." Journal of Farm Economics 35(1953):74-87.

Raiffa, Howard. The Art and Science of Negotiation. Cambridge, Mass.: Belknap Press of Harvard University Press, 1982.

Ratchford, C. Brice. "Competition Among Cooperatives." In Research on Cooperatives in the 1980s, pp. 83-84. Washington, D.C.: USDA ACS Staff Rep., 1983.

Rhodes, V. James. The Agricultural Marketing System. Columbus, Ohio: Grid Publishing, 1978.

Roberts, Marc J. "An Evolutionary and Institutional View of the Behavior of Public and Private Companies.'* American Economic Review 65(1975):415-27.

Roth, Alvin E. Axiomatic Model of Bargaining. New York: Springer-Verlag, 1979.

Schotter, Andrew. The Economic Theory of Social Institutions. New York: Cambridge University Press, 1981.

Schotter, Andrew, and Gerhard Schwodiauer. 'Economics and the Theory of Games: A Survey." Journal of Economic Literature 18(1980):479-527.

Shubik, Martin. "Information, Theories of Competition, and the Theory of Games." Journal of Political Economy 60(1952):1945-50.

Staatz, John M. "The Cooperative as a Coalition: A Game-Theoretic Approach.*' American Journal of Agricultural Economics 65(1983):1084-89.

_____ "A Theoretical Perspective on the Behavior of Farmers' Cooperatives:" Ph.D. dissertation, Michigan State University, 1984.

_____. "Farmers Incentives to Take Collective Action via Cooperatives: A Transaction Cost Approach." In this volume.

_____ "The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences." In this volume.

Swank, C. William. "Competition Among Cooperatives and Relationships of Operating Cooperatives, Bargaining Associations, and Farm Organizations." In Research on Cooperatives in the 1980s, pp. 80-82. Washington, D.C.: USDA ACS Staff Rep., 1983.

Taylor, Michael. Anarchy and Cooperation. New York: John Wiley and Sons, 1976.

Zusman, Pinhas. "Group Choice in an Agricultural Marketing Co-operative." Canadian Journal of Economics 15(1982):220-34.

COMPETITION AMONG COOPERATIVES

V. James Rhodes*

> No issue brings to the fore more incisively one's conception of the basic character of cooperatives and of their role in the market system than the question as to whether each of them engaged in a particular type of operation should have an exclusive territory. (Heflebower, p. 195)

Is competition among cooperatives a good thing? To many readers, the answer will seem so obviously yes that there is no point in pursuing the matter. The merits of competitive markets in providing efficiencies are well-known. Note, however, that the question is not about abandoning competitive markets or creating cooperative monopolies but about the relationships among a special type of firms competing in a market. It is not at all unusual for competing firms to merge, and even when one or both firms are relatively large, the merger is often judged by the Department of Justice to be acceptable. In most regional or national agricultural markets, the merger of all existing cooperatives would not create a monopoly and frequently would not create a firm that ranked in the top four firms in that market.

Historical Background

Cooperation was regarded early as the antithesis of competition. The slogan of early British cooperators was **cooperation, not competition" (Wiles, pp. 253-54). These early practitioners saw cooperatives as a type of public enterprise with multiple social objectives- -objectives that could not be fulfilled if all energies were focused on prices and patronage refunds. As transportation improved in the early 20th century, British cooperative stores encountered more and more overlap among their trade areas. The Cooperative Union campaigned to eliminate this intercooperative competition through negotiation of boundaries or of mergers. Generally these early British leaders felt that competitive overlapping led to wasteful duplication, unsound financial practices, and the erosion of the cooperative spirit (Boner, pp. 98-101 and 340-42).

Transportation improvements in the United States in the past century have led--as in Britain--to more overlapping of the trade areas of local agricultural cooperatives. Such cooperative competition sometimes has led to mergers or to the demise of one or more of the participants, but it has sometimes persisted for many years.

The regional cooperatives rather quickly encountered other regionals as they grew in the 1920s and 1930s. Responses to interregional competition have varied. As one example, Consumers Cooperative Association (CCA) (Farmland Industries' predecessor) overran the rather bitter opposition of the Farmers Unions of Nebraska and Kansas to CCA's solicitation of business from their locals in those states (Fite, pp. 112-15). On the other hand, the Virginia Seed Service (the predecessor of Southern States) withdrew from North Carolina upon the organization of FCX in that area and later withdrew from

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Tennessee as a result of an understanding with Tennessee Farmers (Knapp et al., pp. 535-46).

The only cooperatives with exclusive territories--the rural electric cooperatives (RECs) and the Farm Credit System--resulted from government sponsorship in their organization plus the utility nature of the RECs. Note that the Farm Credit institutions have much investor-owned competition and that the boundaries limit cooperative competition, not proprietary competition.

On request, Joseph Knapp, the first administrator of the Farmer Cooperative Service, presented a paper on this topic at the 1949 annual meeting of the American Institute of Cooperation. Knapp reported the findings of an informal survey of cooperative managers and outside observers on the subject as well as his own judgments. Knapp found that:

1. Excessive competition among cooperatives was judged to be a problem- -often expensive and divisive;

2. Competition also had its good points in keeping managers on their toes and eliminating the inefficient;

3. Excessive competition among cooperatives often was due to managers --their vanity or their empire-building ambition;

4. An ideal cooperative system would not have competition among cooperatives, but that probably is not attainable.

Theoretical Considerations

From society's viewpoint, is any restriction of competition among cooperatives a bad thing? That depends on how much competition would survive among the investor-owned firms (IOFs) and the cooperatives. Generally, as suggested earlier, active competition would survive because the market structure is not highly concentrated, product differentiation is often rather small, and entry barriers are moderate or lower. The argument could be carried into less competitive markets. To the extent that a few markets may be highly contestable, competition is adequate even when there is high structural concentration or even monopoly (Rhodes). Moreover, arguments could be made that section 2 of the Capper-Volstead Act can be used to regulate adequately even cooperative monopolies. Without judging the merits of that position, this paper does not go that far. It is simply argued that in most markets the elimination of competition among the cooperatives would not affect the public interest. Where there are exceptions, perhaps competition among cooperatives should be preserved for public policy reasons. The next section proceeds on the assumption that there will be adequate competition in the market regardless of how little the competition among the cooperatives.

There also is a criterion of cooperative member welfare as well as the public interest. Is any restriction of competition among cooperatives a good thing

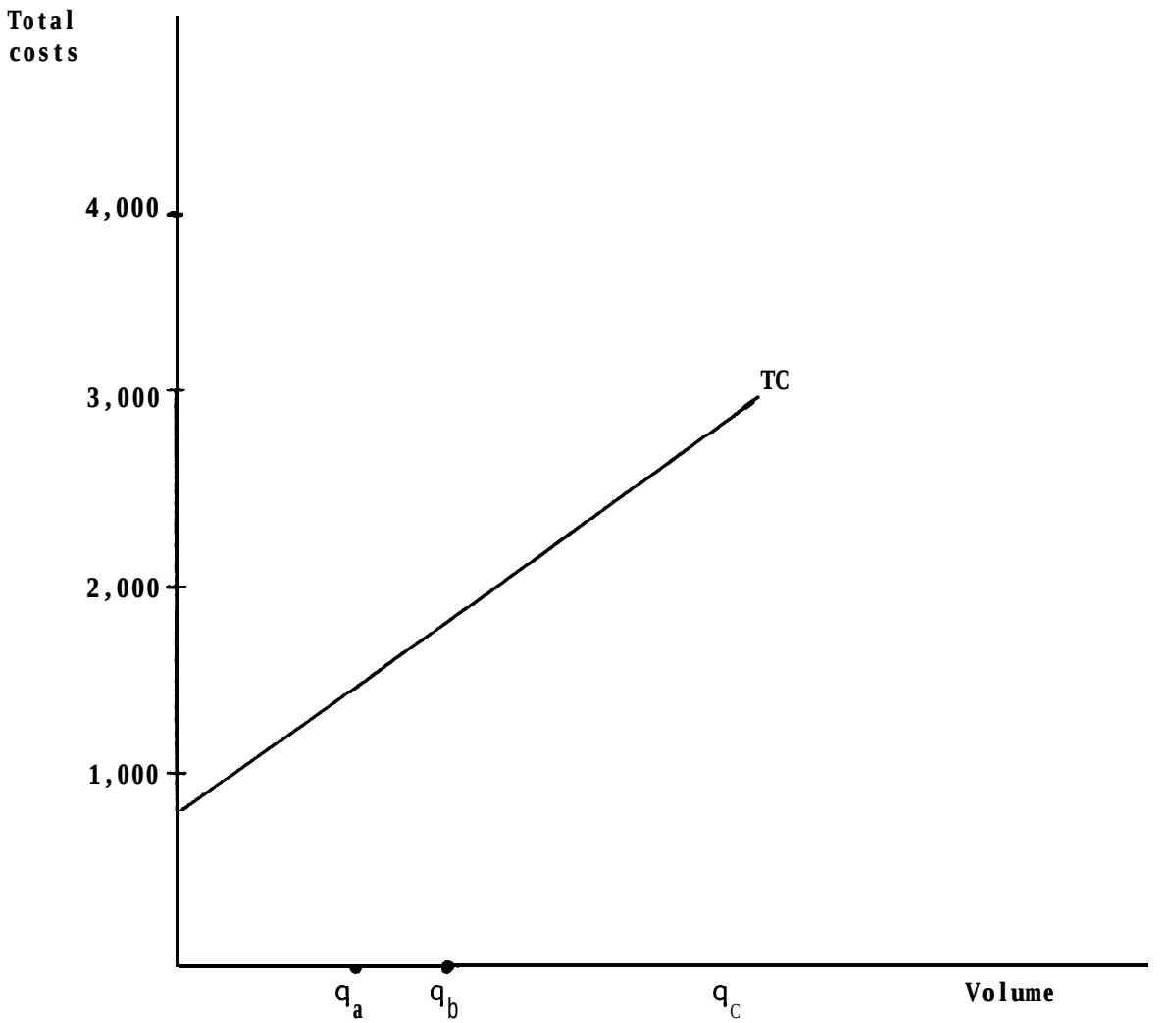
for the members? Would it be economical for a given set of farmers to originate two or more independent cooperatives to compete in hauling their milk, making cheese, marketing grain, or whatever? Generally not. That is, any volume that these farmers demand to be handled has a lower total cost for one firm handling it than would be the combined total cost of two or more firms doing it. In figure 1, output q_c is the output marketed through a single cooperative; output qb is 1/2 q_c and output q_a is 1/3 q_c; TC is the long-run total cost curve for the most efficient performance of that particular marketing function. It can be seen that $3TC_a > TC_c$ and $2TC_b > TC_c$. It is likely, of course, that there is some output qd (where qd $> q_c$) at which the TC is rising faster than a linear rate because of diseconomies of scale and it is no longer efficient for the total volume to be handled by one firm. What is argued here is that this subadditive condition[1] of one firm being the most efficient to serve a given set of farmers is empirically true for many markets.

Likewise it generally would not be economical for a given set of local cooperatives to set up two competing regionals to make their fertilizer, provide them fuel, or market their grain. Because of the costs of duplication of facilities, personnel, and efforts, setting up competing cooperatives ordinarily would not be beneficial for the members. The argument that competition among cooperatives is essential to X-efficiency ("keeping cooperative managers on their toes") is not valid because plenty of competition from the IOFs exists with the possible exception of one or two commodities.

Competition among two cooperatives usually involves not one set of farmer-members, but two overlapping sets. The overlap is formed roughly by the members being competed for by both cooperatives. The overlap members may vary from a tiny percent to a majority of all members. Member interests are even less homogeneous. Even boards of each cooperative may have some thoughts of "winning" the competitive battle. Those members being competed for may obtain special prices and services. Those beneficiaries will likely praise cooperative competition. Even if beneficiaries realize their gains are at the expense of the financial health of their organization, they probably can rationalize their gains. For example, those nearing retirement can reason that they merely are getting back some of their investment that they otherwise would not get for a long time.

While farmers as a group clearly may benefit from cooperation among cooperatives, their members may focus more on individual payoffs. The problem is the same in any coalition. There is a natural struggle over the division of the benefits. An individual is likely to focus on his or her return rather than on the group's total returns. An individual is not likely to consider whether action to increase their own return may reduce the total group return. He or she may be caught in a fallacy of composition in which they presume that individual gains translate into group gains rather than the opposite. If an individual does consider and does perceive the negative relationship of individual and group returns, he or she does not necessarily restrain himself or herself. The individual may justify his or her action by arguing that others will take similar advantage of the situation. The possibility of beggaring thy fellow member is the reason that citizens may

Figure 1



voluntarily vote a compulsory tax, or farmers may voluntarily vote the compulsions of a marketing order. While various cooperative rules and state and federal legislation ameliorate the individual-group conflicts within a cooperative, various members persist in using competitive market place opportunities (IOF as well as cooperative) as a way to enhance their individual bargaining power and economic returns. If there were an institution similar to a marketing order to minimize cooperative competition, members could avoid the prisoner's dilemma they now face.[2]

What will be the outcome of this conflict of interests? Will the cooperative spirit (the community of interest) of all farmers cause members to object to the cooperative competition? Will their objections affect cooperative policy? Answers must be empirical. On the European continent, agricultural cooperative competition generally is not permitted (Straub). Some of that restriction may arise from the intervention of government or other supracooperative organizations as well as from the solidarity among farmer-members (Foxall). That is, the Europeans generally have developed the institutions necessary to solve the problem. In this country, our brief historical survey suggests that "cooperative statesmanship" sometimes prevails. However, competition among cooperatives sometimes is especially aggressive and even vindictive.

Cooperatives and Government Policy

Government policy could range from active intervention to nationalizing a cooperative system (as in some European countries) to stern antitrust attacks on any attempts to reduce competition among cooperatives. The present political climate certainly does not support nationalization. Likely, the government will not be much involved as long as there is general adherence to the antitrust regulations.

What can cooperatives do about reductions in competition if and when desired by membership? A chief remedy for excessive competition would appear to be structural. Mergers and acquisitions can remove many of the worst overlaps of territories and the clash of opposing interests. Managers and boards have their own personal reasons for dragging their feet on mergers and acquisitions, but they feel more comfortable considering structural rather than conduct remedies to excessive competition. Structural consolidation of cooperatives offers much promise in certain areas such as milk assembly and grain marketing, but it has its limitations. Members are concerned about the impacts of structural consolidation on their market outlets, their sources of inputs, their claims to capital in the cooperative, and their influence in governance. These quite legitimate concerns of members tend to hinder structural consolidation even where economies of scale appear favorable. The feasibility of joint ventures or common sales agencies needs to be examined as a halfway step in many situations.

Certain principles of conduct by cooperative board and managers should be considered:

1. Do not build or acquire a facility or enter a market when that effort can only succeed at a substantial cost to another cooperative;

2. Do not dump excess inventories in another cooperative's market;

3. Do not start price wars;

4. Develop the kind of healthy interaction with members and a program of equity rotation so that most members will not consider the cooperative of more value dead than alive;

5. Develop member understanding of the larger payoff available to the group if it is not undermined by excessive competition among cooperatives- -a competition that is often incited or abetted by individual members.

Summary

The "problem" of competition among cooperatives often is discussed by cooperators, but not for publication. Early British cooperators sought a cooperative or socialist system rather than market capitalism. American agricultural cooperators accept the market system and the values of the competitive market.

The question is twofold: (1) Can competition among cooperatives be moderated without damaging the competitive market? (2) If so, does moderation of competition among cooperatives benefit their members? A qualified yes is given to both questions. Most regional and national markets are dominated by IOFs, not cooperatives, and preservation of the competition among the IOFs and between them and the cooperatives is not at question. Ordinarily, a reduction of competition among cooperatives would benefit members as a group. However, such reduction may likely reduce the individual returns of some members who have benefited directly from the competition.

The earlier literature, as shown in Knapp, emphasized that the attention of cooperative managers to their individual goals was a cause of cooperative competition. While that problem remains, more recent thinking emphasizes that membership attention to their individual payoffs may be equally at fault. This prisoner's dilemma can be solved by group solidarity, by farsighted board and management action, or by more far-reaching institutions. The European cooperative solution typically is that of our Farm Credit districts--erect boundaries between cooperatives by regulation. Some regional cooperatives have respected boundaries, but many have not. Ordinarily there are no boundaries to guide local cooperatives. It is not feasible to tell farmers where to market their grain or purchase their supplies. Boards of directors are likely in the best position to appreciate and to push for the maximum long-term payoffs to all cooperative members. It is doubtful that most boards are well enough informed and strong enough to do much about the problem. Thus the problem of competition among cooperatives remains a challenge to educators, cooperative leaders, and those who could design new institutions.

Notes

1. See discussion of subadditivity in chap. 2 of Baumol, Pangar, and Willig.

2. Staatz presents an excellent development of this problem.

References

Baumol, William J.; John C. Panzar; and Robert D. Willig. Contestable Markets and the Theory of Industry Structure. New York: Harcourt Brace Jovanovich, 1982.

Bonner, Arnold. British Cooperation: The History. Principles and Organization of the British Cooperative Movement. Manchester, England: Cooperative Union, 1961.

Fite, Gilbert. Farm and Factory: A History of the Consumers Cooperative Association. Columbia, Mo.: University of Missouri Press, 1965.

Foxall, Gordon. "Marketing Development in Agriculture: The Contributions of Supra-Cooperative Organizations." Oxford Agrarism Studies 7(1978):75-86.

Heflebower, Richard. Cooperatives and Mutuals in the Market System. Madison, Wis.: University of Wisconsin Press, 1980.

Knapp, Joseph. "Competition Between Cooperatives: Meeting the Problem." In American Cooperation 1949, pp. 341-61. Washington, D.C.: American Institute of Cooperation, 1949.

Knapp, Joseph, et al. Great American Cooperators. Washington, D.C.: American Institute of Cooperation, 1967.

Rhodes, V. James. "Cooperatives and Contestable/Sustainable Markets? In this volume.

Staatz, John M. "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives.'* In this volume.

Straub, Willy. "A European Perspective of Cooperative Thought." Paper presented at Graduate Institute of Cooperative Leadership, Columbia, Mo., July 19, 1982.

Wiles, Peter J. D. Economic Institutions Compared. New York: John Wiley and Sons, 1977.

LARGE AGRICULTURAL COOPERATIVES: ON THE ROAD TO WHERE?

V. James Rhodes*

The cooperative and the common-stock corporation are highly flexible forms of business organization. The cooperative has been put to use by people with highly divergent interests and beliefs. This diversity leads to some confusion as to how cooperatives are perceived by both members and nonmembers.

This paper suggests some of the variety of uses of cooperatives and develops a certain evolution over time. However, the paper does not attempt a history of cooperatives. This presentation highlights by its incompleteness.

There can be little doubt about the basically anticapitalist ideology of the famed Rochdale weavers. The 34 Rochdale pioneers included more socialist thinkers than weavers (Bonner). Those early British cooperatives emphasized mutual aid, equality, democracy, decentralization, and the poor instead of competition, hierarchy, and unlimited&accumulation (Wiles).

U.S. agricultural cooperatives owe as much to the American frontier as to Europe. "Cooperating" in barn raisings, threshing, and other large-scale activities was a virtue born out of necessity on the frontier. It was a short step from shared labor and shared machinery to shared enterprises serving essential needs for insurance, farm supplies, or simple marketing. Of course, there were personal and intellectual connections with the European cooperative movement, and the so-called Rochdale principles were widely adopted as guidelines.

Sixty years ago one of the founders of our profession with an intense interest in cooperatives, E. G. Nourse, enumerated the Rochdale fundamentals and discussed their then-current relevance. The three fundamentals were:

1. Reduced costs through increased efficiency and/or reduced services;

2. Popular distribution of savings (net earnings);

3. Democratic control--one-member/one-vote.

Nourse argued that each of these fundamentals was a protest against perceived shortcomings of the economy. First was the perception of a wasteful system that had much excess capacity and that provided several services for which a large market segment would prefer not to pay (e.g., retail credit in 19th century England). Nourse argued in 1922 that U.S. farmers still perceived cooperative opportunities for reducing overcapacity, streamlining services, and reducing some of the other costs associated with nonprice competition among investor-owned firms (IOFs). A few years later the new theory of monopolistic competition would explain why competitive markets could have overcapacity and extra costs while being at a zero-profit equilibrium.

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The second complaint arising from Rochdale days was the belief that stockholders should not be the residual claimants of firms. That anticapitalist notion was the justification for cooperatives paying minimal interest on capital stock and paying out the rest as patronage refunds. By 1922, Nourse saw clear erosion of the basic complaint. American farmers shared no anticapitalist ideology with labor. Nevertheless, the principle of patronage refunds still was strongly held.

The third perceived shortcoming was the closely allied belief that economic control of IOFs by stockholders (and often a relatively few of them) was basically antidemocratic. While a cooperative, even as an IOF, is a union of people and capital, the cooperative ideology emphasized the primacy of the people. Nourse notes that U.S. cooperatives still were holding tenaciously to the one-member/one-vote working rule. Democracy of control fitted well with American populist ideas and the antitrust sentiments of the early 20th century. There also was the pragmatic perception that democracy is very compatible with the cooperative philosophy of bringing together farmers with a common need.

Nourse summarized by noting that cooperatives have been utilized by three social classes--each attempting to enlarge its class share of the fruits of the economy. Labor tried cooperatives but soon turned to trade unions. Consumers tried cooperatives with little success except in England where Nourse astutely observed that they had overreached and were on the way to socialism. Farmers, only mildly class-conscious in Nourse's judgment, have used cooperatives in a very pragmatic way to improve their position in the economy. Their purpose has been "functional reorganization" rather than "comprehensive economic regeneration" (Nourse 1922).

In Europe and North America, most agricultural cooperatives were organized in reaction to agricultural distress. In Europe it was the agricultural crisis of the 1880s that spawned many farm cooperatives (Natronale Cooperatieve Raad). The Grange in the 1870s organized cooperatives and supported populist causes. Later the Farmers' Alliance in the South and the Farmers' Union and eventually the Farm Bureau helped to organize more locals (Bakken and Schaars). Although farm cooperatives were part of a general reform movement and were seen as a corrective to the unequal bargaining power of farmers, their members placed them in a capitalist perspective. Cooperation per se was extolled as virtuous but the dominion of the market was accepted.

Some Cooperatives Became Large-Scale Organizations

Regional cooperatives developed in the early 20th century in a variety of ways. Farm organizations often promoted them. In a few cases, able entrepreneurs, seeing the opportunities to serve locals, developed the regional organizations. For the first time in the U.S. experience some cooperatives became large firms after World War II.

While American cooperative theory, as previously shown by Nourse, had adopted readily to capitalist cooperatives, it had not foreseen large cooperative

firms and their implication. Nourse had fought the Sapiro cartel concept, which was certainly conducive to large cooperatives.

Nourse's views were to be characterized later as the competitive yardstick role for cooperatives. The objective of cooperatives was to stimulate competitive performance but not to supersede other business forms. Cooperatives could serve a real purpose by entering agricultural markets in which services were inadequate or were provided inefficiently. Once cooperatives had innovated superior methods or broken a monopolistic bottleneck, Nourse urged a halt to further cooperative growth. **[Cooperatives] should then be content merely to maintain 'stand by' capacity, or a 'yardstick' operational position rather than try to occupy the whole field or a dominating position within it. In some cases, they may be well advised in entirely terminating operations once they have stimulated regular commercial or manufacturing agencies to competition amongst themselves" (Nourse 1945).

Study of large-scale organizations indicates the small probability of the management of any large firm--cooperative or IOF--taking a passive standby position or terminating the firm because its objective has been accomplished. Any large-scale organization is greatly different from a small organization. A hierarchy of management develops bureaucratic procedures. In large firms, there is a greater gulf between owners and management. Boards of directors find the large firm less easy to comprehend and the performance of its management more difficult to evaluate. The operating philosophy is not the competitive yardstick but rather: This firm must survive.

Some later writers of the Chicago school have abandoned the tenuous arguments that IOF stockholders have either the motivation or the institutional mechanisms for directly monitoring the behavior of management (Fama). But they insist that effective monitoring exists. The monitoring is by the board of directors, which generally consists of top management plus some outsiders. According to this view, the nationwide market for managerial talent motivates managers to be good monitors of each other and to be helpful to board members in assessing performance. The stockholders' indirect role is exercised through their market-revealed attitudes toward the firm's stock. A bearish attitude conveys a negative signal. Likewise the attentions of a potential raider stimulate the monitors and management.

While there are obvious differences among modern theorists as to how completely the market does pressure the managers of large-scale corporations to keep their shoulders to the wheel and their noses to the grindstone, there is a common emphasis on conceptualizing the firm as an organization.

Various authors stress various views of the large organization. Williamson emphasizes the hierarchial nature of the firm and the advantages of fiat in solving certain transactional difficulties arising out of the inevitably conflicting goals of firm members. Galbraith, impressed by the breadth of technical information assembled in modern decisionmaking, refers to the firm as a hierarchy of committees. Fama and Jensen focus on the organization as a nexus 0f written and unwritten contracts among managers, employees,

suppliers, and customers. If somehow all those contracts were to be destroyed in one fell swoop, the organization would have likely lost its ability to survive. The focus on contracts emphasizes the pervasive impingement of the markets for people and commodities on the decisionmaking within the organization.

Earlier in this century, Commons anticipated much of the current discussion about transactions and firms as organizations. A firm is a going concern--"a visible, tangible, living body of men animated by a common purpose** (p.144). There is no facile assumption that a firm is nothing but a money-making machine. However, such an organized mass movement as a firm expects income; if that expectation fails, the promised corporate immortality is a casualty. A going concern exercises purposeful control over property and people. The members of the organization are guided by two sets of working rules--those internal to itself, and the external rules and laws of the state. To a considerable extent the state has granted industrial self-government to those aggregations exploiting economies of size. Everyone in a going concern has some discretion in performing his or her duties (the higher the rank the more the discretion) and thus each contributes to "the collective will." A going concern is a set of transactions guided by the precedents and customs of the past. As an association, a set of future transactions may be anticipated extending beyond the expected life of any individual in the group. Working rules for an organization are essential "to hold together in a continuing concern the overweening and unlimited selfishness of individuals pressed on by a scarcity of resources" (p. 138). Working rules are all of those laws, regulations, business ethics, and norms that guide transactions among people.

Commons's view of the firm complements that of those who focus on market forces. Commons focused on rules and customs that evolve in a society to handle interpersonal relationships. Conflict within and between associations of people is recognized as inevitable. The working rules define duties and rights and the processes for the achievement of some common purposes by an organization. These working rules guide much of the self-monitoring and board-monitoring so central to numerous modern theories of the firm. These working rules evolve as perceived circumstances change. What is right and/or legal for a manager in 1950 is not necessarily identical to what is right and/or legal in 1980. What a society expects of its industrial empires will change with accumulated experience, and those changing expectations will impact on the working rules according to Commons.

Red ink on the bottom line can lead to belt-tightening (i.e., new corporate rules), dismissals of lower level managers, and, at the worst, to selection of new top managers. Management teams may reflect other market forces as they set goals for themselves of continued growth in sales or in net earnings, or the continuity of stable dividends. These market influences are interwoven with the working rules already described. The size of top executive compensation and the depth of the associated perquisites is decided within the context of both market comparisons and ideas of equity. Similar forces affect the wage contracts negotiated with the unions.

Cooperatives and IOFs

The cooperative has much in common with IOFs--more commonalities than differences. The differences arise less in market forces imposing on them than in the set of working rules that apply to each type of firm. In view of the anticapitalist origins of English cooperatives, there is irony in the difficulties frequently perceived in distinguishing large regional cooperatives from other large corporations in our capitalistic economy..

The cooperative board is structured to have more independence from management than is the case with IOFs. Generally members of management, with the possible exception of the president, are not voting members of cooperative boards while IOF boards typically have several members from management. The election of cooperative boards also is structured to be representative of the broad range of members via democratic voting procedures and the absence of proxy voting. The typical IOF board is a self-perpetuating closed group except when a crisis or a raider breaks the network.

Whether the actual performance of a cooperative board is much different from an IOF board still is the subject of much debate. A lot has been said about the possibilities that farmer board members are too unsophisticated and uninformed to monitor management effectively. IOF boards often include outside experts in finance and marketing while cooperative boards rarely include any nonmembers. If there is widespread apathy among voters--as might appear rational when members number in the tens of thousands--then the cooperative board may become a self-perpetuating closed group. Undoubtedly the degree to which the structural potential for "owner control" actually is realized depends on the quality of leadership and acceptance of cooperative ideals in both the cooperative board and management.

Cooperative growth--and even survival- -depends on a continual infusion of capital. If cooperative ideals are assumed away, then each member tries to minimize their capital contribution. It is frequently observed that members are reluctant to subscribe to new capital and that they want their dividends in cash. Management, to preserve the organization, must protect it against the chipping away by individual members that would destroy it. Members may perceive as empire building by management the actions that managers perceive as proper stewardship of the organization. The debates about plans for equity redemption and allocated versus unallocated reserves reflect--among other things- -attitudes as to whether rules on capital should be used by members to control cooperative size (Cobia et al.; Royer; Murray).

The Hunter Cooperative

Those who guide the long-term planning and decisionmaking of large firms must decide the range of potential activities that will be considered. Many firms have been committed to a single industry. For generations, the family firm may have been in a single business: tentmaking, banking, or whatever. A railroad firm with its immense fixed assets has been presumed to remain a railroad firm into perpetuity. All the great advantages of industry know-how were passed down through the years as assets--intangible but valuable.

However, technological advances frequently have invalidated single-industry commitment. The harnessmaker faced a disastrously declining demand. The railroad encountered a no-growth future. The railroader was encouraged to consider himself or herself in the transportation business, not the railroad business. The final step was simply to consider himself or herself as being in business--free to enter and leave industries at will as he or she hunted for the best opportunities for the firm.

Modern business schools have stressed the flexibilities of good managers. Their MBAs are trained to manage anything in any industry. The large conglomerates of the 1960s and 1970s epitomized the hunters. Go wherever the dollars beckon.

The hunter firm may lose something in its unbounded chase after earnings. Peters and Waterman's best seller, In Search of Excellence, suggests that excellent performance requires commitments to certain values involving customer service. McDonalds is committed to QSCV (quality, service, cleanliness, and value). IBM is committed to service of the business machines they sell. People are buying IBM's home computers because they believe IBM will be there to service them when many other firms are gone. IBM's commitment, as much as its relative size and strength, are the bases for that belief.

Peters and Waterman argue that earnings are a necessary, but not a sufficient, condition for a firm's excellence. Profits are like health, they say, necessary and the more the better. But also like trying to be healthy, one does not focus exclusively on getting profits. Fortune conducts an annual survey of executives concerning the most admired large corporations (Perry). "The most admired U.S. companies believe that their ultimate success depends on how they are perceived by the public. ... Repeatedly, corporations with first class reputations are seen to put quality, integrity, and respect for the customer alongside profits on the bottom line" (p. 56). In 1983, Dow Jones was second only to IBM among admired companies. Dow Jones's CEO, Warren Phillips, is quoted as saying: "Lots of companies set as a goal maximization of earnings, return on equity, etc. We set high standards of performance in terms of content and quality. Financial excellence follows from that" (p. 54).

Commitment to service and to excellence obviously is not identical with an unchanging commitment to a single line of activity. A committed service harnessmaker still would have gone out of business. However, a commitment to service and excellence is even further away from indiscriminate profit-hunting. The committed firms do not view themselves as solely financial managers seeking the top dollar of returns. The committed firms move with technology and with the times but they strive to be experts in a limited set of activities, not in anything and everything.

Owners of most large IOFs generally do not determine the firms' long-run strategies. It is the firm's employees and especially its top management and directing board that set a corporate culture and the long-term objectives. Despite elaborate attempts to argue otherwise (Fama; Fama and Jensen), the relationship of ownership to firm direction and control for most large IOFs

generally is seen as exceedingly tenuous. Moreover, because IOF owners are seldom major customers of their firm, they really do not care about its customer service and commitments so long as the earnings are produced somehow.

Cooperatives are different from IOFs because many or all of their customers are their owners. Cooperative owners care about commitment to customers' service because they are the customers. In the beginning, the cooperative was set up by its potential customers to serve their needs. The cooperative's owners demanded the firm's commitment to themselves as customers. The classic cooperative with its special form of vertical integration of farm and agribusiness is the epitome of commitment.

Shifting Membership to Support Cooperative Growth

The life cycle of the classic cooperative was as follows: Set up by members for a specific purpose; served that purpose for decades; disbanded when no longer needed. This classic life cycle doubtlessly has applied to many smaller cooperatives. It does not apply to the large regionals.

The participants in any large organization generally desire its survival as a minimum and its rapid growth and prosperity as the standard. While the performance of any firm is affected by its economic, political, and cultural environment, much depends on the quality of its participants and the way they interact. Theorists such as Fama conceptualize a firm as a nexus of contracts among the participants. While this concept properly emphasizes the valuable coordination of specialists made feasible by the firm, it lacks a flesh-and-blood dimension. As Williamson and Leibenstein emphasize, contracts must necessarily be incomplete so the exercised discretion of the people in a firm is an important factor in firm performance. Firm performance is a social achievement and, as such, is quite variable among organizations.

Large cooperatives frequently face lack of growth or even decline if they stick with their original purposes and their original members. It is hardly thinkable that a cooperative management will so commit itself to its original purposes and membership as to accept firm stagnation or decline. It is difficult to fault such managerial decisions. The question is how far shall the cooperative swing toward the other extreme. Shall it become an aggressive hunter, seeking new members and activities wherever a profit seems likely? How readily shall it drop old activities and members when associated earnings shrink? What equity issues arise in transferring the cooperative owners from the old set of owners to the new set?

Cooperative theory has hardly recognized the issue of a cooperative abandoning much of its membership. Much has been written about "disloyal" members deserting their cooperative, but not the reverse. Theories dealing with cooperatives with large earnings generated by market power often have argued that an influx of members will dissipate the excess earnings. However, much of cooperative theory implicitly takes an existing membership as a constant. When economists have modeled agricultural cooperatives, they have often included the earnings of both the organization and a given set of

farmer members. One considerable debate concerned whether the cooperative even should be considered as a maximizing unit separate from its individual members (Phillips vs. Helmberger and Hoos). The one group of cooperative papers that relates even indirectly to this membership issue is that on the revolving of ownership equities associated with death, retirement, or other reasons for members' leaving the cooperative (Cobia et al.; Royer; Murray).

Hunter cooperatives may contribute in some ways to more competitive markets. An alert and sophisticated cooperative management can likely organize a new cooperative activity better than can a group of producers organizing a cooperative de novo. The large existing cooperative is likely to have a better appraisal of markets and of input costs and be better at producing information. In some industries, the entry barriers are sufficient that de novo entry is difficult while the existing regional cooperative can more readily project its capital and managerial skills into those industries.

It can be argued that many of the cooperative successes of the past half century have been achieved by cooperative managers enlisting members and developing cooperation rather than by farmers building cooperatives. Federated regionals often are built top down by a cooperative that captures the business of locals rather than bottom up by locals uniting to create a regional.

Other Issues Associated with Hunter Cooperatives

There are various ramifications of this new organizational force. Members are obtained by "merchandising" rather than by their own organizing. Consequently, membership loyalty is lost in two ways: (1) The new members had no particular occasion for developing loyalty differently from the way cooperative satisfied customers of IOFs might develop it; (2) the old members likely become estranged as they perceive the resources and interests of "their" cooperative being diverted into new fields. Management of a hunter cooperative must develop expertise in seeking out profitmaking opportunities and in selling its board on them--in much the same way an IOF does. Management finds it more difficult to keep in mind the cooperative's basic objectives when the membership base is not a constant, but a variable that can be manipulated. Serious equity issues arrive when capital contributed by one group of members is switched to the use of a new group (see next section).

In the case of federated regionals that provide farm supplies or market grains and oilseeds, their hunting leads to competition with other regionals and with IOFs for the business of local cooperatives. The local cooperative often winds up buying feed from one regional, fertilizer from a second, farm chemicals from an IOF, and fuel from a third regional while marketing grain through a fourth. In such a situation, it would be surprising if any sense of a cooperative system or of particular cooperative loyalty would be developed by either the local management or its farmer members. Another hunting result is intensified competition among regionals. The head-to-head competition of regionals for the business of locals and the various "invasions" of one regional's "territory" by another regional leads to cooperatives becoming most uncooperative with each other.

Still large cooperatives are not likely to become as aggressive and far-ranging hunters as the conglomerate IOFs. The old owners do exercise some voice for restraint in their cooperatives through various channels, including the elected boards. Boards typically are- torn between continued service to old members and the tempting potential profits of new, but less familiar, enterprises. The difficulty of cooperatives in raising new capital is another important constraint. Some cooperatives have ties to State farm organizations that tend to delimit their market boundaries.

When a hunter cooperative tends to stand some traditional cooperative ideas on their head, is it worthy of Capper-Volstead protection and the support of the cooperative community? The answer may depend on where the cooperative falls on the commitment-hunting scale. A cooperative that is genuinely committed to the interests of its current members and serves them with enthusiasm and dedication and hunts only as necessary to maintain the organization is serving those needs that Capper-Volstead was meant to support. A cooperative that is strictly an earnings-oriented maximizer and that does not allow service and current member interests to get in the way of such earnings maximization has a less obvious claim to uniqueness. Even the classic defense of the cooperative monopoly--that it does not really monopolize because the flow through to members of earnings encourages producer supply response rather than supply restriction--would not apply to a cooperative management that diverts its earnings into developing new enterprises and markets. The difficult cases are those in between the polar cases just discussed.

Cooperative leadership needs to deal more openly with this issue. Cooperatives are a special form of vertical integration undertaken to obtain efficiencies, to secure continued access to markets without fear of opportunistic exportation, to reduce uncertainty, and for other reasons. Generally those objectives require commitment. A member whose cooperative can abandon him or her at any time does not have much incentive to be a member. But a cooperative that can never turn away from old members is likely a firm condemned to eventual insolvency. Hence a middle way must be followed between the twin dangers. Understanding and statesmanship by cooperative leadership--management and board--is essential to maintaining the merits of committed service cooperatives while allowing that freedom for the cooperative to seek new avenues when it is essential to the continued economic viability of the organization.

For example, more attention needs to be given to the equity issues within the cooperative. Because risk capital is hard to get from members, managers typically make it even more difficult for the members to get it back. Consider the following scenario. A marketing cooperative has served successfully a group of members (designated as Set A) for 2 decades and has built up a net worth of $100 million. However, demand for the crop produced by its members is dropping and eventually the first loss is encountered--a million dollars in 1 year. Managers decide that net earnings likely could be restored to $5 million a year by shifting activities to serve a largely new group of members (call them Set B). When should the shift be made? Should there first be a major effort to cut costs and/or restore demand so as to continue serving Set A? The true hunters would say the cooperative should

shift immediately. Set A members might reply that the cooperative can shift when their net worth of $100 million is exhausted, which implies a shift in 100 years! Alternatively, the Set A members might demand their shares of the cooperative in cash. Or Set A members might demand that all capital and expenses associated with Set B must be provided by Set B producers. Obviously, there is a genuine and major conflict of interest between Set A members and management. Compromises need to be found that are acceptable to all. The bargaining problem is similar to those discussed by Staatz.

Obligations and Legitimate Activities of Cooperatives

Observers are frequently struck by the extent to which the young, able, middle-managers of cooperatives deny the uniqueness of their organizations. Have large cooperatives lost their uniqueness and their rationale for being? Does the management of cooperatives face a set of obligations and legitimate activities that differs from those of IOF management? This section is directed at those people who have trouble with these questions.

Cooperative managers seem to agree that their goal is "to improve the economic position of members (French et al.). The goal is roughly similar to that of "profit maximization" that is generally attributed to IOF management. It seems that much of cooperative management views these two goals as having similar or even identical implications for firm management. They are not identical.

I believe that the usefulness of the cooperative to its members depends on three conditions:

1. The degree to which its members can rely on the cooperative to serve their specialized needs in vertically adjacent operations;[1]

2. The degree to which the cooperative can provide an economic return over time (higher marketing prices and/or lower input prices) as compared to competitors;

3. The degree to which economic returnsin the entire market have been improved by the presence of the cooperative.

The third condition--an externality- -is Nourse's competitive yardstick. While it may have been sought by a cooperative's founders, it tends to become invisible or at least unconvincing to later generations of members (see Rhodes). Thus, we ignore its possible relevance to the obligations of cooperative management.

Obligations of an IOF Management to Its Owners

Management is expected by IOF owners to:

1. Operate within the law and the general culture;

2. Not mislead owners or potential owners as to the financial position of the firm and its reasonable expectations for future profits;

3. In some general sense, maximize net earnings over some vaguely defined time span.

Beyond that brief list, managers of today's larger IOFs--with board approval- -are relatively free to operate as they please. Managers of a railroad or chemical factory are free to move assets into other wholly unrelated businesses consistent with these obligations, even if such moves may be inconvenient to current customers. Managers are free to shift services, adopt new practices, close facilities and do whatever else is consistent with the listed expectations.

Obligations of a Cooperative Management to Its Owners

Management of a cooperative is generally expected by the owners to:

1.-3. Follow the rules listed for IOFs;

4. Provide, where feasible, the services desired by members and continue to provide them as long as feasible;

5. Fully inform members so as not to mislead them in any way--not even in ways generally accepted as legal and moral;

6. Deal properly and fairly with each group of customers and their investments where various products and/or services are handled (i.e., do not cross-subsidize enterprises too much).

Independent economic units do business with each other in a free marketwhen transactions are to their mutual benefit. When pairs of firms find themselves to its members depends on trading regularly, they may place more emphasis on the worth of the continuing business relationship than on the gains of each specific transaction. Nevertheless, no firm can expect that a trading relationship will survive any significant series of transactions that is unprofitable for one or both parties.

Firms, including farmers, with needs for specialized inputs or for specialized marketing services must find someone to perform the service or must perform it themselves. Economies of scale in farming and in the adjacent input and marketing stages usually are different enough that farmers cannot individually integrate forward or backward. However, they often have united as a cooperative "to perform a service for themselves." Over time, those cooperatives often have expanded into other services and other territories. Eventually, the cooperative- -a separate legal entity[2]--may find it uneconomic to continue to perform a particular service or operate a particular facility. The affected farmers cannot expect that either a cooperative or an IOF will continue indefinitely to engage in a stream of losing transactions.

Cooperative owners have some legal and moral claims to the cooperative's assets. In many cooperatives, the discounted value of those claims for any individual owner is relatively small because equities are rotated slowly and sometimes not very dependably. The claims of ownership then become largely a rather intangible claim to service (cooperative obligation no. 4). It is this dual owner-customer status that makes cooperatives unique. The claims to service are defined by custom and procedures rather than hard and fast laws and regulations. Each obligation contains such significant modifiers as "where feasible" and "properly and fairly." No member can be absolutely sure of service. The early rural electric cooperatives (RECs) took pride in serving everyone even if the practice meant running a line an obviously uneconomic distance to an isolated farmstead. In times of high interest rates, hard-pressed REC boards and managers no longer will subsidize such distant customers.

Suppose a regional cooperative that emphasizes milk marketing and farm supplies finds that its poultry operation is losing money according to the cost accountants. If the accounting numbers are bad enough, the poultry member surely will lose his or her claim to service. If the numbers are a little better, but not good, a "political decision" may determine his or her claim to service. Certainly, the cooperative member, as an owner, has a *'right** to expect some consideration and some cost justification for a loss-of-service decision, while an IOF manager is free to make such decisions without providing any consideration or justification to his or her customers.

Suppose a farm supply cooperative has been built through the efforts of management and many relatively small farmers. As times change, the managers perceive that the larger volume of business lies with larger farmers. They propose to transfer the assets "owned" by the smaller farmers into facilities and practices that will serve better the larger farmers but will largely abandon the present "owners." Would it be surprising if the current owners exercise a claim to service and if they argue that management is failing its responsibilities? In the game-theoretic bargaining discussed by Staatz, the small farmers may have little bargaining power to enforce their moral claims.

In summary, one of the unique obligations of cooperatives is a commitment to the continuation of past and present member service that goes beyond that of the IOF. While there is no easy or lucid way to define the difference in commitment, it exists and its existence is important. A frequent criticism of cooperatives is that they stay too long in losing businesses. The presence of such criticism suggests that many cooperatives have stayed with their commitments longer than have IOFs.

The dual customer-owner status of cooperatives applies to the problem of providing information and avoiding deception of any sort in advertising and all types of communication (obligation no. 5). It is unlikely that cooperative management will "improve the economic position of members" while misleading them. A farm supply cooperative should view itself as the procurement representative of farmer members; instead it often views itself as marketing to farmers.[3] The difference is important. A profit made by exploiting the ignorance of cooperative members is an empty profit indeed. Again, the differences in management practices of cooperatives compared with

many well-run, consumer-oriented IOFs will not be large. The point is that the very nature of the cooperative demands a customer-benefit standard of conduct that is beyond that of the ordinary IOF.

The sixth obligation of a cooperative is very close to the fourth. Because of the customer-owner duality, the conglomerate or diversified cooperative faces some special problems of equity. Owners of an IOF have no concerns about cross-subsidization of enterprises within a firm as long as they contribute to the firm's objectives. But the cooperative that markets widgets and gidgets has problems when the widget producers are different people from the gidget producers. Assuming that there are "economies of scope" that justify the union of the two enterprises on a cost basis, each group benefits from the other.[4] Then each group can afford to share a bit when there is a need for investments or for meeting a shortfall in cash flow. However, neither group can expect a continual subsidy. An economic limit to cross-subsidy can be defined. When either group is potentially better off without the other group in the cooperative, the limits of cross-subsidy have been reached.

It is tempting for cooperative managers to use the funds available regardless of the lack of relationship between the groups (enterprises) generating the funds and the groups that will benefit from them. Farmer groups usually are patient about cross-subsidy within cooperatives when it involves the short term and relatively small sums. Member perceptions may differ widely from reality. It frequently is easy for significant cross-subsidization to occur without farmer awareness. However, if some crisis develops, farmers may imagine far more damage from cross-subsidy than has in fact occurred. Thus management bears a special responsibility to try to keep cross-subsidy within the economic bounds previously specified. Cooperative policy in funding new enterprises generally should be that the new group must provide its own capital ("each tub sits on its own bottom"). It also is proper to insist that the "accounts" should be assessed as the average of several years rather than each group trying to obtain its precise share of benefits each year. Situations should not be allowed to arise that will cause farmer-members to become obsessed with keeping score.

Social theorists have had great difficulty in explaining the rationality of loyalty or any allegiance to a group that seems to contradict immediate self-interest. The best answer to date seems to be that many individuals recognize the problem and are ready to foreswear free riding if they are convinced that a reasonable number of others will match their behavior (Guttman). The voluntary contributions to the dairy PACs (political action committees) by thousands of dairymen is a case in point. Under those assumptions of matching behavior, one's actions make a difference and it becomes rational to support the cooperative rather than take a slightly better option elsewhere.

To sum up this section, the customer-owner status of cooperatives continues their uniqueness. The differences of cooperatives from IOFs create different obligations for management in the three areas of: (1) continued service of current members needs as defined by members, (2) full information in sales and service, and (3) limitations on internal cross-subsidization.

Summary

A cooperative is an organization linking assets, business activities, and people in a distinctive way. The dual status of people as both customers and owners of the cooperative--with earnings distributed according to customer patronage--has been the important constant in cooperatives. Much else has changed about cooperatives in the past century. The large agricultural regional cooperative is far different in organization, management, and ideology from the Rochdale weavers' cooperative. More changes can be expected as the cooperative's participants continue to adapt it to their current needs.

The ultimate cooperation in the regional cooperative is between managers, board, and members as they develop an organization that adequately serves all their needs. A cooperative management does have some obligations to the owners that are unique to cooperatives. A cooperative management faces tighter constraints on its actions than the management of a conglomerate IOF. Members of a cooperative expect a high degree of managerial commitment to member service. It is gratifying to note that some of the most successful IOFs have a deep commitment to customer service. Instead of being a burden, the cooperative's member commitment can be a shared mission that energizes and guides the entire organization.

Some firms are hunters--continually seeking new activities in any parts of the economy that promises a better return on investment. Owners of IOFs may appreciate managers that are aggressive hunters, although the long-run consequences may not be as impressive as often suggested. Hunter cooperatives present a special problem. A conflict of interest can develop quickly between the old member-owners of the cooperative fearful of losing service, capital, and influence and the new members. These very divisive potentials need to be faced squarely. In a changing world, it is usually unreasonable to expect a cooperative management to do no hunting. However, the consequent equity problems need to be managed carefully to protect the legitimate interests of new and old members and of management. There is a strong caution to managers. If their concern for future growth and security leads to aggressive hunting that endangers the mutual commitments of members and cooperatives, they endanger the cooperative in its special role in society and the Capper-Volstead protections it has enjoyed.

Notes

1. "Some of the greatest benefits of cooperatives arise from greater stability of prices and returns, retaining decision making authority at the producer level, assuring producers of an outlet for their products and assurance of input supplies" (Knutson, p. 11).

2. Because farmers united to form a cooperative, they may feel that they <u>are</u> the cooperative. They, as owners, are an important part of the cooperative, just as cooperative management and cooperative boards also are important parts. Together, they form an organization which both legally and operationally is an entity separate from each of them.

3. Schaars expressed this idea many years ago in his argument that the cooperative is the 'agency" of its members.

4. See the definition of economics of scope and an extensive discussion of the attributes of multiproduct cost in Baumol, Panzar, and Willig.

References

Bakken, Henry, and Marvin Schaars. Economics of Cooperative Marketing. New York: McGraw-Hill Book Co., 1937.

Baumol, William J.; John C. Panzar; and Robert D. Willig. Contestable Markets and the Theory of Industry Structure. New York: Harcourt Brace Jovanovich, 1982.

Bonner, Arnold. British Cooperation: The History. Principles and Organization of the British Cooperative Movement. Manchester, England: Cooperative Union, 1961.

Cobia, David W., et al. Equity Redemption: Issues and Alternatives for Farmer Cooperatives. Washington, D.C.: USDA ACS Res. Rep. 23, Oct. 1982.

Commons, John R. The Legal Foundations of Capitalism. Madison, Wis.: University of Wisconsin Press, 1968.

Fama, Eugene. "Agency Problems and the Theory of the Firm." Journal of Political Economy 88(1980):288-307.

Fama, Eugene, and Michael C. Jensen. "Separation of Ownership and Control." Journal of Law and Economics 26(1983):301-25.

French, Charles, et al. Survival Strategies for Agricultural Cooperatives. Ames, Iowa: Iowa State University Press, 1980.

Galbraith, J. K. The New Industrial State. Boston: Houghton Mifflin Co., 1967.

Guttman, Joel. "Understanding Collective Action: Matching Behavior." American Economic Review 68(1978):251-55.

Helmberger, Peter, and Sidney Hoos. "Cooperative Enterprise and Organization Theory." Journal of Farm Economics 44(1962):275-90.

Knutson, Ronald. "Cooperative Strategies in Imperfectly Competitive Market Structures--A Policy Perspective." American Journal of Agricultural Economics 56(1974):904-12.

Leibenstein, Harvey. Beyond Economic Man. Cambridge, Mass.: Harvard University Press, 1976.

Murray, Gordon C. "Management Strategies of Corporate Control in British Agricultural Cooperatives--Part 2." Agricultural Administration 14(1983):81-94.

Natronale Cooperatieve Raad. The Cooperative Movement in the Netherlands: An Analysis. The Hague, Netherlands: Natronale Cooperatieve Raad, 1957.

Nourse, E. 2. "The Economic Philosophy of Cooperation." American Economic Review 12(1922):577-97.

_____. "The Place of the Cooperative in Our National Economy." In American Cooperation 1942-45, pp. 33-39. Washington, D.C.: American Institute of Cooperation, 1945.

Perry, Nancy J. "America's Most Admired Corporations." Fortune, Jan. 9, 1984, pp. 50-62.

Peters, Thomas J., and Robert Waterman, Jr. In Search of Excellence: Lessons from American's Best-Run Companies. New York: Harper and Row, 1982.

Phillips, Richard. **Economic Nature of the Cooperative Association." Journal of Farm Economics 35(1953):74-84.

Rhodes, V. James. "Cooperatives and Contestable/Sustainable Markets." In this volume.

Royer, Jeffrey S. "Financial Impact of Mandatory Equity Programs on Farmer Cooperatives." Agricultural Finance Review 43(1983):30-40.

Schaars, Marvin. "Basic Principles of Cooperatives: Their Growth and Development." In Agricultural Cooperatives, ed. Martin Abrahamsen and Claud Scroggs, pp. 183-203. Minneapolis: University of Minnesota Press, 1957.

Staatz, John M. "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives." In this volume.

Wiles, Peter J. D. Economic Institutions Compared. New York: John Wiley and Sons, 1977.

Williamson, 0. E. Markets and Hierarchies: Analysis and Antitrust Implications. New York: Free Press, 1975.

AGRICULTURAL COOPERATIVES: A UNIFIED THEORY OF PRICING, FINANCE, AND INVESTMENT

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Coonerative Principles, Objectives, and Social Science Method

Introduction

Agricultural cooperatives are a significant form of business enterprise. In many respects, they are similar to the investor-owned, profit-maximizing firms that, along with other organizations such as households and government agencies, form the institutional framework for western economic theory. Yet as so many authors have pointed out, cooperatives also are distinctly different from investor-owned firms (IOFs).

A considerable body of literature exists on the theory of agricultural cooperation, and it is very diverse in method as well as subject matter. Cooperatives have been analyzed from both a normative perspective, i.e., how cooperatives should perform to attain a particular norm or objective, and from a positive perspective, i.e., how they actually do perform. Prior theoretical work has primarily focused on static price theory and resource allocation. Little purely theoretical work has been done on cooperative finance and investment. As recently as 1978, Moore and Fenwick clearly recognized the deficiency, writing:

> A theory of "cooperative finance" does not exist. All we know is that corporate finance capital budgeting models fail to provide assistance on cooperative management decisions. (P. 30)

Cooperative taxation, and unique cooperative finance methods such as revolving funds and the related issues of equity allocation and redemption, have attracted most interest (Erdman and Larsen; Dahl and Dobson; Cobia et.al.; Beierlein and Schrader; Royer 1983). Recent articles by VanSickle and Ladd, and Knoeber and Baumer present advanced analyses of cooperative finance issues.

This paper explores the possibilities for a unified theory of agricultural cooperation. It does so by developing a theory of cooperative price, investment, and finance decisions under conditions of risk as well as certainty. This work also is a unified approach to theory in another sense. It jointly examines two areas of cooperative action that usually have been studied separately since 1945. Those two areas are the theory of the

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cooperative firm and the impact of a cooperative on market performance. [1] Examining the link between theories of the cooperative firm and market performance is timely for two reasons. First, there is a renaissance of interest in the appropriate role of cooperation in the food system. Second, the efficient market approach that has enabled economists to make great advances in the theory of corporate finance has not been extended to cooperatives. Using it here provides powerful new insights into several issues facing cooperatives.

Among the many questions that this unified theory addresses are the following:

> Exactly how does a cooperative improve the efficiency of the economy, and what does this imply for cooperative membership education efforts and public policy in areas such as cooperative taxation and antitrust?
>
> What rate of return do cooperative members require on their equity?
>
> What is the role of unallocated equity, most notably retained earnings, in a cooperative? Do they enhance member welfare?
>
> How can one measure the benefit stream for a projected cooperative investment?
>
> How can one develop risk-adjusted discount factors to evaluate investments that have different levels of inherent risk?

As implied by these questions, the theory is testable. Empirical evidence can provide cooperatives with direct operational guidelines.

The Coonerative Dilemma: An Obstacle to Progress in Coooerative Theory--Perhaps the greatest obstacle to progress in the pure theory of cooperation has been the lack of agreement on how to define a cooperative. Briscoe describes this discord as the cooperative dilemma (1971a, 1971b). He explains that cooperators tend to be attracted to two very different concepts. According to him, idealists are concerned with how cooperatives should be organized and what they should do to improve the welfare of their members. Traders, on the other hand, focus on the actual organization and readily observable monetary performance of cooperatives. Basically what is at issue is a normative versus positive approach to the definition of a cooperative.

Many cooperative practitioners derive their energy from a conceptualization of what a cooperative should be. They fear that losing sight of the ideal will harm the cooperative movement. One of the difficulties of this normative approach to defining cooperation is that once one moves beyond the cooperative principles- -which have the approval of more than a century of practice to support them- -any concerned cooperative philosopher can produce a set of cooperative organizational rules. This impedes advances in cooperative theory as well as practice. Energy is focused on determining whether a cooperative follows this or that creed. The normative approach often degenerates into an exercise in catechism. On the other hand, it

certainly is healthy for cooperative thinkers to envision how the cooperative enterprise form can evolve to serve more perfectly its member owner-users.

Rather than shunt these normative issues aside, a theory of cooperation should provide a vehicle for analyzing them. This is an important endeavor because public policy toward cooperatives and the legal status of cooperatives are based, to a large degree, on their unique structural and operating features. Torgerson provides a concrete example of the need for a broad approach:

> In recent years a few cooperatives have taken on business characteristics not entirely in keeping with cooperative character. They include investment unrelated to use of the business, an orientation to growth through mixed ownership arrangements, and capitalization techniques relying increasingly on tax-paid surplus rather than patronage-based investment. They appear to be changing to businesses that just happen to have farmer ownership, but further similarity to cooperative character is purely coincidental. ... This trend spells trouble if it continues. It poses a policy dilemma and raises concerns about the direction of cooperation. (p. 2)

The concern is for "cooperative character" and "the direction of cooperation." What is needed to answer these questions is a scientific, i.e., positive approach that analyzes different cooperative structures and operating procedures to determine how they influence cooperative performance. Then perhaps some insight can be gained into the normative policy issues that cooperative strategic planners face, as well as the more visible public policy issues.

One can begin defining what a cooperative is by reviewing the cooperative principles. Of course, there are other approaches. A standard approach common in many texts, e.g., Roy, is to compare cooperatives with other forms of business enterprise to highlight what a cooperative is and how it differs from other business forms. To do this, however, one must first identify, i.e., define, a cooperative business. Yet another approach is to examine the way cooperatives are defined in the incorporation statues of the states and in federal statutes such as the Capper-Volstead Act. This involves a large amount of legal research and does not contribute much. Different states appear to have written the cooperative principles into law in different ways, but the principles were the starting point for all statutory constructions.

The Organization of This Paper--This section proceeds by reviewing the cooperative principles. A short introduction to the questions of defining a cooperative's objective follows. It helps to delimit the scope and method of this paper. The last part of this introductory section addresses more general methodological issues. It does not purport to be comprehensive. Rather, itis a convenient vehicle for identifying those aspects of cooperative activity that are important but unaddressed components of a unified theory of cooperation. Briefly acknowledging some of the underlying canons of scientific inquiry and related areas of inquiry is important for an endeavor of this sort.

The second section proceeds from a microeconomic perspective. It focuses attention on the cooperative as a firm within a market to analyze the price and output performance of agricultural supply and marketing cooperatives. The third and fourth sections incorporate investment and finance functions in a model of a supply cooperative. The result is a unified theory of cooperation comprising price, output, investment, and finance activities.

The Coooerative Principles

Abrahamsen provides the most complete readily available discussion of the history and evolution of the cooperative principles. Roy also has a chapter on them. Bakken's classic article (1954), his book (1963), and Robotka (1947) provide more perspective on the principles than the textbooks mentioned.

The principles originated with the Society of Equitable Pioneers, a purchasing cooperative, in Rochdale, England in 1844. The original Rochdale principles, as they have come to be called, included the following:

1. Open membership to all regardless of sex, race, politics, or religious creed;
2. One vote per member;
3. Any capital required should be provided by members and should earn a limited rate of return:
4. Any net margins should be returned to members in proportion to patronage;
5. Cooperatives should allocate some funds for education in the principles and techniques of cooperation;
6. Market prices should always be charged, i.e., no price cutting to pass on cooperative savings directly;
7. Cash trading: no credit given or asked;
8. Products should be accurately formulated and labeled;
9. Full weight and measure should be given;
10. Management should be under the control of elected officers and committees; and
11. Accounting reports of financial health should be presented frequently to members.[2]

Over time many of these have come to be recognized as business practices that any firm may or may not follow for better or worse. The first five principles, with minor modifications, plus the requirement that cooperatives cooperate among themselves are the six principles that the International

Cooperative Alliance (ICA) recognizes today as the Rochdale principles of cooperation.

Table 1 gives the ICA version of the Rochdale principles. Agricultural economists, most notably Nourse; Bakken and Schaars; Robotka (1947); Bakken (1954, 1963); Schaars (1980); and Abrahamsen, have interpreted and refined these principles so that they more directly address the particular situation of agricultural cooperatives. With regard to the first principle, membership in an agricultural cooperative is always voluntary, but there are additional considerations. Membership is available only to producers of agricultural products, and agricultural cooperatives can have open or closed membership policies. An open membership cooperative admits producers when they apply for membership. A closed cooperative may refuse a prospective membership application until such time as the cooperative wishes to expand its ranks. Commodity marketing associations often have closed or selectively open membership policies for two somewhat similar reasons. First, closed membership helps to avoid the short-run free-rider problem that can occur when producers who are playing the open market realize that the crop is very large and, after the fact, wish to join the cooperative marketing effort to obtain a higher price. Such late joiners do not contribute to the group marketing plan by committing product and investment capital or by participating in the group marketing decision in a timely fashion. Second, membership policies that are closed over periods longer than the production season allow the members to benefit from long-run investment strategies to develop market channels and establish popular brands that command a premium price. Agricultural purchasing cooperatives, especially secondary or tertiary associations, also ration membership on occasion. The interregional cooperative CF Industries is a tertiary cooperative because it is owned by regional cooperatives such as Farmland Industries (secondary), which is federation of local cooperatives (primary). Until recently, CF Industries produced fertilizer only for the cooperatives that set it up. As will be seen in the last three sections, whether a cooperative's membership policy is open or closed can have a large impact on cooperative performance.

Note that with regard to the second principle, democratic choice systems other than one-member/one-vote (e.g., voting proportional to patronage) are explicitly allowed for secondary cooperatives. The third principle, limiting the rate of return on share (equity) capital, helps to ensure that the benefits of cooperation are distributed to users of the cooperative rather than their investors. In many cases, users and investors are a common group of farmers who are the members of the cooperative. Even then, however, this principle helps to ensure that benefits accrue to members as users rather than members as investors.

The fourth principle is the "operation at cost" principle. The modern version allows considerably more latitude for the disposition of net margins. Members must directly, or indirectly through their board of directors as is usually the case, decide how to honor the operation-at-cost concept. There are three possibilities. First, according to the ICA, members can choose to retain net margins as capital to expand the business. In the United States, this is done by declaring net margins to be earnings, incurring any corporate income tax liability that arises, and using the

Table 1.--The Rochdale Principles of Cooperation Established by the 1966 Congress of the International Cooperative Alliance

1. Membership of a cooperative society should be voluntary and available, without artificial restriction or any social, political, racial, or religious discrimination, to all persons who can make use of its services and are willing to accept the responsibilities of membership.

2. Cooperative societies are democratic organizations. Their affairs should be administered by persons elected or appointed in a manner agreed by the members and accountable to them. Members of primary societies should enjoy equal rights of voting (one-member/one-vote) and participation in decisions affecting their societies. In other than primary societies the administration should be conducted on a democratic basis in a suitable form.

3. Share capital should only receive a strictly limited price of interest.

4. The economic results arising out of the operations of a society belong to the members of that society and should be distributed in such a manner as would avoid one member gaining at the expense of others. This may be done by decision of the members as follows: (a) by provision for development of the business of the cooperative; (b) by provision of common services; or (c) by distribution among the members in proportion to their transactions with the society.

5. All cooperative societies should make provision for the education of their members, officers, and employees and of the general public in the principles and techniques of cooperation, both economic and democratic.

6. All cooperative organizations, in order to serve the interest of their members and their communities, should actively cooperate in every practical way with other cooperatives at local, national, and international levels.

net-of-tax retained earnings for investment. Torgerson has called these unallocated retained earnings "tax-paid surplus" (p. 2). Currently there is major disagreement over whether cooperatives that employ unallocated retained earnings are honoring the operation at cost principle. Torgerson seriously questions whether such financial policies are operation at cost. Some cooperative analysts point out that it is not known who owns the retained earnings, and, except when a cooperative dissolves, they are not returned to member-users. Perhaps more important to this position is a concern that the management of cooperatives that are heavily capitalized by retained earnings may not be as responsive to member-users (Torgerson, p. 2). A related consideration is that members of cooperatives with large amounts of unallocated capital may feel less need to control management through their democratic voting rights because they do not have a direct claim on the cooperative's investment capital. If one has little or no investment capital to lose, why get involved? If member control is weak or nonexistent, is the organization a cooperative?

These concerns are a very important example of the disagreement over what constitutes a cooperative. I choose to include the retained earnings method of operating at cost precisely because of this controversy. Some cooperatives in the United States use it, most notably Agway Inc. The theory developed in subsequent sections will suggest possible reasons why cooperatives' use retained earnings and shed considerable light on their impact on cooperative performance.

A second way for cooperatives to operate at cost is to allocate the net margins to common services for the members. Such common services may be as simple as an end-of-the-year banquet or as complex as a concerted political action program to represent member concerns in public forums.

The third and most common way of operation at cost is to refund net margins to members in proportion to patronage. Such patronage refunds may be in cash or allocated to patrons' capital accounts and used for investment in the cooperative. Note that allocated patronage refunds are different than retained earnings because members have specific ownership claims on the assets. Allocated patronage refunds may ultimately be returned to members. Except for dissolution, retained earnings are not.

Historically, most agricultural economists have regarded principles two, three, and four--democratic control by users, limited return on capital, and operation at cost--as the core of the cooperative business enterprise structure. Both Bakken and Schaars emphasized that they are fundamental for agricultural cooperatives. Abrahamsen reflects the opinion of most agricultural economists today when he includes principle five, cooperative education, in the set of core principles. Also, the fact that members own a cooperative is now separated from the general principle of democratic control to examine the relationship between ownership and control. In practice, one may have ownership without effective member control. Control relates most directly to the internal political process of a cooperative, whereas ownership has major economic consequences: most notably, that owners bear the risk of success or failure of their firm.[3]

Rochdale principle six, cooperation among cooperatives, usually has been regarded as a "practice" that cooperatives should undertake to satisfy the more fundamental "principles." It is not essential for identifying a cooperative. Some cooperative thinkers, nonetheless, have resisted demoting it to secondary status (Rhodes).

In summary, for agricultural cooperatives, the cooperative principles are commonly listed as follow:

1. Operation at cost;

2. Member control;

3. Member ownership;

4. Limited returns on equity capital; and

5. Duty to educate.

Coonerative Business Practices --Schaars establishes six other practices for agricultural cooperatives. They generally have been regarded as good business management practices so "business" has been inserted to emphasize this fact.

1. Members (of the business) should provide equity capital in proportion to patronage.

2. All (business) transactions should be at market prices.

3. (The business) should strive for operational efficiency.

4. (The business) should grow through horizontal and vertical integration.

5. (The business) should control or own marketing facilities.

6. (The business) should remain neutral on political, religious, and racial issues. (Schaars 1951)

The first is most relevant for the theory developed in this paper. Investment proportional to patronage greatly simplifies the analysis of cooperative performance. Although this rule has not been followed by many agricultural cooperatives, the outpouring of concern by farmer patrons, public agencies, and cooperatives on the equity redemption issue suggests that cooperatives will have to increasingly honor it or some other equity investment plan that allows cooperatives to redeem equity on a systematic basis. Otherwise they may have to pay market rates of interest on capital that is not provided by current members in proportion to patronage (U.S. General Accounting Office; Cobia et. al.). For theoretical purposes then, it seems appropriate to assume that equity investment is, at least in the ideal situation, proportional to patronage. One might add that this practice

supports an important aspect of the service-at-cost cooperative principle: it helps to avoid one member benefiting at the expense of another.

The Cooperative Objective--Structure based on cooperative principles is not sufficient to develop an economic theory of cooperation. One also must know something about organizational behavior. Organizational behavior can be very complex. For an economic--as opposed to an organizational or political--theory of cooperation, identifying a cooperative's objective simplifies things a great deal. Once the objective is known in an operational fashion, it can be used in conjunction with the constraints imposed by the organization's structure and market environment to produce a set of predictions or hypotheses about the organization's economic behavior. Alternatively, the theory provides prescriptions for behavior that the firm can follow to obtain its objective. Within the literature, there have been two distinctive approaches to the economic objective of cooperatives issue. One is market-oriented, and it usually has focused on the aggregate welfare of the agricultural sector by examining the performance of the markets in the sector. The other is microeconomic. It focuses on more narrow and immediate firm goals. A cooperative, for example, that cannot pay its bills can hardly advance the welfare of the agricultural sector.

Different schools of cooperative thought propound different market-oriented objectives. There are several, but two have played an historically important role in the development of agricultural cooperatives in North America. The competitive yardstick school, as typified by the writing of Edwin Nourse, reasons that cooperatives should seek to make the marketing system more efficient, thereby benefiting the consuming public as well as farmers. The commodity marketing school, as typified by the vibrant and visionary speeches of Aaron Sapiro, argues that all producers of a particular commodity should organize themselves into a single marketing cooperative. Sapiroism counsels that strength through group action will improve the performance of markets and benefit farmers.

To have historical validity, a theory of agricultural cooperation must at least address this divergence in vision. Does the debate between the efficiency and group power camps, which was most strident during the 1920s and 1930s but lively and often heated today, imply that two distinctly different economic theories of agricultural cooperation exist? The answer to this question is no. The role of cooperatives in markets is circumscribed by the political and economic philosophies of the country in which they operate (Cotterill 1984). In the United States, cooperatives generally are envisioned in law as market-perfecting instruments as Nourse argued, but the concept of workable competition does allow for group action through commodity marketing and bargaining cooperatives. Although cooperatives can exert market power in some cases, they cannot pursue Sapiro's philosophy to its logical extreme--complete control of the marketing system through a producer cartel.

At the microeconomic level, work on cooperative theory has borrowed heavily from the neoclassical theory of the firm. In static models, the IOF maximizes profits. In dynamic models that analyze investment, production, and consumption over time, the IOF maximizes the wealth of current

shareholders by maximizing the net present value of the company's stock (Haley and Schall, p. 23). For cooperatives, there is even less agreement here than there is among the proponents of market-oriented theories of cooperation. In fact, some organization theorists assert that a cooperative does not seek to maximize any objective. They prefer to conceptualize a cooperative as a set of coalitions that makes decisions through a complex political process like a legislature (Vitaliano).

A nonmaximizing approach to decisionmaking may be very useful for explaining the rich detail of organizational behavior in cooperatives. However, the approach taken here is more neoclassical. The reasoning that supports this approach is as follows. Cooperative members cannot only voice their preferences through the democratic control structure of a cooperative, they also can exit the cooperative if it does not meet their needs as well as the next best alternative (Hirshman).[4] For a cooperative firm, the possibility of entry and exit by members is a more general example of changing patronage when the price of cooperative goods and services change. There is a demand curve for cooperative services that represents the sum of members' preferences for the cooperative's services. If the cooperative is a marketing- -rather than a supply--cooperative then there is a supply curve. Given that the cooperative faces such member supply or demand curves, the quest for an economic objective assumes a well-known form. Cooperative management must decide where to operate on the member supply or demand schedule. This involves setting prices and is a market transaction rather than an exercise of administrative fiat. There is need for an objective function of the standard microeconomic sort to guide management price, finance, and investment decisions.

The second section of this paper examines several objective functions that have been proposed for agricultural cooperatives. Because different objectives can produce significantly different predictions about cooperative behavior, it would be a significant advance in cooperative theory if several objectives could be eliminated or shown to produce the same result when particular competitive conditions and/or cooperative structural features are given.

A Note on Social Science Methods and Unexplored Areas in the Theory of Coooeration

Clark has described the method of inquiry in economics as follows:

> General economics must simplify in order to interpret; otherwise its description will be just as unwieldy and baffling as the world itself. . . . It will be a never ending search for generalizations that are significantly true and for that very reason are often neither one hundred percent accurate, nor universally applicable. (P. 78)

In other words, a theory cannot be a complete catalogue of activity, nor can it be, at the other extreme, a tautological statement that by construction is impossible to reject. Friedman (1953) concurs by describing useful theory as parsimonious and robust in the sense that it predicts observed behavior well.

Because economics is a social science, a feature of theory construction that is undoubtedly more mettlesome than for the physical sciences is the issue of scientific objectivity. Friedman and the logical positivists argue that value (i.e., normative) premises are irrelevant. As long as the resulting theory has descriptive content that is testable for empirical validity, it is useful. A definition of the operation-at-cost principle, for example, that includes the possibility of the cooperative retaining unallocated earnings for investment can serve as a building block for a theory that may predict many aspects of cooperative behavior well.

Others disagree, arguing that a vibrant and often implicit relationship exists between value premises, the resulting theory, and its analysis of economic events. Continuing the example, a concern for the impact of unallocated retained earnings on cooperative performance may lead a theorist to formulate a different theoretical model than he or she otherwise might. Science may be objective, but in deciding what angle of attack to take in their search for order, scientists are not. Myrdal has emphasized the importance of this interdependence for social science theory. He writes:

> In order to avoid biases in research and to make it "objective" in the only sense this term can have in the 'social sciences we need to select and make explicit specific value premises, tested for their feasibility, logical consistency, relevance, and significance in the society we are studying. (p. 146)

Aresvik argued for this approach in diffuse fashion during the 1950s debate on whether a cooperative is a firm or an association (p. 142). With regard to the theory presented in this paper, perhaps the most important general value premise is: that the cooperative is a firm rather than an association of firms. A substantial collection of scholarly work based on the anarchist philosophy of Kropotkin and the economic analyses of Emelianoff and Phillips views the cooperative as an association. Robotka (1947); Savage; and Helmberger and Hoos argue otherwise and conclude that the appropriate premise is to regard the cooperative as a firm. In response to the question does a new economic entity emerge when a cooperative is formed, Robotka dismissed the decentralist and individual approach of the anarchists. He wrote:

> "The cooperative organization is a business enterprise firm" is almost universally accepted without question or verification. ... Although a cooperative does not appear to meet all the specifications of a firm, it cannot be denied that it is an economic entity. ... A new decision making body is created; ... a new risk bearing body emerges. (Robotka 1947, p. 103)[5]

Less attention will be paid to related avenues of inquiry that are very important for a complete theory of cooperation if one values member control, democratic organizations, and the quality of cooperative management. To proceed in this area, one must examine the structure and operation of the member control process. Ostergaard and Halsey pioneered formal analysis in this area with Power in Cooperatives. Craig's "Representative Control Structures in Large Cooperative" and subsequent work establish him as a skillful theoretician in this area. A recent research report by Mirowsky

uses organization theory to explain how different democratic control systems can be analyzed in agriculture cooperatives. Finally, Vitaliano considers similar issues by applying the agency theory that Jensen and Meckling and others have developed to cooperatives. A truly comprehensive effort to establish the general theory of agricultural cooperation would integrate the current efforts with a theory of member control and the internal political process of cooperative firms. That, however, is beyond the scope of this effort.

The Coonerative Objective and Coooerative Price Eauilibrium Without Investment or Finance

Introduction

One way to expand the theory of cooperation is to begin with the competitive yardstick theory, critique it, and ultimately generalize it. Nourse first explained that a major objective of the agricultural cooperative movement is to act as a competitive yardstick for farmers in the food system (Cotterill 1984). As cooperatives perform this strategic function, the economy becomes more efficient because competitive pricing allocates resources without waste. Efficiency gains accrue primarily to farmers and consumers.

A yardstick cooperative, Nourse explained, produces this result by moving into a oligopolistic input or oligopsonistic processing industry. Like an invention that lowers costs, the cooperative provides its members benefits directly and other farmers benefit indirectly because IOFs must match the cooperative's performance. With a farm marketing cooperative, farm prices are higher and farm output increases. These results can be attained without raising prices to consumers. With a farm supply cooperative, input costs are lower and farm production and income increase. Increased output in the supply cooperative case ultimately produces lower food prices for consumers.

However, the monetary reward for innovation (in this case, organizational innovation) that farmers enjoy can be transitory. This is because farming is a competitive industry. Once equilibrium is regained, farmers' profits will be no higher than they were at the outset. The only exception to this rule is that rents for any resource in limited supply and owned by farmers may be bid up as output expands. Strictly speaking, however, increased rents are capitalized into increased factor values, e.g., value of land or the genetic potential of purebred cattle. Such capital gains are due to resource ownership rather than farming per se.

Two criticisms commonly are made of the competitive yardstick theory. To some, it is simplistic. Cooperative performance has more dimensions than this competitive price model suggests. Marketing cooperatives often benefit their members by differentiating their product to improve producer returns. Cooperatives also benefit members and society in other ways not captured by the yardstick theory, for example, leadership training or representation of farmers in the political arena as well as results of a more economic sort, for example, services directly related to product use. They point out that such cooperative activities are public goods that benefit many, and it is

difficult if not impossible to charge a price for them. This is a more general, even sociological, approach to cooperative theory.[16]

The second major criticism of the yardstick theory manifests itself in a subtle but pervasive fashion. Economists and cooperative executives making public statements, such as speeches at annual meetings, often shy away from yardstick pronouncements because they feel that the theory does not focus attention on the activities and performance of the cooperative enterprise in a constructive fashion. Under the yardstick theory, cooperatives must not only be well-run businesses that provide members value through desirable prices or handsome year end net margins; they also must change the competitive behavior of IOFs with whom they compete. It is this second charge that creates uneasiness, especially if the cooperative is not a well-established firm with a leading position in the industry. Executives in smaller cooperatives understandably do not like to make claims or promises about their ability to change industry conduct. Executives in larger cooperatives may prefer to be known in the industry as good corporate citizens rather than tough competitors. This reticence to embrace the yardstick philosophy in a day-to-day operational sense suggests an important proposition. The competitive yardstick objective at best is a long-run goal.

A similar situation exists for IOFs. No IOF reports to its stockholders that it had a good year because it caused other firms to lower prices. Its executives report the amount of profits earned. Profitability is a goal in itself. It directs business decisions. Adam Smith's invisible hand ensures that such overt self interest serves broader social interests. In other words, competitive markets ensure that the long-run performance goal (price efficiency) is met when firms maximize profits.

For a cooperative, then, an intensive approach to theory would be to articulate and analyze an analogue to the IOF profit maximization-invisible hand combination. To do this, one needs a theory of the cooperative firm that is an integral part of a theory of market equilibrium. The analysis presented here demonstrates that cooperative membership policies, financial practices, and members' expectations interact with cooperative objectives to produce considerable variation in cooperative price-output performance. Some results produce competitive yardstick equilibria; others do not.

The approach planned is as follows. First, here in the introductory part of this section, there will be a brief discussion of cooperative equilibrium. This concept has implicitly played a central role in many early theories of cooperation (Helmberger and Hoos; Phillips). Cooperative and market equilibrium concepts are the core of the theory developed here. Next the basic assumptions of this analysis and the cooperative objectives commonly advanced by economists will be presented.

The next part of this section will examine agricultural supply or purchasing cooperative theory. First, some facilitating assumptions will be made. Second, the demand curve for a monopoly purchasing cooperative (the market demand curve) will be partitioned in a useful way. Then supply cooperative equilibrium will be explored in different market environments--most notably in monopoly and oligopoly markets. An important feature of this section is

that it extends the cooperative yardstick concept to cover supply cooperatives that are monopolists. Monopoly cooperatives, do not, for example, behave like IOF monopolists. The impact of retained earnings, of closed versus open membership, and cash patronage refunds will be examined. Finally, the question of competition among cooperatives and the implications of extending the theory to the multiproduct case are discussed.

The third part of this section will explain agricultural marketing cooperative price theory. First, some facilitating assumptions are made. Then the input supply curve is partitioned, and, finally, cooperative performance is analyzed in monopsony and oligopsony markets. The possibility of a marketing cooperative developing market power through product differentiation in the processed product market will be introduced, but not analyzed. Such an analysis is a straightforward and major extension of the theory developed in this section.

Cooperative Eauilibrium--A cooperative that transacts business in a market is considered to be in equilibrium as an organization when its management has attained its objective and no members or potential members determine that, as a result or‘ the cooperative management policies, they must change their business relationship with the cooperative to attain their own business objectives. A cooperative objective, for present purposes, need not be an exact quantitative target such as a 15 percent growth rate. It could be a more general commitment, e.g., to maximize sales within the constraint that net margins are nonnegative.

The definition of cooperative equilibrium is comparable to the long-run equilibrium condition for an IOF. Such a firm is in equilibrium when its management has attained its objective, e.g., profit maximization, and no patrons or potential patrons determine that, as a result of the firm management's decisions, they must change their relationship with the firm to attain their own goals, i.e., there are not shifts of or movements along the supply or demand curves facing the firm.

Cooperative price-quantity equilibrium, however, can be different from IOF equilibrium even when the two firms have identical cost and demand conditions and the same objective. The reason for this is that a cooperative does not distribute net margins as profit to equity holders; it distributes net margins to members in proportion to patronage. Given the assumption that equity investment by members is proportional to patronage, net margins distributed according to patronage also are distributed proportional to investment as in an IOF. Nonetheless, as will be demonstrated, channeling the distribution through patronage can produce a different equilibria for the cooperative firm. Other features of a cooperative also can establish cooperative equilibria that differ from IOF equilibrium. These differences are the source of a cooperative's yardstick impact on market performance, i.e., the movement toward an efficient allocation of resources in a market economy.

Basic Assumptions--To analyze the relationship between cooperative objectives and cooperative equilibrium, it is convenient to assume the following. Assume that the economy is static. All production and consumption decisions

are made at a point in time. Points in time occur in a successive but unrelated fashion, i.e., there is no investment to link present and future economic activity. Thus equity capital is a purchased input for immediate use in the production process and its price (rate of return) is determined in the market for capital at that point in time. Also assume that there are no taxes. With regard to cooperative structure, the cooperative is organized according to the cooperative principles listed in table 2. With regard to the operation-at-cost principle, assume all net margins are paid as cash patronage refunds in the following period. The model could be generalized to encompass patronage refunds that are allocated into revolving funds. It also can accommodate per-unit capital retains commonly used in marketing cooperatives. With regard to the limited rate of return on capital, assume it is equal to the return on capital in alternative uses. If it is not, one can alternatively assume that members have provided the capital in proportion to patronage. Then prices paid can be adjusted so they are net of opportunity costs payments to equity capital. In addition to the cooperative principles, also assume the cooperative sells only to members. **This** assumption could, but will not, be relaxed to analyze the impact of nonmembers patronage on cooperative performance.

Coooerative Obiectives--Several objectives commonly have been advanced for use by cooperatives. The most important ones and some of the authorities that have argued for them are listed in table 3. Other objectives that have attracted some attention are minimizing the cooperative's costs and maximizing the patronage refund per unit (Kennedy, p.77). They are not included because the former is equivalent to characteristic three in table 2, and the latter produces no insights beyond those obtained from examining objective one.

Supply Cooperative Theory

To facilitate a systematic analysis, the following assumptions are made and will be relaxed at various points in this section. Assume members base their patronage decisions on the market transaction price. Members regard the cash patronage refund in the next period as a windfall gain. Also assume the cooperative is a monopoly and entry is blockaded. Finally, assume the cooperative sells only one product to farmers.

Partitioning a Supply Coooerative's Demand Curve--To analyze the objectives listed in table 3 within the context of a purchasing or supply cooperative, it first will be helpful to partition the cooperative's demand curve into demand from a set of members and demand arising from changes in that set of members. Because at this stage of the analysis the cooperative is by assumption a monopoly with blockaded entry, it faces the market demand curve DD in figure 1. D_1D_1 is the demand for the cooperative's product from a given set of cooperative members Ml. Thus it is the demand schedule for a closed membership cooperative. In a closed membership with Ml members, a price decline to P_2 would cause the quantity demanded from those members to

increase from Ql to Q_{12}. This is a move down D_1D_1. If the cooperative were an open membership organization with membership Ml at price Pl, a price decline to P_2 also would increase demand because new members join the

Table 2.- -Basic Assumptions for Price Analysis

Static Model Assumptions

1. All economic activity occurs at unrelated points in time (exception: patronage refunds, if any, are distributed at the following point in time).

Coooerative Organizational Characteristics

1. Member control.

2. Member ownership.

3. Operation at cost by paying patronage refunds in cash at the next time point of economic activity.

4. Limited rate of return on equity capital that is:

   (a) equal to the market rate of return, and

   (b) equity capital input is provided proportional to patronage.

5. The cooperative promotes education about cooperatives.

6. The purchasing (marketing) cooperative sells (buys) only **to (from)** members.

Table 3.- -Possible Objectives for a Cooperative

1. Maximize cooperative net margins.

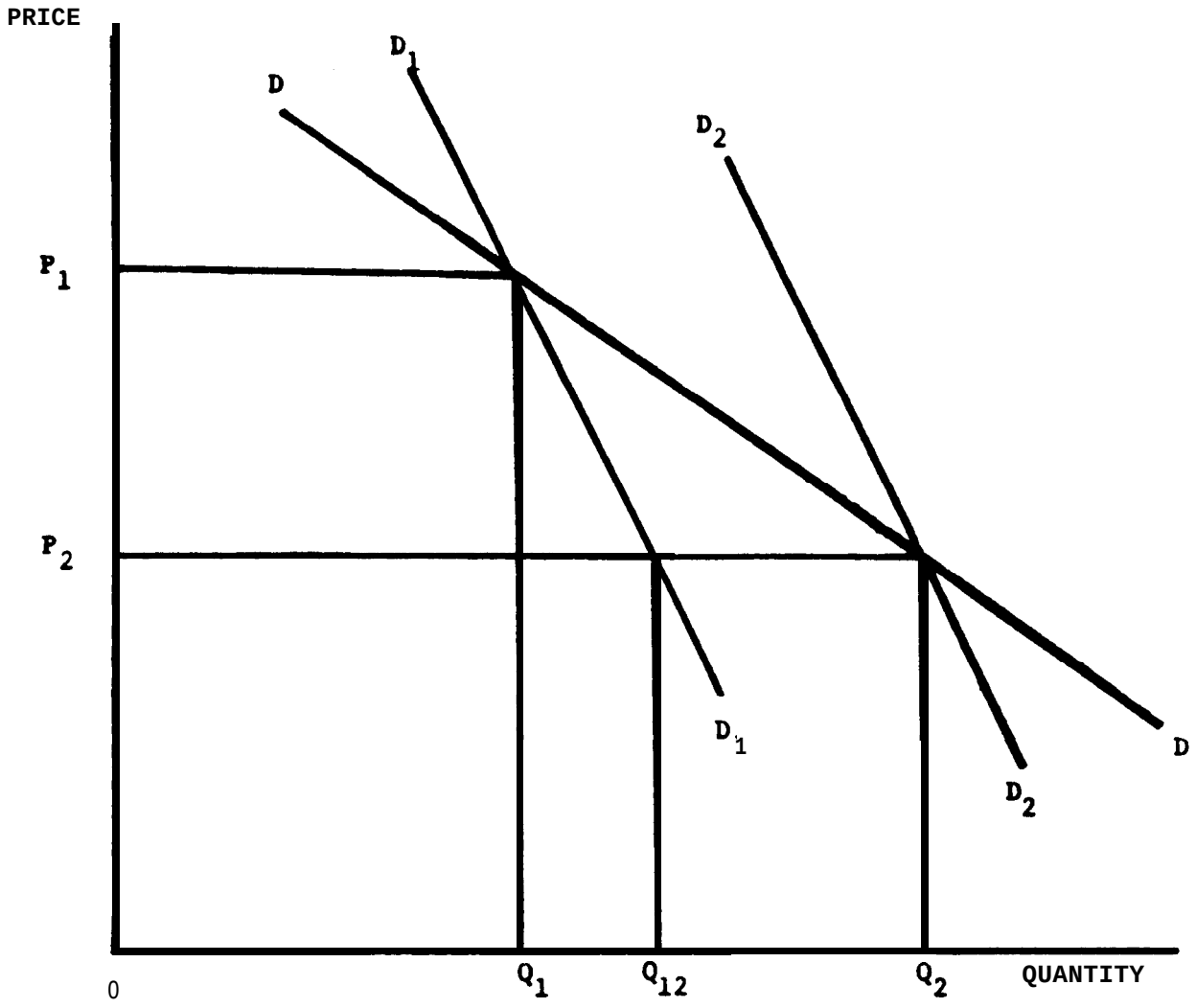
2. Maximize members' welfare (Ladd; Royer 1979, 1981; **Enke**).[a]

3. Minimize (maximize) price in a purchasing (marketing) cooperative (Nichols; Clark; Helmberger and Hoos; Heflebower).

4. Charge market prices and refund surplus (Rochdale pioneers; Walsh).

[a] Ladd and Royer address different types of agricultural cooperatives, and Enke examines only a consumer cooperative. Nonetheless, the objectives they proffer are the same.

Figure 1--Partititioning a supply cooperative's demand into demand from a set of members and changes in the set of members



cooperative. The quantity sold at P_2 would be Q_2. The market demand DD is a combination of these two separate effects. Thus an open membership cooperative faces the market demand curve. D_2D_2 is the new membership demand curve at membership level M2, which is greater than M_1.

It is insightful to note what happens when price increases in a closed membership cooperative. First, assume that members can quit the cooperative, i.e., there are no real or perceived barriers to exit. Then raising price from P_2 to P_1 will not reduce the quantity demanded by moving up D_2D_2. Rather the quantity demanded is reduced by members quitting until membership demand shifts to D_1D_1, and the remaining members purchase Q_1Q_{12} less of Q. An important conclusion follows. A closed membership cooperative's demand curve is kinked. Purchase behavior along any membership demand curve is bounded on the upper side by the market demand curve.

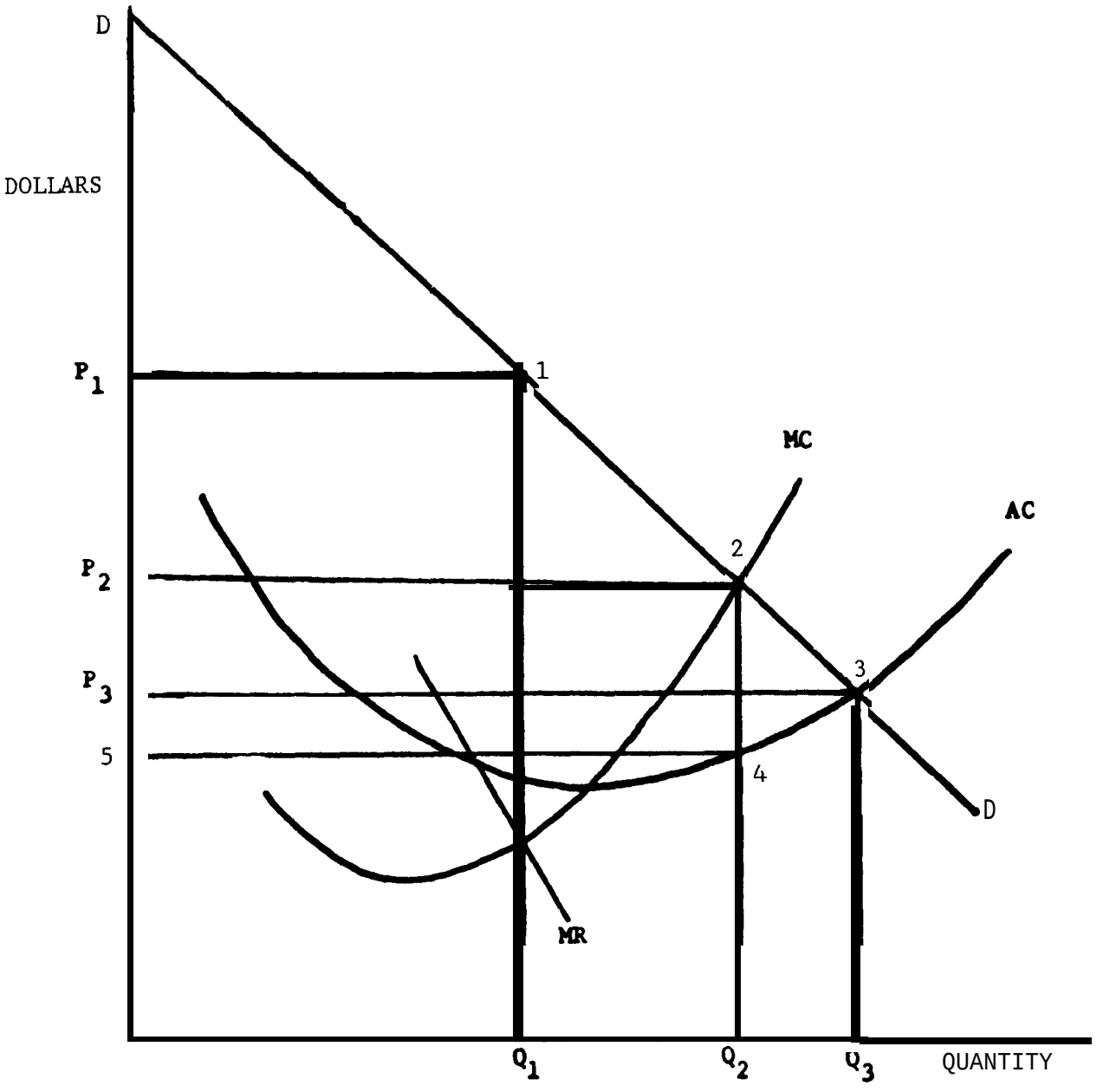
If members, for whatever reasons, cannot exit the cooperative when price rises, the new equilibrium would on D_2D_2 at price level P_2. Although there may be cases where members are locked in because of contracts or other ties to the cooperative, this probably does not occur often. Thus the demand curve in a closed membership cooperative normally will be kinked.

Analysis of Supply Coonerative Obiectives--Turning now to the analysis of the four objectives listed in table 3, figure 2 portrays the cost and demand conditions for a supply cooperative with an open membership policy that has a monopoly and expects no entry by outside firms. Because the cooperative is the only firm in the market, DD is the market demand curve. Point 1 indicates the price a private profit-maximizing monopolist would charge, which is the price that a cooperative charge if it seeks to maximize net margins. Few cooperatives explicitly adopt this pricing objective.

Enke; Ladd; Royer (1978, 1982); and undoubtedly others have reasoned that the appropriate goal for a cooperative is maximum welfare gain for members. Royer analyses a more complex cooperative than is presented here. For an agricultural cooperative that sells several inputs to farmers and purchases several products from them, he concludes that the maximum welfare gain for members occurs when the sum of the members profits from on-farm operations plus cooperative net margins (patronage refunds) are at a maximum (Royer 1982, p. 30)[7]

For a supply cooperative, one can express this condition in terms of maximizing the sum of the cooperative's producer surplus (profits) and the aggregate Hicksian consumer surplus members derive from purchasing the product (Royer 1982, p. 36; Enke). In figure 2, a cooperative can attain this result by charging P_2 and selling Q_2. At point 2, cooperative's marginal cost intersects the farmers' aggregate derived demand curve for the input. The cooperative's profits or net margins are represented by area P_2245. Because the area under the demand curve equals the amount farmers would be willing to pay rather than do without the input, that area is Hicksian consumer surplus. Both Royer and Enke demonstrate that, at point 2, the decrease in the cooperative's profits from an increase of one unit of output is just offset by the increase in the consumer surplus. Beyond that point, the marginal profit loss is greater than the marginal consumer surplus

Figure 2--Cost and demand conditions for an open membership supply cooperative with a monopoly and blockaded entry



gain, indicating that point 2 gives the output level that maximizes the sum of cooperative profits and members' consumer surplus.

In Enke's consumer cooperative framework, where the demand curve is for consumption, this member welfare-maximizing solution also maximizes social welfare. For the same property to hold in the agricultural purchasing cooperative situation, one need only require free entry and adjustment to a long-run equilibrium of zero profits in the farming industry. As this process occurs, any short-run quasi-rents (profits) are passed on to consumers, assuring economic efficiency. Cooperatives following the member welfare-maximizing goal could do so with the following pricing rule: charge farmer members the price (P_2) that produces the volume of business (Q_2) that equates price and marginal cost. Because price P_2 is greater than the average cost at output level Q_2, the cooperative enjoys a positive net margin. To honor the operation-at-cost principle the cooperative could, among other things, pay a patronage refund.[8]

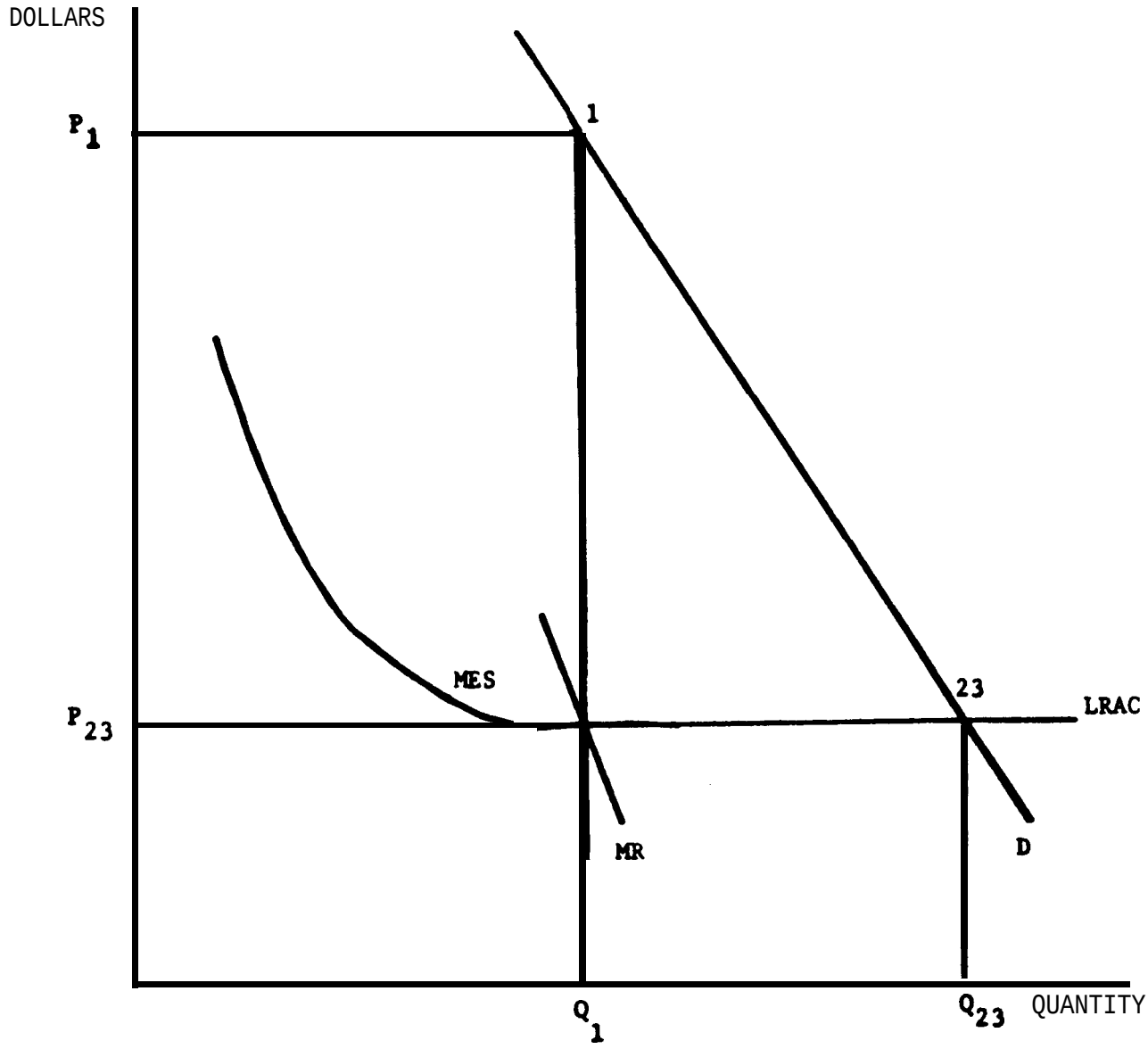
Helmberger and Hoos; Heflebower; and others have asserted that a single product open membership supply cooperative will seek to offer farmers the product at the lowest price consistent with covering the cooperative's costs. A cooperative would attain this goal by charging P_3 and selling Q_3. No net margins remain, so there are no patronage refunds, or any other type of surplus distribution, to members. This minimum price objective in an open membership cooperative also can be described as output maximization.

The fourth objective in table 3, charge the market price and refund any net margin, is not applicable under current assumptions. Because the cooperative is a monopoly, it sets the market price. It cannot follow other firms. Given the assumptions made about cooperative structure and market conditions, objective two is the most desirable objective for the cooperative because it maximizes member welfare.

Analysis of Cooperative Objectives: L-Shaped Long-Run Average Cost Curves--Consider figure 3 where the long-run average cost curve of the cooperative is now assumed to be L-shaped. A cooperative behaving like a profit-maximizing monopolist and maximizing net margins would charge Pl, sell Q_1, and return net margins to members as patronage refunds. The novel result is that objectives two and three, maximum member welfare and minimizing product price, occur at the same price-quantity point. Following a marginal cost pricing rule gives the same results as following an average cost pricing rule because long-run average cost equals long-run marginal cost beyond the minimum efficient scale (MES) in figure 3. Therefore, if long-run cost conditions are as portrayed in figure 3, objectives two and three are the same for analytical purposes, and one no longer needs to argue the merits of one over the other.

Analysis of Cooperative Objectives: Consideration of Patronage Refunds--Relaxing the assumptions that members consider only the transaction price when deciding how much to buy from the cooperative produces an even more powerful result. Assume that member demand for the cooperative product is now a function of expected net price E(NP), which is defined as the transaction price P minus the expected patronage refund per unit E(PR).

Figure 3--Open membership cooperative monopoly with declining and then constant long-run average costs



That is,

(1) $E(NP) = P - E(PR)$.

Furthermore, assume that the expected patronage refund E(PR) in the current period equals the actual patronage refund of the preceding period. More realistic specifications of farmers' expectation formation processes could be developed. However, the added complexity adds little to the general results obtained here.

The cooperative equilibrium concept now becomes important. Management may seek to maximize net margins or member welfare, but in this dynamic model, they will be thwarted by member demand behavior. Consider the following scenario illustrated in figure 4. The cooperative has been charging P, selling Q, and paying no patronage refunds in the past. In the next period, period two, management decides to maximize member welfare by charging P_2 and returning P_2 - AC2 per unit as a patronage refund on quantity Q_2. In period three, management continues to charge transaction price P2, but members now expect a per-unit patronage refund of amount $P_2 - AC_2$. Thus they decide to purchase Q_3. The cooperative experiences higher average costs and the actual per unit refund is $P_2 - AC_3$. Given this lower patronage refund, in period 4, members only demand amount Q_4. This cobweb adjustment process continues until equilibrium is reestablished at Q. Management continues to charge P2, but expected net price is now equal to P because members know they will receive P_2 - P as a per-unit patronage refund.

The conclusion of this analysis is as follows. The only objective for an open membership supply cooperative that is consistent with long-run cooperative equilibrium is objective three, minimize the price of the product. Alternatively, an open member supply cooperative will seek to maximize quantity sold given market demand and subject to covering costs of operations. This is a constrained sales maximization goal only if the elasticity of demand is greater than one.

Analysis of Coooerative Objectives; Consideration of Patronage Refunds and Closed Membership--How, one may ask, would converting to a closed membership cooperative affect the results of the previous section? Figure 5 can be used to answer this question. The market demand curve has been partitioned into two membership demand curves. D_1D_1 is the membership demand curve for all farmers who would purchase the product at expected net price Pl. As explained earlier, usually only the portion below the market demand curve has economic significance; an exception would occur if there are barriers of any sort that prevent members from ceasing to purchase the product at the cooperative. The same is true for D_2D_2, the membership demand curve for farmers who would purchase the product at P_2. The number of members here, M_2, is less than Ml, the number associated with D_1D_1. Restricting membership to the M_2 level would temporarily raise the price to P_3. However, it is not a long-run equilibrium solution. The cobweb adjustment process would ultimately lead the cooperative to equilibrium at expected net price P_2 and output level Q_2. Expected net price would be composed of a

Figure 4--Dynamic analysis of a cooperative equilibrium when members recognize the value of expected patronage refunds

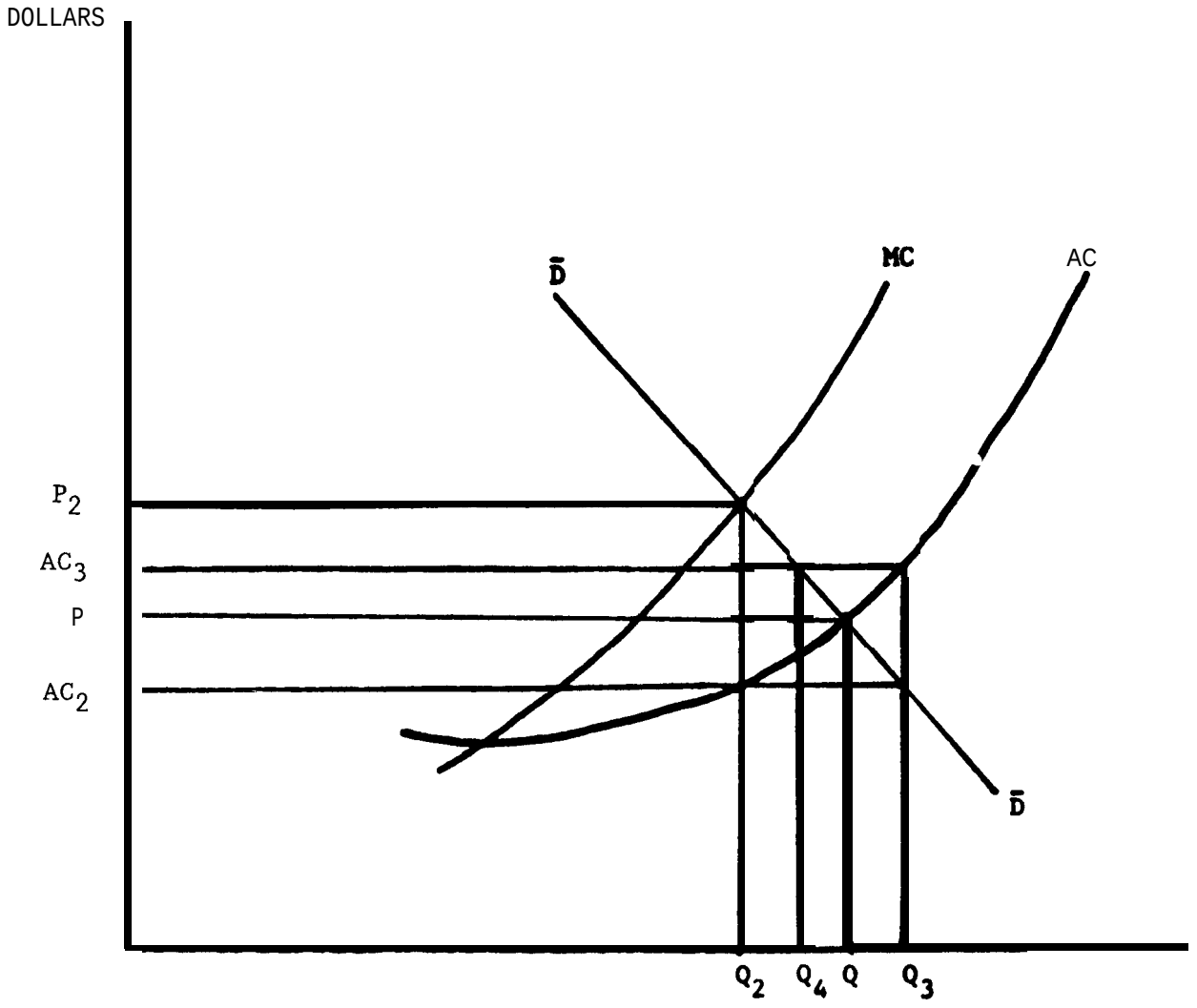
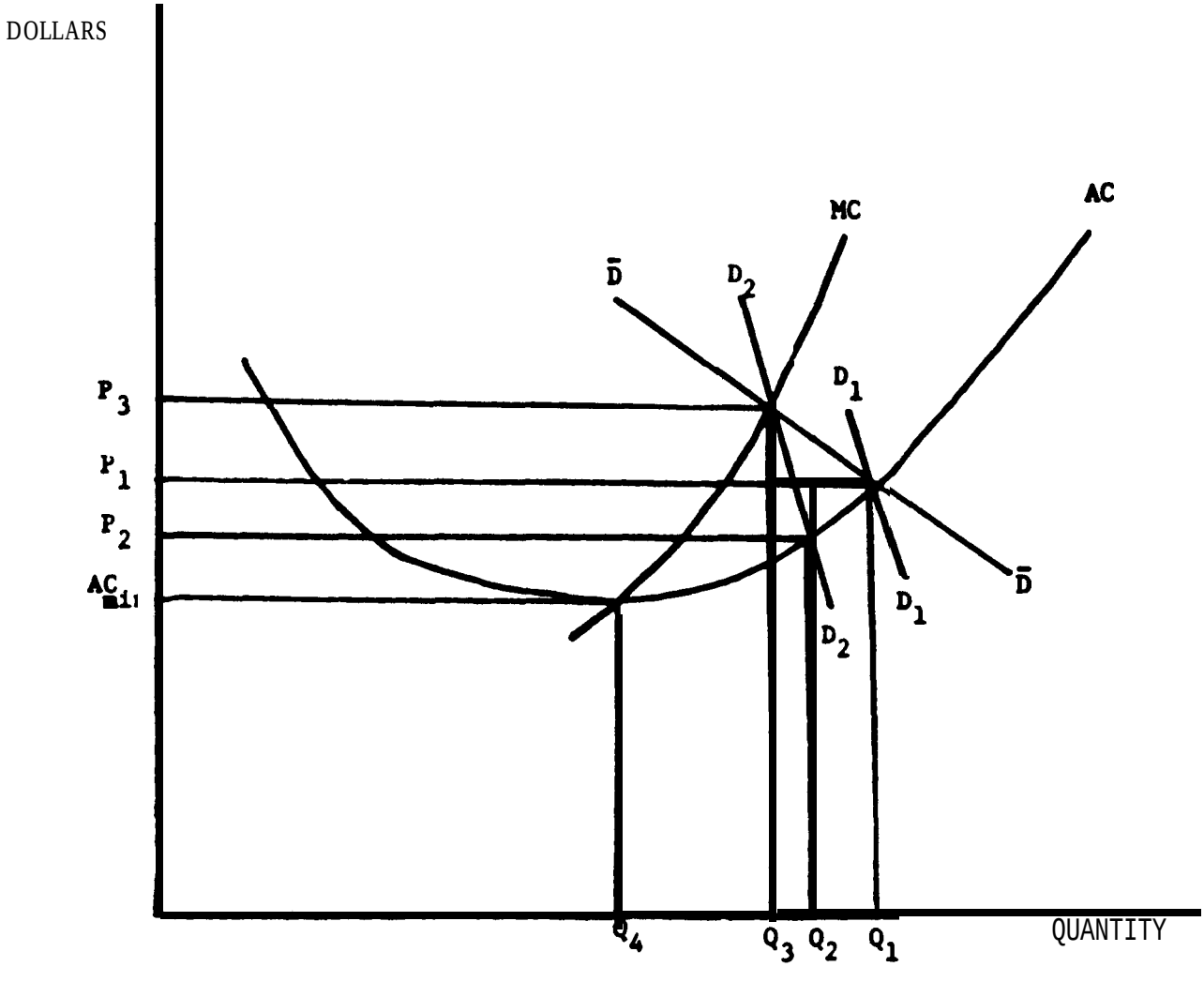


Figure 5--Impact of a closed membership policy on monopoly supply cooperative equilibrium when members recognize the value of expected patronage refunds



transaction price equal to P_3 set by management and a patronage refund equal to $P_3 - P_2$.

Two important results of this analysis follow. Membershlp restrictions cannot be used to establish the maximum member welfare objective. To attain it, the cooperative must adopt some form of quota or production control scheme. Note, however, that membership restrictions can be used to lower the cooperative's expected net price to the minimum value of the long-run average cost curve. This produces a member welfare maximum for the remaining members because at that point price equals marginal cost, but it does not produce maximum social welfare for the obvious reason. A number of producers have been excluded from the input market. The quantity of the product sold is considerably less than Q_3, the socially desirable amount. As a result, the amount of agricultural production is less than it would otherwise be. Consumers pay higher prices and the fortunate farmers who are in the cooperative earn economic rent (profit) on their cooperative membership. If the membership was attached to the farm, it would be capitalized and raise the value of the farm. Thus a restrictive membership policy would not benefit future cooperative members who buy the farm and have to pay for cooperative access as well.

Retained Earnings in a Monopoly Supply Coooerative--Retained earnings, i.e., net margins that are not distributed as cash or allocated to members' equity accounts, affect cooperative equilibrium. A cooperative that retains net margins can attain any price output point on the market demand curve in figure 2, including points 1 and 2. Because members do not expect to receive any patronage refunds, they base their purchase decision on the transaction price. The cooperative can, for example, price like a profit- (retained earnings) maximizing firm by setting price at level Pl. Setting price at level P_2, however, does not maximize member welfare because members do not receive retained earnings.

The Three Stages of Coonerative Output--A useful concept worth mentioning is related to the conclusion that the price received by members is determined by the intersection of the market demand curve and the average cost curve. One can define three different stages of cooperative output according to the economic relationship that exists among members. If demand intersects the average cost curve to the left of its minimum, this is known as the complementary output stage. Increases in demand lower price for all cooperative members. If demand intersects a flat section of the average cost curve, if any exists, this is known as the supplementary output stage. If demand intersects the rising portion of the average cost curve, the cooperative is in the conflictive output stage. A cooperative's membership policy and membership education effort may depend very strongly on the particular stage in which it is operating (Croteau, pp. 9-10).

Conclusions for the Coonerative Monopoly Model--This section on cooperative objectives under monopoly conditions concludes with three general points. First, the supply cooperative objective that is consistent with cooperative equilibrium, when farmers expect patronage refunds, is to minimize the price of the product subject to covering the cooperative's costs. This price occurs where the demand curve for an open or restricted membership

cooperative intersects the long-run average cost curve. Therefore, a monopoly cooperative that pays patronage refunds acts as a competitive yardstick against itself. In the long run, cooperative price equals average cost.[9] This generalization of the competitive yardstick concept is novel and potentially quite important as a guideline for antitrust analysis of cooperative business practices. Even monopoly cooperatives may attain desirable social welfare norms such as allocative efficiency.

Second, the allocation of cooperative benefits between the transaction price and the patronage refund per unit cannot be used as an instrument by management to maximize member welfare, and it need not be used to minimize the price subject to covering costs. No matter how the allocation is set, the cooperative will attain long-run equilibrium.

Third, a cooperative that retains earnings has the flexibility to select any price-output combination on the demand curve facing it. This includes the net margins (retained earnings) maximizing point. Retained earnings, however, cannot be used to earnings maximize member welfare. These results also hold for cooperatives that are not monopolies.

Fourth, controlling the size of the membership can benefit those who are not excluded, but such policies are not socially optimal. One might, however, correctly point out that a restricted membership cooperative may be able to move the economy toward a more efficient allocation of resources if entry is not blockaded. The existence of several potential or established farmers who do not have access to this input might signal a private firm to enter or provide incentive for excluded farmers to organize a second cooperative. If a second cooperative was established and demand in figure 5 was shared between them, the result would be that all farmers would enjoy price near the level minimum average cost level. Member and social welfare would be even higher than it was at the unattainable price output point (P_3,Q_3). Whether social welfare would be higher if an IOF enters takes us into an analysis of how cooperative objectives are influenced by market structures where the cooperative has investor-owned rivals.

Relaxing the Independence Assumption--Analyzing cooperatives as if they were monopolists with blockaded entry essentially assumes that they are unaffected by and do not have an impact on other firms in the market environment. This independence assumption is now relaxed to examine what different competitive environments can tell us about a cooperative's objective and its performance. The fourth objective in table 3 now has content because there is a market price and the cooperative can choose it or some other price level as its transaction price. The competitive yardstick concept, as Nourse envisioned it, also becomes operative. Previously a cooperative was only working against itself or, more accurately, its members. Now it is working against other firms as well, and one can ask whether it pulls rivals as well as members toward a more efficient allocation of resources. Continuing the example of a purchasing cooperative, there are three structural configurations that merit analysis--perfect competition, monopolistic competition and oligopoly.

The first two, perfect competition and monopolistic competition, can be dismissed as trivial for cooperative theory. In a perfectly competitive market, entry is easy, firms are numerous, and they are price-takers. No firm, including a cooperative, has discretion over price so the objective must be to charge the market price and refund any net margins to members. In long-run equilibrium, market price equals minimum average cost. Net margins are zero, and members receive no patronage refunds. Member and social welfare would be at a maximum because price equals marginal cost. With regard to monopolistic competition, it is sufficient to note that long-run equilibrium occurs for each firm where its demand curve is tangent to the long-run average cost curve (Ferguson, p. 299). Therefore, as in the perfectly competitive situation, it makes no difference which objective a cooperative pursues. Each produces the same equilibrium price-output result.

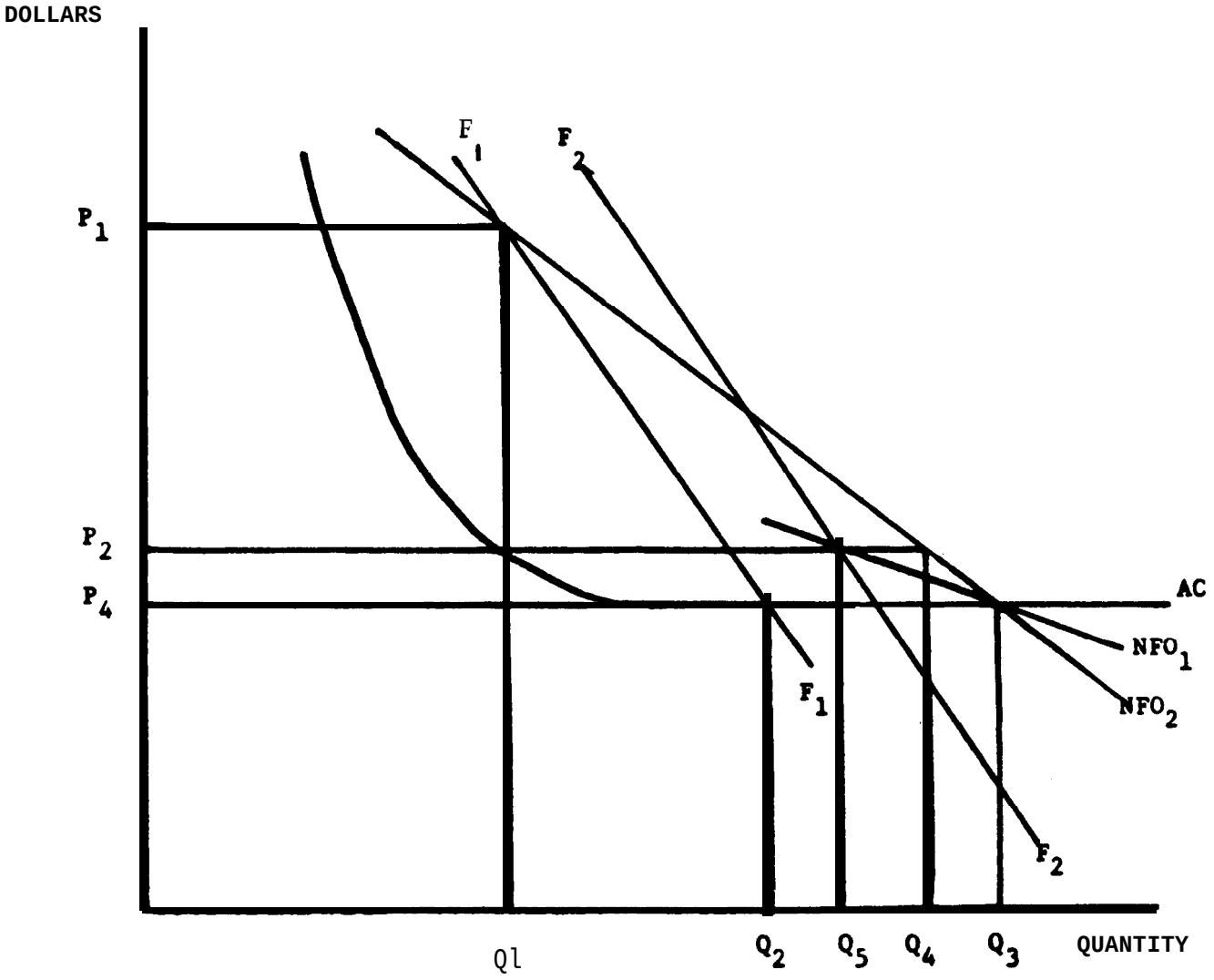
Oligopoly is the most relevant real-world, theoretically interesting environment for most cooperatives. Assume that all firms, including the cooperative, have symmetric costs, IOFs recognize their interdependence, and they jointly maximize profits as in Chamberlin's small-numbers case (Chamberlin, pp. 46-51). To analyze this joint profit-maximizing solution, industrial organization economists have defined followship and nonfollowship demand curves (Greer, pp. 257-61). A followship demand curve for a firm is that amount of industry sales that it receives when all firms raise or lower prices in tandem. Assuming that farmers do not switch among firms when all firms change prices at the same time, the followship demand curve construct is equivalent to the closed membership demand curve. As all firms in the industry raise or lower prices in tandem, they keep the same set of customers. Thus they are moving along what has heretofore been called a membership curve. A nonfollowship demand curve is analogous to the market demand curve of the monopoly cooperative case in that it is predicated on the assumption that changes in a firm's price are not followed by (are independent of) rival firms. The nonfollowship demand curve therefore is considerably more elastic than the followship curve.

Figure 6 illustrates how the followship and the nonfollowship demand curve can be used to analyze cooperative equilibrium in an oligopoly. Given initially the followship demand curve F_1F_1 and that the IOFs maximize profits by charging P_1, the cooperative has some important choices.

Oligopoly: Closed Membershin Cooperative Eouilibria--If it is a closed membership cooperative, it can price at P_1 and pay a per-unit patronage refund equal to P_1P_2. Ultimately membership demand will attain equilibrium at Q_2. The cooperative will continue to charge P_1, but it will pay a per-unit patronage refund equal to P_1P_4. A very important result follows. A closed membership cooperative equilibrium will not disturb the oligopolistic joint profit-maximizing equilibrium.

There will be no competitive yardstick effect on the market price. This case occurs because the cooperative captures no customers from the proprietary firms. In essence, the closed membership cooperative structure allows the cooperative to move down its followship demand curve while the other firms do not. If it prefers, a closed membership cooperative could lower price from P_1 to P_4 rather than charge market prices and pay patronage refunds.

Figure 6--Supply cooperative equilibrium in an oligopolistic industry



Again, in theory, there would no impact on other firms in the market because buyers could not switch to the cooperative.

This theoretical result may describe reasonably well the impact of agricultural supply cooperatives that have integrated into oil refining. Because these cooperatives sell primarily in rural areas to agricultural producers, they are essentially closed membership organizations. Urban consumers cannot switch their patronage to farm cooperatives. Therefore, any benefits from cooperatives entering the oligopolistic refining industry accrue to cooperative members (rural areas) rather than the general public (urban areas).

Oligopoly: Open Membership Cooperative Equilibria--The situation is quite different for an open membership cooperative. First it could refuse to go along with the joint profit-maximizing price and charge P_4. Rivals would follow by charging P_4 to produce cooperative equilibrium at output Q_2. This is a competitive yardstick result. All farmers now can purchase the input from all firms at price P_4.

An open membership cooperative, however, has what may be a superior alternative. It can pursue objective four from table 3, which is charge market prices and pay patronage refunds. A cooperative would do this even if it had no fear of a price war because it benefits members most. The open membership cooperative would charge P_1, sell Ql, and pay a per-unit patronage refund equal to P_1P_2. Until nonmembers became aware of the benefits to cooperative membership, established members enjoy benefits just like a closed membership cooperative. However, as the patronage refund becomes common knowledge, membership would expand to Q_4 if IOFs do not respond. Assuming no response by rivals, equilibrium would occur at (P_4,Q_3) where the membership demand curve intersects the average cost curve. The IOFs have exited the market and the cooperative output Q_3 accounts for 100 percent of industry sales. This is because no one would buy from the higher priced rivals.

Even if rivals respond by matching the net price in the next market period, and they most certainly will rather than see their market shares fall to zero, some farmers who are upset that they did not share in the already awarded patronage refund may join the cooperative. Although IOFs match the expected net price of the cooperative P_2, these farmers have revised their expectations to reflect their lack of trust in the proprietary firms' performance. Thus the cooperative's market share might increase, and its followship demand might now be F_2F_2. The cooperative also would charge P_2 in period 2. At (P_2,Q_5), the cooperative pays a patronage refund at the end of period 2. The process continues in period 3. More farmers would shift patronage to the cooperative, causing the followship demand curve to shift to F_3F_3 (not shown). Equilibrium is at P_4 and a quantity between Q_5 and Q_3. This is a competitive yardstick result. All firms offer the input at a price equal to long-run average and long-run marginal cost.

Of course, these results change if the firm eventually experiences size diseconomies, which cause the long-run average cost curve to be U-shaped. The cooperative then may or may not move the industry toward an efficient

allocation of resources. As with a monopoly cooperative, if entry is possible, adding one or more additional firms may shift the cooperatives followship demand curve until it intersects the long-run cost curve at its minimum. The entering firms do not necessarily have to be cooperatives.

Comoetition Among Cooperatives --Recently Rhodes and Ratchford have rejuvenated concerns about the sixth Rochdale principle by looking at its negation, competition (not cooperation) among cooperatives. The theory presented here addresses the issue. First, consider an oligopoly market where economies of size are not the major determinant of market structure. Where long-run average cost curves are U-shaped (diseconomies of large scale) and minimum efficient scale occurs at or below 50 percent of the market, two or more cooperatives may produce lower prices for farmers than a single dominant cooperative. If, however, the result is several cooperatives and each has a relatively small share of the market, individually they may not have sufficient market power to influence IOFs that have amassed larger shares through multiplant operations (combinations of two or more units each operating at efficient cost levels). The solution, which may at first seem unorthodox, is collusion, i.e., cooperation, among the cooperatives in the market. If they set price strategies as a group, they may be able to lower prices farmers pay toward the competitive price level. If IOFs in oligopolies can tacitly collude to raise price above the competitive levels, cooperatives in that industry should certainly be allowed to collude, even openly collude through joint marketing efforts and price discussions to provide a competitive yardstick. Of course, an alternative that is often preferred to open collusion is merger.

A second situation, which is more relevant in many midwestern market areas, is that two or three cooperatives currently make all sales. There are no IOFs. If further cost efficiencies can be gained by consolidation, i.e., these cooperatives are in the complementary output stage, then these cooperative should merge. A monopoly cooperative would increase social welfare as well as benefit farmers. Competition among cooperatives would be wasteful.

The Multioroduct Case: A Solution to the Joint Cost Allocation Puzzle--This analysis of a farm supply cooperative can be generalized to address a multiproduct cooperative. Some other researchers have not fully appreciated this fact. When arguing for the "maximum member welfare objective," Ladd dismissed the "minimize price subject to covering costs" objective. He reasoned one cannot add up the prices across commodities to produce a single measure of cooperative performance (Ladd, p. 18). He prefers to add the two measures of welfare, producer and consumer surpluses, across commodities. Yet a cooperative does not need to have a single measure of performance. Its decision rule can be to set market level prices in each market and refund net margins as they materialize. Cooperative equilibrium will be attained. If the cooperative wishes, it can limit membership until expected net price equals minimum long-run average cost for each product.

Methods exist and are regularly used by multiproduct cooperatives to compute patronage refunds (Davidson). The allocation of joint (overhead) costs to individual products is a problem the equilibrium theory developed here can

address. Consider a purchasing cooperative that sells two products in oligopolistic markets. If it allocates all of the overhead cost to one product, that product's cost curve shifts up and the favored product's cost curve shifts down. How will this affect equilibrium in the two markets? Costs in the favored market are not only lower, they are lower than the costs of single-product rivals that do not have the ability to shift costs. Therefore, the cooperative's expected net price will be lower than the price that rivals require to earn a competitive return on their invested capital. They will exit the market and the cooperative market share will rise. Joint cost allocation practices in a cooperative are analytically equivalent to price cross-subsidization in a conglomerate IOF (Greer, chap. 17).

Cooperative performance in the unfavored market also will change. Because the joint costs are being charged to users of this product, the cost curve shifts up. In cooperative equilibrium, the expected net price will be higher and rival joint profit-maximizing firms will enjoy positive profit levels.

Note that this approach finesses the issue of how to allocate joint costs across several products- -a theoretical puzzle that continues to baffle microeconomists. Here only the deviation from the historical norm matters. The norm may be set by tradition, custom, happenstance, or collusion.

This analysis suggests an empirical test for the direction and extent of deviation of joint cost allocation from industry norms. A complete model would be more complex than what is suggested here. However, the current purpose is only to show the direction that research can proceed. Note that in cooperative equilibrium, the net margin for each product will be zero, regardless of how joint costs are allocated. The cost allocation effect registers on market share, measured as the percent of quantity sold. Examining the unfavored market first, if rivals follow the cooperative up the followship demand curve, the cooperative's market share will not change.

Market share variation for the favored product depends on the shape of the long-run average cost curve. If it is L-shaped, the cooperative's market share would expand to 100 percent. All rivals would be forced out of the market. On the other hand, if unit costs rise at larger volumes, market share would only expand until the increase in unit costs equals the amount of the excess joint cost allocation. At that point, the cooperative's expected net price would equal the minimum long-run average costs of IOFs. Market shares would stabilize with the cooperative having a larger share than before. Because both the cooperative and the remaining IOFs charge the competitive price, one might think that the equilibrium is socially optimal. It is not. The cooperative's market share is too large. Members who buy the favored product gain at the expense of farmers who must pay a higher price for the unfavored product.

Marketing Cooperative Theory

There are two major types of agricultural marketing cooperatives: bargaining and processing cooperatives. Bargaining cooperatives act as the common selling agent for members. They may or may not take title to the farm commodity. The Michigan Agricultural Cooperative Marketing Association is an

example of a bargaining cooperative. It negotiates with processors to establish contract terms for fruit and vegetable growers in Michigan. Some bargaining cooperatives act on behalf of only their members. Others are exclusive agency bargaining associations. By law these cooperatives establish the terms of trade for all producers, members and nonmembers alike in a market area. Exclusive agency bargaining cooperatives are analogous to a closed union shop situation. As such, they are in a much stronger bargaining position with processors. When farmers bargain collectively, they are attempting to exert market power (monopoly power) to offset the buying power (monopsony power) processors possess due to control over market information, processing facilities, market access, or other resources. Galbraith explained that farmers who bargain collectively are developing countervailing power. The price-quantity equilibrium resulting from this bilateral monopoly situation, he concluded, depends on the relative bargaining strength of the two sides. Nonetheless, he felt it could be closer to the competitive (efficient) equilibrium than if there were no farmer bargaining.

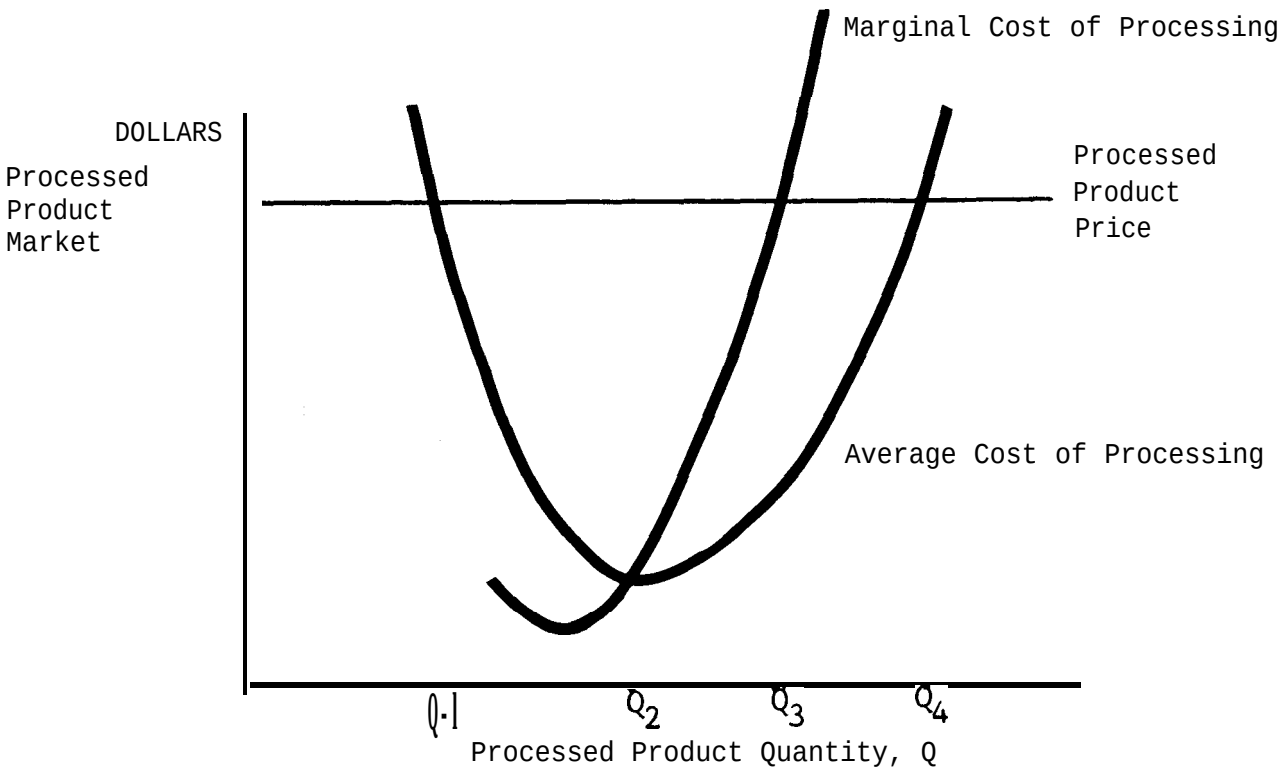
Processing cooperatives procure raw product from members, transform it, and sell the processed product to wholesalers and retailers. Land O'Lakes and Ocean Spray are examples of such marketing cooperatives. The theory developed here is most pertinent for processing cooperative activities. However, it also can provide insights for bargaining cooperatives. An exclusive agency bargaining cooperative would, for example, seek to move an investor-owned monopsonist toward one or more of the equilibrium points discussed for cooperative monopsony.

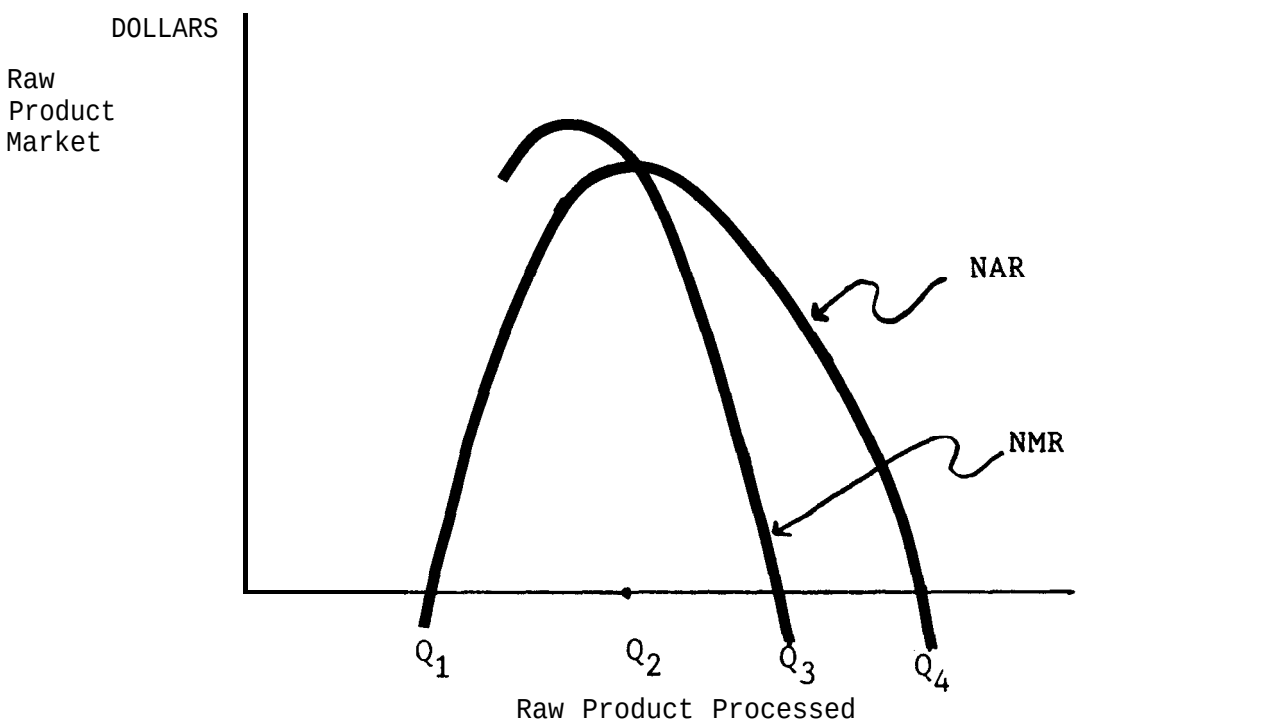
Marketing cooperatives often have special payment arrangements that are related to the pooling of products and the timing of sales over a market period. Growers receive several installment payments as the marketing process continues. Those that deliver products that go into higher quality pools also receive higher prices. To facilitate the examination of the general price-output behavior of marketing cooperatives the complex timing of payment and pooling arrangements will not be included in this analysis. Here it is assumed that members receive a transaction or market price when the product is delivered to the cooperative. Any net margins remaining at the end of the market year are refunded as cash patronage refunds at that time. Per-unit capital retains, a financing arrangement that often is used by marketing cooperatives instead of allocated patronage refunds, will not be analyzed. It also will be assumed that the cooperative markets only one product for members and the processed product market in which it sells is perfectly competitive.

At the outset of the analysis, this marketing cooperative is assumed to be a monopsony with blockaded entry. The only marketing alternative available to growers is to sell product through the cooperative. This assumption will be relaxed at a later point to examine cooperative conduct in oligopsonist markets.

Deriving Net Revenue Curves for a Marketing Cooperative--A marketing cooperative that processes raw farm product and then sells it is an intermediate stage firm in a food marketing channel. Figure 7 conceptualizes

Figure 7--Derivation of net revenue product curves for a marketing cooperative





this activity in a useful fashion. It helps us determine how much revenue net of processing costs is left to pay the farmer for delivery of the raw product. First we assume it takes exactly one unit of raw product to produce one unit of processed product. This is not necessary, but it makes the graphical presentation easier. It allows us to derive net revenue product directly from the price and cost conditions displayed in the processed product market.

Because we have assumed the processed product market is perfectly competitive, the demand curve for processed product is perfectly elastic and is the processed product price line in figure 7. Introducing imperfect competition in the processed market, such as product differentiation of the Land O'Lakes butter or Ocean Spray cranberry juice type, would produce a negatively sloped processed product demand curve. That will not be done here. However, the extension of the theory is straightforward and important for analysis of many real-world situations.

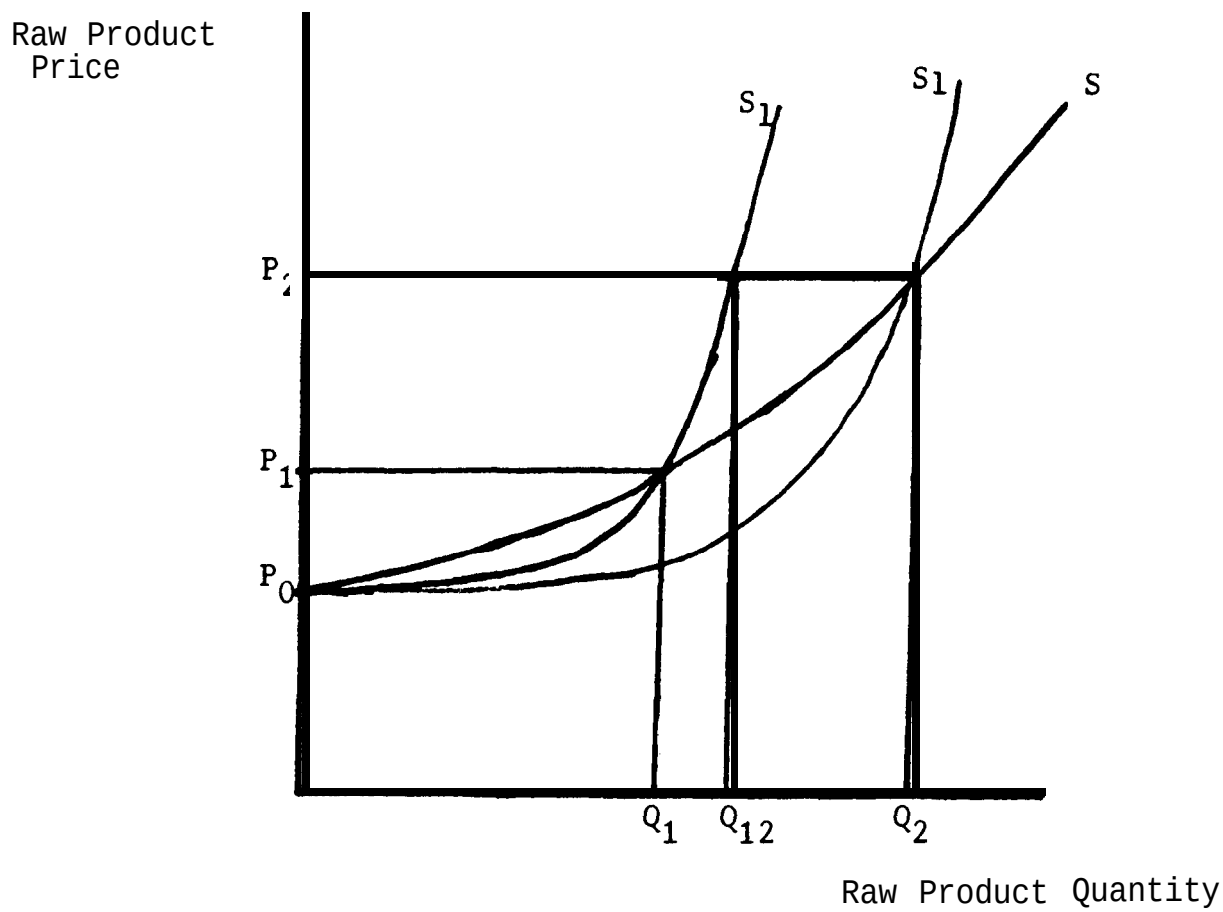
The average marginal cost of processing curve in figure 7 includes all costs except the cost of raw product supplied by members. Subtracting these unit costs from the price received for the processed product produces the net average revenue (NAR) and the net marginal revenue (NMR) product available. The NAR indicates for each quantity of product processed net revenue per unit or price the cooperative can pay the farmer for raw product.

Representative NAR and NMR curves are displayed in lower part of figure 7. Note that NAR equals zero at Q_1 and Q_4 because processed product price equals the average cost of processing at these output levels. NAR attains at maximum value at Q_2 where the vertical distance between processed product price and its average processing cost is greatest. NMR equals zero at Q_3 because for output levels above Q_3 the marginal cost of processing is greater than the marginal revenue (processed product price) gained from selling the product.

The exposition of marketing theory that follows will use only the NAR and NMR curves displayed in the bottom section of the figure. Before analyzing how raw product prices and quantities marketed actually are determined, we must first describe in a specific fashion the raw product supply conditions the cooperative firm faces.

Partitioning the Raw Product Supply Curve of a Marketing Cooperative--As in the case of a supply cooperative, partitioning the offer curve a marketing cooperative faces provides powerful insights into price-output performance. For a marketing cooperative, the relevant offer curve is the supply curve. It is partitioned in figure 8 into supply arising from changes in output from a set of members and supply arising from changes in the number of members in the cooperative. Because at this stage of the analysis the marketing cooperative is assumed to be the only buyer of the farm product (monopsonist) S in figure 8 is the market supply curve for raw product. At price PC, no farmer will produce the product. As price increases from P_0, the market supply curve S indicates that the quantity of product forthcoming from all farmers increases. At price P_1, the amount supplied is Q_1. At this point, some number M_1 of farmers are member-patrons of the cooperative.

Figure 8--Partitioning the raw product supply curve faced by a marketing cooperative into supply from a set of members and changes in the set of members



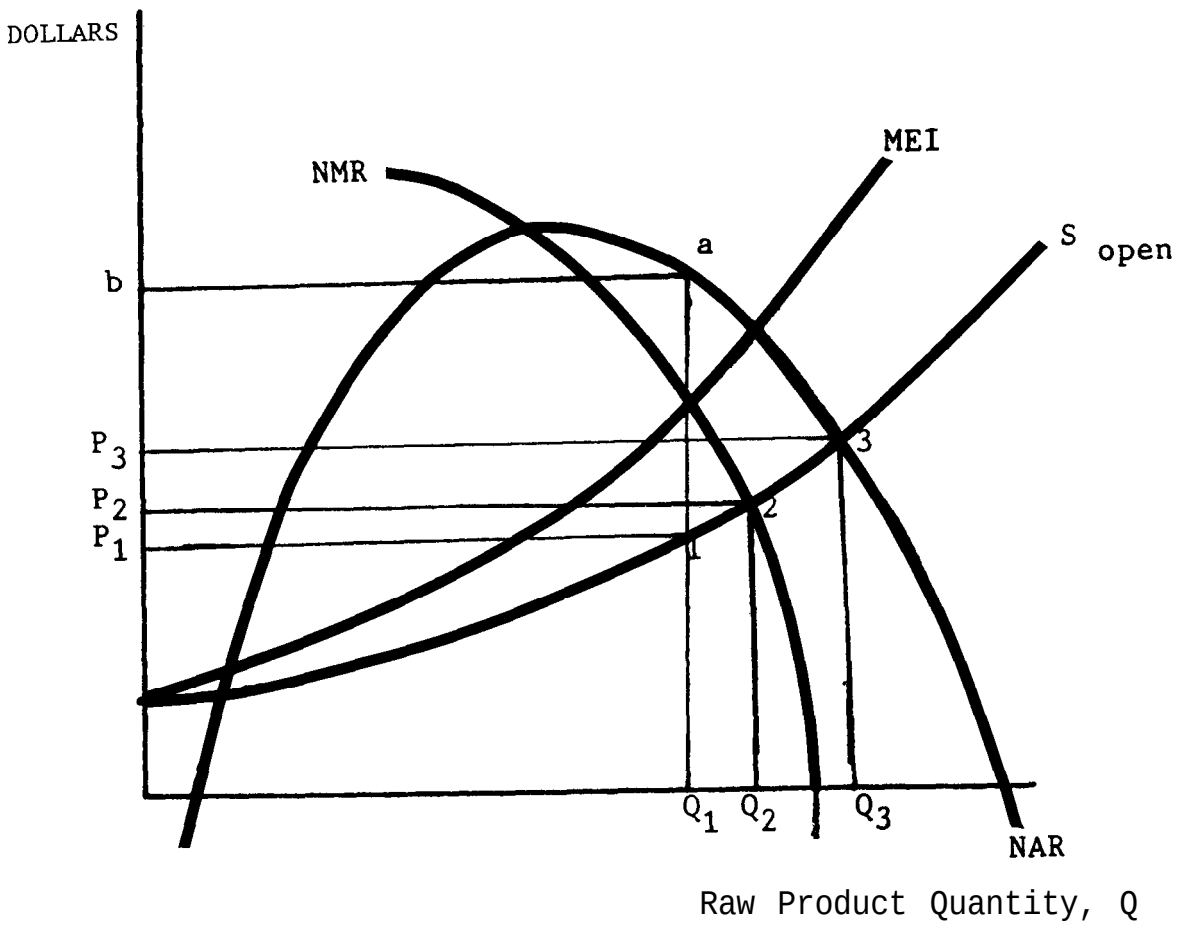
The curve Sl is the supply curve for that given set of members. Thus it is a supply schedule for a closed membership marketing cooperative with Ml members. In such a closed membership cooperative, a price increase to P_2 would increase raw product supplied to the amount Q_{12}. This is a move up the Sl curve. If the cooperative were an open membership organization with membership Ml at price Pl, a price increase to P_2 also would increase supply because new members would join the cooperative. The quantity supplied at P_2 would be amount Q_2. The market supply curve S is the combination of these two separate price responses. S_2 is a second membership supply curve. The number of members M_2 is greater than Ml, the number of members associated with curve Sl.

If there are no real or perceived barriers to exit in a closed membership cooperative, the cooperative faces a kinked supply curve for raw product. For example, if the cooperative has Ml members and price is at level Pl, increases in price will produce output increases along the membership supply curve Sl. For price decreases from level Pl, however, the relevant supply curve is not Sl. It is s. Some members free to exit the cooperative will do so, and supply reductions are larger for this reason.

Analysis of Marketing Cooperative Objectives--The revenue product curves and supply curve constructs previously developed can be used to analyze desirability and feasibility of the four cooperative objectives listed in table 3. The analysis is analogous to that presented for a supply cooperative, so it will be abbreviated here. Because at this stage we are analyzing a monopsony marketing cooperative, only the first three objectives of table 3 are relevant: (1) maximize net margins, (2) maximize member welfare, and (3) maximize the price farmers receive for raw product. At the outset, assume the cooperative has an open membership policy. Any grower can market product through the cooperative. Given this assumption, a monopsonist cooperative in figure 9 faces the market supply curve S_{open} for raw product. Also assume cooperative net margins, if any, are not returned to members as patronage refunds. However, assume farmers consider only the price paid at delivery when making production decisions. They regard patronage refunds as windfall gains.

In figure 9, the three objectives are illustrated by the corresponding price-output points 1, 2, and 3. At point 1, the cooperative behaves like a profit-maximizing monopsonist and maximizes net margins, area Pllab, by processing raw product Ql and paying farmers price Pl. At point 2, member welfare is maximized, as explained in the supply cooperative discussion, because net marginal revenue equals the supply price at output level Q_2. The price farmers receive is P_2 and cooperative net margins are lower than they are when the first objective is pursued. At point 3, the price farmers receive is maximized subject to covering processing costs. The cooperative has zero net margins. As was shown for a supply cooperative, if members of this marketing cooperative base their production-supply behavior on the expected raw product price, which is the known transactions price at delivery plus any expected patronage refunds at year-end, the only sustainable equilibrium is point 3 in figure 9. In other words, a monopsonist marketing cooperative with an open membership policy will process more of the product and pay producers a higher price (point 3) than an

Figure g--Alternative microeconomic objectives for an agricultural marketing cooperative that is a monopolist with an open membership policy



investor-owned monopsonist firm (point 1). This is a generalization of Nourse's competitive yardstick theorem.

How, one might ask, do these results change if the cooperative pursues a restrictive, closed membership policy? Figure 10 illustrates the impact of closed membership. The price-maximizing equilibrium for an open membership occurs at point 3. If the cooperative restricts membership to a number smaller than the number of producers at point 3, the relevant supply curve will be a closed membership supply curve such as S_1. Equilibrium will change to point 3'. Those producers who continue to sell to the cooperative receive a higher price, and the amount of raw product processed is reduced. Note that consumers do not suffer from this output restriction because the price for the processed product does not change. The losers are the excluded growers who no longer have a market for their product.

Relaxing the Independence Assumption: Oligopsony--When the assumption the marketing cooperative is a monopsony is relaxed, the most relevant market structure to analyze is oligopsony. The cooperative no longer faces the market supply curve. Instead, it competes for raw product with a small number of investor-owned processors.

To facilitate the analysis, assume all firms, including the cooperative, have symmetric processing costs and face the same processed product price line, i.e., there is perfect competition in the processed product market. Then all processors have the same net average revenue and net marginal revenue curves. Also assume that the investor-owned oligopsonists recognize the interdependence in the raw product market and jointly maximize profits as in the Chamberlin small-numbers case for oligopolists (Chamberlin, pp. 46-51).

To analyze industry equilibrium and the impact of a marketing cooperative on it, define the analogues to the followship and nonfollowship demand curves introduced in the supply cooperative discussion. These are the followship and nonfollowship raw product supply curves. A firm's followship supply curve is the amount of raw product that is offered when all buyers raise or lower their prices in tandem. Because farmers would not switch among firms when all firms follow each other's price changes, the closed or set membership construct is equivalent to the followship supply curve. As all firms raise or lower prices at the same time, they keep the same set of customers, thus they are moving along what has heretofore been called a set membership supply curve. A nonfollowship supply curve is analogous to the market supply curve of the monopsony cooperative case in that it is predicted on the assumption that changes in a firms price are not followed by (are independent of) rival firms. The nonfollowship supply curve is considerably more elastic than the followship supply curve because the price mover receives increased supply from producers that switch to take advantage of the higher price as well as increased supply from its prior customers who increased output.

Figure 11 illustrates how the followship and the nonfollowship supply curve can be used to analyze cooperative equilibrium in an oligopsony. Given initially that the IOFs maximize profits by charging P_1, i.e., all firms in

Figure 10--Impact of a closed membership policy on monopsony marketing cooperative equilibrium when members recognize the value of expected patronage refunds

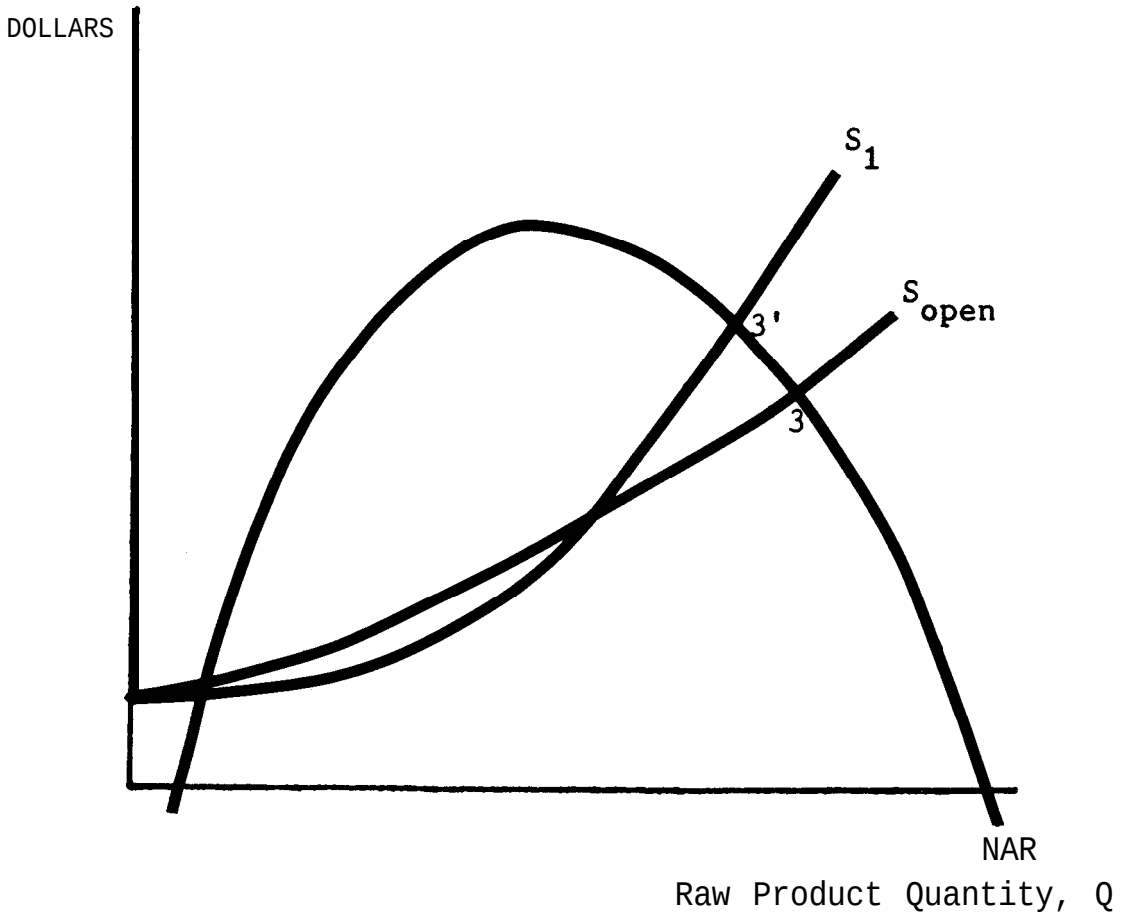
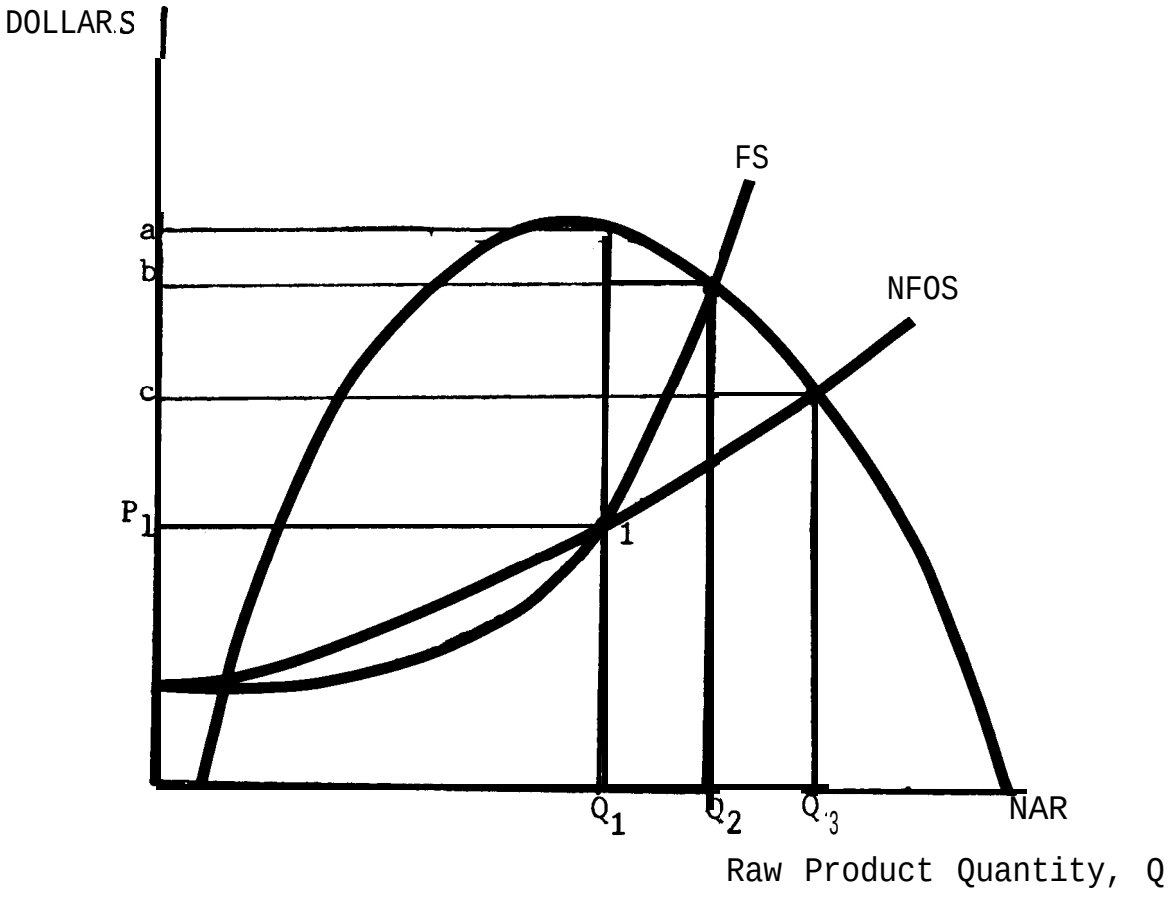


Figure ll--Marketing cooperative equilibrium in an oligopsonistic industry



the market are following objective 1, the cooperative faces followship supply curve Sl and some important strategic choices.

Oligopsony: Closed Membership Coonerative Equilibria--If the cooperative is a closed membership organization, it can price at Pl and pay a per-unit patronage refund equal to Pla. Ultimately membership supply will attain equilibrium at Q_2. The cooperative will continue to charge Pl but it will pay a per-unit patronage refund equal to Plb.

A very important result analogous to that for a supply cooperative follows. This closed membership cooperative equilibrium will not disturb the oligopsonistic joint profit-maximizing equilibrium of the industry. There will be no competitive yardstick effect on the market price. This is the case because the cooperative captures no customers from the proprietary firms. In essence the closed membership cooperative structure allows the cooperative to move up its followship supply curve while the other firms do not. If it prefers, a closed membership cooperative could raise price from Pl to b rather than charge market prices and pay patronage refunds. Again, in theory, there would be no impact on other firms in the market because suppliers could not switch to the "closed" or "waiting list" cooperative.

Oligopsony: Open Membership Coooerative Eauilibria--The situation is quite different for an open membership marketing cooperative. First, it could refuse to go along with the joint profit-maximizing price and pay amount b as a transactions price to farmers when they deliver product. Rivals would follow by paying b to produce cooperative equilibrium at output Q_2. This is a competitive yardstick result. All farmers now can sell this product to all firms at price level b.

A second possibility is that the IOFs, for whatever reason, do not follow the cooperative's price increase. Then the relevant supply curve is NFOS. The cooperative would not only receive increased product from existing members, but producers would switch from other firms, increasing the cooperative's market share and producing equilibrium at price level c and output level Q_3. This also is a competitive yardstick result. Although it does not force other firms to raise their prices, it does reduce their market shares. If they continue to refuse to raise price the cooperative conceivably could expand to supply 100 percent of the market.

A Closing Comment

Perhaps an appropriate closing for this section is to recall that open membership cooperatives in oligopolistic markets that are in equilibrium pay no patronage refunds. This is contrary to what is commonly observed. Some agricultural cooperatives do pay patronage refunds on a regular basis. It is unattractive to conclude that this is because they are in perpetual disequilibrium. Other factors obviously are at work. One of the assumptions in this paper has been that cooperative capital earned it opportunity cost rate of return. This amount is built into the cost curves. In the'real world, members furnish equity capital to their cooperatives and the fixed dividend rate they are paid often is below the opportunity cost rate. Thus a

cooperative in equilibrium may have positive patronage refunds to cover fully the opportunity cost of invested funds. In fact, this point is central to the analysis of the next two sections of this paper.

Coooerative Eouilibrium with Investment; The Certainty Case

> Market values for corporation stock can appreciate. This value is related to capitalizing a stream of anticipated future earnings by the opportunity cost of the investor. A nice neat package. No such package, however, exists for cooperatives. There is no standard way to measure performance of a cooperative in terms of making the member-patron better off. (Fenwick, p.208)

Introduction: Basic Concepts

This section develops a unified theory of cooperation that seeks to meet the cogent need for performance measures described in the opening quote. Fenwick; Beierlein and Schrader; and others have pointed out that, unlike an IOF, a cooperative cannot examine ex post changes in its value in the capital market to evaluate investment performance. The analysis presented here demonstrates that for ex ante evaluation of potential investments and ex post evaluation of investment performance cooperatives must measure the flow of benefits to members via the product market if any product price adjustments occur. In such cases, one must analyze more than cash flows to the cooperative.

This section proceeds by generalizing the supply cooperative equilibrium models of the last section to include investment and its related concern, the financing of investment. The resulting theory will be used to analyze several important issues including the following: (1) the impact of unallocated retained earnings on cooperative equilibrium performance, member welfare, and cooperative investment analysis; (2) the appropriate form of investment analysis models for cooperatives in differently structured markets and with different operating procedures; and (3) the significance of the free-rider problem to cooperative performance.

This section is divided into several subsections. Each covers a distinct topic. For convenient reference, table 4 identifies all the variables used in the mathematical analyses in this section.

The Risk-Free Rate of Interest--Investment, by definition, is the outlay of funds today to obtain an income in the future. Investment activity makes economic analysis more challenging. This is true for cooperatives as well as IOFs. One must analyze how a cooperative makes and finances investment choices today that will generate income in the future. The economic problem not only gains an intertemporal dimension, but investment links present and future economic activities.

The counterpart of investment, savings, performs a similar function. Cooperative members, for example, will reduce consumption and save money if

Table 4.- -A Key to Symbols Used in the Analysis of Cooperative Equilibrium with Investment (Equations (2) Through (28))

Equation where first introduced	Symbol	Definition
(2)	V_0	net present value of cooperative at time t_0
	CO	cash payment to cooperative members at time t_0
	Cl	cash payment to cooperative members at time t_1
	i_1	risk-free rate of interest
(3)	X_0	net cash margins from operations at time t_0
	F	equity capital paid in by new members at time t_0
	B	amount of funds raised by selling debt securities or preferred stock at time t_0
	I_0	investment by cooperative at time t_0
(4)	f_i	ith member's share of equity capital paid in by new members at time t_0
	m	number of farmers that join at time t_0
(5)	a_1	ith member's share of total cooperative sales at time t_0
	It	total investment of cooperative at time t_0
(6)	S_i	ith member's purchases at time tl
	S_1	total cooperative sales at time tl
(7)	I_p	investment in cooperative prior to time t_0
	IO	investment in cooperative at time t_0
(8)	c_1	ith member's cash payment at time t_1

(Continued)

Table 4.- -A Key to Symbols Used in the Analysis of Cooperative Equilibrium with Investment (Equations (2) Through (28)) (Continued)

Equation where first introduced	Symbol	Definition
	X_1	cooperative's net cash margins, including net cash from dissolution, at time t_1
(11)	Q_1	total cooperative sales at time t_1
	P_1	cooperative transaction price (market price) at time t_1
(12)	Q_1^o	t_1
	Q_1^n	t_1
(14)	C_1^o	t_1
(15)	V_0^o	t_0
(19)	RE_1	t_1
(23)	X_1'	t_1 I_0
	ΔX_1	t_1 I_0 change in net margins at time
(25)	ΔV_0^o	$t_0 I_0$
(26)	$\Delta X_1'$	t_1 time
(27)	V	t_0
(28)	AV	I_0

the interest rate is high enough to reflect their rate of time preference for consumption (Samuelson). Such savings are loaned to other consumers, who wish to borrow against future income to increase their current consumption, and to firms, such as cooperatives, if the rate of return on investment is high enough. In equilibrium, the supply of funds from savers and the demand for funds from borrowers determine the interest rate in the capital market.

There are, of course, more powerful models of interest rate determination than this classical supply demand analysis which has been attributed to Fisher. One class of models recognizes that savings preferences also vary by age (Friedman's life-cycle consumption function (1957)). Another class of models recognizes that monetary authorities can influence the rate of interest and thereby influence aggregate investment and consumption patterns to manage the level of aggregate economic activity (Keynes). This later theory of course, is an important component of macroeconomics. For current purposes it is not as important to know how the rate of interest is determined as it is to know that it exists and all economic agents can lend and borrow freely at that rate.

Under the certainty assumption of this section, decisionmakers know all economic facts. This includes how much income an investment will generate over its useful life as well as all aspects of current economic conditions. Nothing is unknown or risky, so the equilibrium interest rate is called the risk-free rate.

Superiority of the Cash Flow Based Net Present Value Analysis--Firm valuation, investment, and finance questions have been analyzed for IOFs by using net present value analysis based on cash flows (Copeland and Weston). Nearly every undergraduate text in finance explains why net present valuation is superior to other investment analysis methods, including internal rate of return and payback. The primary alternative to analysis of cash flows is analysis of reported earnings. The two approaches are sometimes described as measuring economic as opposed to accounting profits (Copeland and Weston, pp. 22-25). Accounting measures of earnings capitalize investment and then write off that amount as depreciation over the life span of the investment. Depreciation is a noncash expense. Cash flow analysis records the receipt of funds from equity holders or other finance sources and the actual payments of cash to equity holders when they occur.

Bodenhorn emphasizes three desirable properties of cash flow analysis for IOFs (p.16). First, cash flow analysis can be used in decisionmaking because maximizing the net present value of cash flow increases the value of the firm and thus is in the best interest of stockholders. Second when profits for an IOF are measured with cash flow techniques, they are identical to income on investment. Third, cash profit for an IOF can be measured from market values, so it is an objective measure. Accounting profits are more susceptible to manipulation by management.

None of these properties hold unequivocably for a cooperative. Maximizing a cooperative's cash flow does not necessarily increase the value of the firm to members. Cooperative net margins, even when measured by cash flow rather than accounting methods, are not necessarily identical to benefits

attributable to investment. Finally, measures of cash flow benefits are less subject to manipulation by management than accounting measures, but the cash flow from a cooperative investment can accrue as product price reductions as well year end margins. These points suggest that cooperatives demand more careful examination.

Cooperative Valuation Theory: A Useful Partition--Cooperatives have not adopted net present value analysis of investment alternatives as rapidly as IOFs (Street, p.1). Perhaps one reason for reticence has been the lack of a clear theoretical exposition of when and how net present value analysis can be applied to cooperatives. The unified product capital market theory developed in this section helps to overcome a major stumbling block--identifying exactly what it is that observed cooperative cash flows measure.

When evaluating investments for an IOF, the primary question is whether the commitment of funds will increase the value of the firm, i.e., increase the value of the stock stockholders own. Let us begin our analysis of the value of a cooperative firm to its members by noting that the value of any firm can be partitioned into two parts, its core value and its global value. The core value of a firm is the value it would command if it were in a competitive industry that is in long-run equilibrium. Industry equilibrium price equals long-run average cost and the firm earns the competitive rate of return.

Global value can be equal to or larger than the core value of a firm. For an IOF, it is defined to be the long-run equilibrium value of its stock as determined by the capital market. It is the total amount investors are willing to pay the for the firm. When an IOF possesses market power, for example, it can increase its net cash flow by charging prices above long-run average cost. The global value of the firm increases as investors bid up the stock price until the rate of return decreases, given the certainty assumption of this section, to the risk-free interest rate. This is the equilibrium adjustment mechanism that Fenwick referred to when pointing out that "no such package" exists for cooperatives.

Turning to the cooperative firm, its global value is similarly defined as the amount its members-owners are willing to pay rather than do without the cooperative. The difference is that, for a cooperative, long-run equilibrium is achieved through adjustments in the product market rather than the capital market. Moreover, how global value is measured depends, among other things, on the market structure of the industry and the membership and pricing practices a cooperative follows. Consider a supply cooperative with an open membership policy in an oligopoly. The analysis of this type of cooperative in the previous section indicated that, in equilibrium, it would charge a price equal to long-run average cost. Long-run average cost includes the cooperative cost of capital as well as other input costs. As a result, the net cash margins that remains after paying for other input costs measures only the cooperative's core value.

Two important corollaries follow. First, the cooperative's reported net margins, on a cash flow basis, can be used to measure the required return on cooperative capital. Given the certainty assumption, the issue is somewhat

trivial because the required rate is the risk-free interest rate and can be determined elsewhere. This feature becomes more important when risk is introduced to the analysis in the next section. The cooperative's required rate of return then would include a risk premium and be higher than the risk-free rate. Second, to measure the cooperative's global value, one must add to cooperative cash margins the increased cash flow to members that materializes because they pay lower prices than they would if there were no cooperative in the market. This second component of cooperative benefits is known as the security return. In general, the global value of a cooperative equals its core value plus its security return.[10]

Now consider a second type of cooperative. A closed membership cooperative in an oligopoly. Because IOFs do not fear losing customers to the cooperative, they will continue to charge the shared monopoly price no matter what the cooperative does. If the cooperative charges the same price as they do and refunds all net cash margins to members, those net margins reflect the global value of the cooperative to members.

These two cases make it clear that the observed net cash flows of a cooperative must be interpreted carefully. Exactly what net cash flow measures depends on the structure of the product market as well as the structure and conduct of the cooperative. If a cooperative prices at the industry price level, has no impact on it, and that price level is above long-run average cost, net margins measure the global value of the firm to members. Standard investment analysis procedures are appropriate. A different approach, however, is necessary when a cooperative has a competitive yardstick effect, bringing other firms as well as itself to an equilibrium where industry price equals long-run average cost. Then the observed net cash flows measure only the core value for the cooperative. This latter type of equilibrium is the one that requires a different approach to valuation. Thus attention is focused primarily on its properties in the remainder of this section and the following section.[11]

A Single-Period Supply Cooperative Model

To keep the analysis of cooperative finance and investment behavior under certainty reasonably rigorous, it is necessary to specify the structure of the cooperative and its environment in detail.[12] First, the analysis will be discrete rather than continuous, and it will be for a single period. The future consists of only a single point one period from now. Thus the analysis concerns cooperative activity at time t_0 and at time tl. One might, consider the analysis to be an examination of a cooperative on January first of two successive years with the cooperative dissolving on the second date. When mentioning flow variables at a point in time, they will be for the preceding period. The terms "sales at t_1" and "sales during period t_1" are equivalent. Stock variables such as investment will be at point t_0 or t_1.

The cooperative's financial structure is assumed to be as follows. Investment funds, if supplied by members, are supplied proportional to planned patronage in tl at time t_0. One might regard this as a base capital finance plan. Members provide equity capital in proportion to their

planned patronage when they join. Cooperative net margins at t_0 are distributed in proportion to patronage. They are distributed as cash or, if necessary, they are allocated to patrons' equity accounts to bring their investments up to the required amount for planned patronage in period t_1. Equity capital invested by members is assumed to earn no interest. There are no taxes of any sort to be paid by cooperatives or IOFs.

The structure of the cooperative is defined further as follows. It is a supply cooperative that sells one product in an oligopolistic market, and it sells only to members. Finally, its transaction price always is equal to the market price. This last assumption is necessary because the resulting cash flow identifies the spread between the industry price and the cooperative's net, operation-at-cost price. If this magnitude is positive, farmers have an incentive to join the cooperative. This is the adjustment mechanism that produces cooperative equilibrium. The assumptions of this section are listed in table 5 for easy reference.

Examining an open membership cooperative in an oligopoly, how does cooperative equilibrium come about when a new investment is undertaken? One can use valuation and cash flow equations to specify an equilibrium adjustment model. In a one-period model the net present value, V_0 of a cash stream that pays C_0 at time t_0 and C_1 at time t_1 when the risk-free interest rate is i_1 is

$$(2)\quad V_0 = C_0 + \frac{C_1}{1 + i_1}.$$

If C_0 and C_1 are cash payments to members of the cooperative, V_0 is the value of the cooperative at t_0.

The cooperative's cash flow equation at t_0 can be written as

$$(3)\quad X_0 + F + B = C_0 + I_0.$$

The left side of (3) identifies sources of cash at t_0. X_0 is net cash margins from operations that belong to old members, i.e., those who patronized the cooperative during t_0. F is equity funds paid in by new members who join the cooperative at t_0. B is the amount of funds raised by taking on debt or selling preferred stock.[13] Because certainty is assumed there is no difference in risk level among member equity and all types of funds secured from outside sources. No risk premiums are demanded or offered, so all funds earn the risk-free rate of interest i_1. The right side of (3) identifies the cooperative's uses of funds. C_0 is cash paid to old members-patrons. I_0 is investment made at t_0 that will increase net margins in t_1.

An initial component of the equilibrium adjustment model is an equation that determines the magnitude of cash paid in by new members at t_0. F is the sum of the paid-in capital of M new members. fi in equation (4) is the paid-in capital of the ith new member:

Table 5.--Basic Assumptions for Analysis of Cooperative Price Equilibrium with Investment

Financial Model Assumptions

1. Certainty.
2. The analysis is discrete rather than continuous in the time dimension.
3. All economic activities occur at two successive points in time t_0 and t_1 (a one-period model).
4. There are no taxes of any sort.

Cooperative Enterprise Assumptions

5. Investment is proportional to patronage.
6. No dividend is paid on equity capital.
7. The cooperatives sells only to members.
8. Patronage refunds may be made in cash at t_0 or allocated to members investment accounts and returned in cash at tl.

$$(4)\quad F = \sum_{i=1}^{m} f_i.$$

As expressed in equation (5), each farmer's investment is a proportion i of total investment I,. Equation (6) indicates that α_i is the proportion of total cooperative sales Sl that the ith member provides. Equation (7) indicates that total investment equals the level of investment prior to t_0, which is I_p, plus current investment IO.

$$(5)\quad fi = \alpha_i I_t \text{ where}$$

$$(6)\quad \alpha_i = \frac{S_i}{S_1} \text{ and}$$

$$(7)\quad It = I_p + IO.$$

Each member will receive at tl a cash refund ci, which is the same proportion α_i of the cooperative's net margins Xl. Because this is a single-period model, the cooperative is dissolving at tl. No cash is allocated to investment at that time because there is no future. Thus total net margins Xl includes liquidation of all investments, and it equals total cash refunds to members Cl. A member's dollar return for investment at t_0 and patronage during t_1 is

$$(8)\quad ci = \alpha_i X_1.$$

Dividing (8) by (5) gives a member's rate of return on investment,

$$(9)\quad \frac{c_i}{f_i} = \frac{\alpha_i X_1}{\alpha_i I_t} = \frac{X_1}{I_t}.$$

Equation (9) indicates the rate of return will be the same for all members and it will equal the average rate of return of the cooperative. New members will join the cooperative if the average rate of return is greater than or equal to the risk-free rate of return. This decision rule can be expressed as

$$(10)\quad \text{join if: } \frac{X_1}{I_t} \geq 1 + il.$$

The investment in the cooperative must earn enough to return the original amount invested plus interest at time tl. Assuming the cooperative is in equilibrium at t_0, i.e., old members have been receiving the risk-free rate of return on I_p, a new investment I_0 that pays a higher rate of return than il will raise the cooperative's average return above il. Unless there is a decrease in the return on the new investment as new members join the cooperative, cooperative equilibrium is indeterminate. An infinite number of new members would join. Recalling the analysis of membership

changes on cooperative equilibrium in the previous section, the net margins generated from investment IO is in fact dependent on the quantity of product purchased by old members Q_1^o, the quantity of product purchased by new members Q_1^n, and the market price Pl that prevails during period tl.[14] Because the sum of old and new members' purchases equals total purchases Q_1, net margins at t_1 are

$$(11) \quad X_1 = X_1(Q_1, P_1) \quad \text{where}$$

$$(12) \quad Q_1 = Q_1^o + Q_1^n.$$

As new members join the cooperative, its output in t_1 increases; this reduces net margins if the cooperative experiences rising average costs of production or if rivals respond to the cooperative's gain in market share by undertaking similar investments and lowering the market price. Either way, once equilibrium is regained, the cooperative's average return on investment will have returned to the risk-free rate i_1. To summarize, this product market adjustment mechanism is the cooperative analogue to stock market adjustments in the value of an IOF's stock for regaining equilibrium in both the product and capital markets.

The Core Value of a Cooperative Firm--If a cooperative prices at long-run average cost, as it does when it has a competitive yardstick effect on the market, it is possible to estimate its core value. Returning to the valuation and cash flow equations (2) and (3), the cooperative's cash flow are now clear measures of its core value. Note that subtraction I_0 from both sides of the equation (3) gives

$$(13) \quad C_0 = X_0 + F + B - I_0.$$

Current cash patronage refunds are determined by the difference between cash inflow and current investment. If F and B are not sufficient to cover I_0, some of X_0 will be retained as allocated patronage refunds and cash patronage refunds will be lower.

The cash flow equation for old members at t_1 is

$$(14) \quad C_1^o = X_1(Q_1, P_1) - \sum_{i=1}^{E} Ci - (1 + i_1) B.$$

Old members cash flow equals net margins minus cash paid out to m new members minus cash that repays outside capital suppliers plus the interest on that capital. Substituting (13) and (14) into (2) allows an analysis of how the core value of old member investment V_0^o in the cooperative changes when investment I_0 is undertaken:

$$(15)\quad V_0^o = C_0 + C_1^o = X_0 + F + B - I_0 + \frac{X_1}{1 + i_1} - \frac{\sum_{i=1}^{m} c_i - B}{1 + i_1}$$

$$= X_0 - I_0 + F - \frac{\sum_{i=1}^{m} c_i}{1 + i_1} + \frac{X_1}{1 + i_1}.$$

But in equilibrium, the following conditions hold:

$$(16)\quad F = \frac{\sum_{i=1}^{m} c_i}{1 + i_1} \quad \text{and}$$

$$(17)\quad I_t = Ip + I_0 = \frac{Xl}{1 + i_1}.$$

New members join only if they earn the risk-free rate i_1 or more on their investment, and in equilibrium all providers of capital earn i_1. This establishes (16). Similarly, (17) is based on the fact that in equilibrium the cooperative's average return on investment will equal the risk-free rate i_1.

Substituting (16) and (17) into (15) gives

$$(18)\quad V_0^o = I_p + X_0.$$

The core value of the cooperative firm to old members equals the prior investment they have paid in plus the net margins available at t_0. This result is so fundamental to the cooperative enterprise structure that its implications may be overlooked. Any cooperative benefits beyond those necessary to compensate capital at the competitive rate of return are distributed via the product market. Also, the financial decisions of management to go outside for capital, amount B, the decision of m new members to join the cooperative and provide F in capital, and the split of patronage refunds between cash and allocated refunds do not affect the core value of old members' investment. This analysis, however, says nothing about how investment or financing strategies affect the global value of the cooperative members. Investment impacts on global value are addressed in a later part of this section.

A New Insight on the Alleged Tax Advantage of Cooperatives--The fact that cooperatives provide no vehicle for capital gains on cooperative investment sheds new light on the issue of cooperative taxation. Some have decried the tax status of patronage refunds, claiming that because allocated refunds escape the corporate income tax, cooperatives receive a hidden subsidy from the government. This theory can be used to analyze the capital market as well as the product market aspects of this proposition. Examining the

capital market aspects brings to the surface the fact that shareholders in investor-owned corporations can receive benefits from their investment as capital gains, which are taxed at the investor level at 40 percent of the ordinary income rate. But in a cooperative, all benefits a member-investor, and any marketwide benefits nonmember farmers receive as a result of the cooperative's impact on price, are ordinary income and taxed accordingly at the patron level. The capital gains treatment investors in an IOF enjoy suggests there is less incentive for a farmer to patronize and invest in a cooperative for tax reasons than heretofore thought. With regard to total tax treatment, cooperatives actually may be disadvantaged relative to IOFs.

An example can illustrate this. First consider a farmer who buys an input for $1,000 from a cooperative at t_0. The cooperative solicits $100 at t_0 from the farmer for a new investment project and pays the farmer the competitive rate of return, 10 percent, for use of that money at tl. As a result, the farmer can buy the input for $800 because of the cost-saving investment. Because the input costs on the farm at tl are $200 lower, the before-tax increase in income is $200. If the farmer is in the 40 percent tax bracket the farmer's after-tax gain is $120 at tl. Discounted at 10 percent to t_0, this value is $109.

Compare this result to the net wealth gain if the firm were investor-owned and the farmer purchases $100 dollars of stock at t_0 to finance the new investment. The IOF continues to charge the farmer $1,000 for the input at t_1. However, the value of the farmer's stock appreciates in the stock market until the farmer's investment returns the competitive 10 percent rate of return. That value is computed as follows. The increment to IOF income is $200. Assuming the effective corporate income tax rate after investment tax credits and other write-offs is 20 percent, the new cash flow available to investors is $160 plus the $10 plus the original $100, which equals $270 at t_1. Thus the farmer's stock appreciates to $245 ($270 divided by 1.1) at t_0 and the farmer experiences a capital gain of $145.

Under capital gain taxation rules, 40 percent of this gain is taxed at the farmer's ordinary income tax rate, which is 40 percent in this example. Thus the after-tax income gain for the farmer is $122. The farmer increases income more by patronizing and investing in the IOF than joining the cooperative.

This tax problem can be analyzed in a more general fashion. Space limits that option. However, the relative position of the cooperative improves, ceteris paribus, as the effective corporate tax rate increases and the farmer's personal tax rate decreases. For some tax rates the cooperative is preferred over the IOF. This analysis suggests farmers in higher tax brackets will have less incentive to join a cooperative.

The Case of Unallocated Retained Earnings--How does its retained earnings policy affect the value of a cooperative firm to members? Retained earnings are net margins that cooperative management, with approval of the board of directors, decides to declare as income to the cooperative. Retained earnings are not allocated to patrons' equity accounts. If the cooperative does not dissolve while a person is a member, the cooperative never pays the

member a pro rata share of retained earnings. Some very different cooperative groups have advocated the use of retained earnings. **Agway**, a very large and professionally-managed farmer cooperative, makes substantial use of them in its finance mix. Compare this organization to **Lambert**, one of the more visionary social philosophers on cooperatives. He argued for retained earnings financing and for not paying them out to members at dissolution (p. 63). **Lambert** and others who would establish a cooperative commonwealth--an entire economy of cooperatives--have regarded this dissolution caveat as necessary to prevent current members from dividing up the accrued capital of previous cooperative members. They have regarded retained earnings as social capital owned by the group in common. Although farmer cooperatives that use retained earnings do not regard themselves as compatriots of cooperative commonwealth advocates, such financial policies do suggest a community or socialist orientation. A retained earnings program indeed can be described as voluntary socialism. Cooperative members abnegate private ownership of cooperative capital at least until cooperative dissolution, which usually is not a goal of the membership or management. Cooperative capital is owned in common. To analyze retained earnings in the one-period model, one must assume they are not returned to members at time t_1. Otherwise they are identical to allocated patronage refunds. For purposes of analysis, make an additional assumption that will be relaxed later. Assume that the following relationship holds:

$$(19) \quad \frac{X_1 - RE_1}{I_t} = 1 + i_1.$$

The cooperative withholds retained earnings of amount RE_1 at t_1 so that the projected average return on investment equals i_1. As a result, there is no increase in membership and old members do not increase their output. Due to (19), F in the cash flow equation (3) is zero. The old members' cash flow equation at t_1 is as follows:

$$(20) \quad C_1^o = X_1 - RE_1 - (1 + i_1)\, B.$$

Cash flow to old members at t_1 equals cooperative net margins at t_1 minus retained earnings at t_1 minus payments to bondholders at t_1. Substitute equation (13) into (2) for cash flow to old members at t_0, and substitute equation (20) into (2) for cash flow to old members t_1. This gives valuation equation (21) for old cooperative members at t_0:

$$(21) \quad V_0^o = X_0 + B - I_0 + \frac{X_1 - RE_1}{1 + i_1} - B = x0 - 10 + \frac{Xl - RE_1}{1 + i_1}.$$

Solving (19) for I, and substituting the result into (21) gives

$$(22) \quad V_0^o = X_0 - 10 + I_t = x0 + I_{p'}$$

Equation (22) indicates that the value of the cooperative to old members equals their prior investment plus net margins available at t_0. This result differs from the previous valuation analysis because it now represents the global value as well as the core value. Because no members receive retained earnings and because according to (19) the cooperative siphons off all earnings in excess of the amount necessary to pay a competitive return, the global value of the cooperative to a member equals the core value. The retained earnings policy therefore can be used as an alternative adjustment mechanism to attain cooperative equilibrium. When a cooperative retains less than the amount of retained earnings necessary for equation (19) to hold, part of the adjustment to the new equilibrium occurs through price-quantity adjustment and equation (22) measures only the core value of the cooperative to old members at t_0.

Another interesting fact is that if a cooperative decides to retain earnings above opportunity cost payments, as in equation (19), the value of the cooperative, defined as the sum of its value to members plus retained earnings, will vary with investment acumen. Changes in this magnitude reflect how profitable investments have been. Maximizing this measure will lead the cooperative to behave as an IOF. In an oligopoly, for example, it would have no competitive yardstick effect on rival firms, and members would receive no economic benefits above their opportunity cost rate of return from the cooperative. This produces the startling conclusion that voluntary socialism is consistent and can coexist with monopoly capitalism. One wonders if the cooperative commonwealth philosophers realized that their grand strategy would have so little impact on private economic power.

Core Value Analysis of Investments--In many situations, a cooperative's cash flow to members measures only the core value of the firm. Two important cases are a cooperative that performs as a competitive yardstick in an oligopoly, and a cooperative that appropriates all net margins above the amount necessary to pay members the opportunity cost of capital. Appropriated net margins are retained as unallocated earnings. What might one say about cooperative investment analysis in these cases? Consider the competitive yardstick case first. Using equation (15) and (16), one can express the core valuation equation as follows:

$$(23)\quad V_0^o = X_0 - I_0 + \frac{Xl' + AX1}{1 + i_1}.$$

Xl' in (23) is net cash margins at tl without investment I_0, and AX1 is the change in the net cash margins due to the investment.

Rearranging terms gives

$$(24)\quad V_0^o = X_0 + \frac{Xl'}{1 + i_1} + \frac{\Delta X_1}{1 + i_1} - IO.$$

The change in core value with respect to the investment is the last two terms of (24); and because it was shown earlier that the change in core value is zero, one obtains

$$(25)\quad \Delta V_0^o = \frac{\Delta X_1}{1 + i_1} - I_0 = 0.$$

Stated another way, investment in a competitive yardstick cooperative, as measured by observed cash flows, always will yield a net present value equal to zero.

Before commenting on this result, let us consider the case for a cooperative that uses unallocated retained earnings and seeks to maximize retained earnings plus the core value of the cooperative to members. Equation (23) still is a good starting point. However, now the subscripts will be removed from V to recognize that this is a different valuation problem. Also, the change in net margins at t_1 due to the investment is now partitioned into two parts--the change in net cash margins that is needed to sustain the competitive rate of return on all cooperative investment $\Delta X_1'$ and retained earnings RE_1. Thus one has

$$(26)\quad \Delta X_1 = \Delta X_1' + RE_1.$$

Substituting (26) into (23), one obtains

$$(27)\quad V = X_0 + \frac{X_1}{1 + i_1} + \frac{\Delta X_1'}{1 + i_1} - I_0 + \frac{RE_1}{1 + i_1}.$$

The analysis without retained earnings indicates that the third and fourth terms on the right side cancel each other, so when management seeks to maximize retained earnings plus the value of the firm to members, the change in the value of the firm due to the investment is

$$(28)\quad AV = \frac{RE_1}{I + i_1}.$$

The increase in value is equal to the net present value of retained earnings.

These results suggest that in competitive yardstick equilibrium, the standard net present value analysis of cooperative cash flows is useless. The computation should produce zero net present value for every investment project. Obviously, what is needed is a measure of global rather than core value. A supply cooperative in an oligopoly that retains earnings in excess of the amount needed to pay members the competitive rate of return on equity capital can use changes in the level of retained earnings to measure the value of a proposed investment.

~ - - This discussion illustrates how global value analysis of cooperative investments can be done. The example analyzed

here is an investment that reduces the average cost of producing the cooperative's product in all levels of output. Farm product market prices are assumed to remain constant at t_1 so that benefits from an investment can be measured by areas under the input demand curve.[15] Cooperatives must look to benefit measures of this type as well as cooperative net margins when the investment affects the farm supply market price level. This investment's impact on the average cost curve of the cooperative is illustrated in figure 12. The average cost curve prior to the investment AC, accounts for the cost of the cooperative's prior investment I_p as well as other factor costs. The price of that capital is the risk-free rate i_1. Once the investment I_0 has been made, the average cost curve shifts down to AC_1. This curve accounts for the cooperative's new investment level, $I_1 = I_p + I_0$, as well as other factor costs. Again, the price paid for this capital is the risk-free, opportunity cost rate i_1.

The cooperative is in equilibrium before the investment at point A, charging price P_o and selling Q_o. It has exerted a competitive yardstick effect on oligopolistic rivals, forcing them down the followship demand curve F_1F_1 to price P_o. Net margins are positive only because the cooperative charges the equilibrium price and distributes the competitive rate of return i_1 to its equity holders via patronage refunds.

After investment, the cooperative will move to a new equilibrium. Two possible equilibria are illustrated. They are points B and D. Regardless of where equilibria is attained, the cooperative's cash flow only will be adequate to pay equity holders return i_1 on their capital at time t_1. However, it is fairly obvious that different equilibrium points produce different benefits in the form of lower price and expanded quantity of Q sold. Figure 13 illustrates total benefits to all farmers that use Q, i.e., it measures the social welfare value of the competitive yardstick effect.

Although it is assumed that the cooperative is the innovator, this is not absolutely necessary. Rivals may have adopted the investment and the cooperative may have moved rapidly to imitate it. Here it is assumed that they both adopt the cost-saving innovations at time t_0. Rivals may or may not match cooperative price reductions. If they do, the cooperative moves down followship demand curve F_1F_1 in figure 12 to a new equilibrium at B. Membership remains constant but old members expand their use of Q from Q_o to Q_1. Old members receive benefits over the opportunity cost returns equal to the change in their consumer surplus, which is area P_oABP_1. Consumer surplus discounted to time t_0 is the net present value of the investment to cooperative members. If net present value is greater than zero, i.e., the investment lowers the cost curve, the cooperative should undertake the investment.

Because the cooperative has played a yardstick role and lowered the market price, nonmember farmers also benefit. Figure 13 illustrates the total market demand curve DD for Q. Price has declined from P_o to P_1 so the aggregate consumer surplus of all farmers is the area P_oMOP_1.

Reconsidering the Free-Rider Problem in Cooperative Theory--The fact that total social welfare benefits are greater than the global benefits enjoyed by

Figure 12--Measuring member benefits from a cost-reducing investment for an open membership purchasing cooperative in an oligopolistic industry

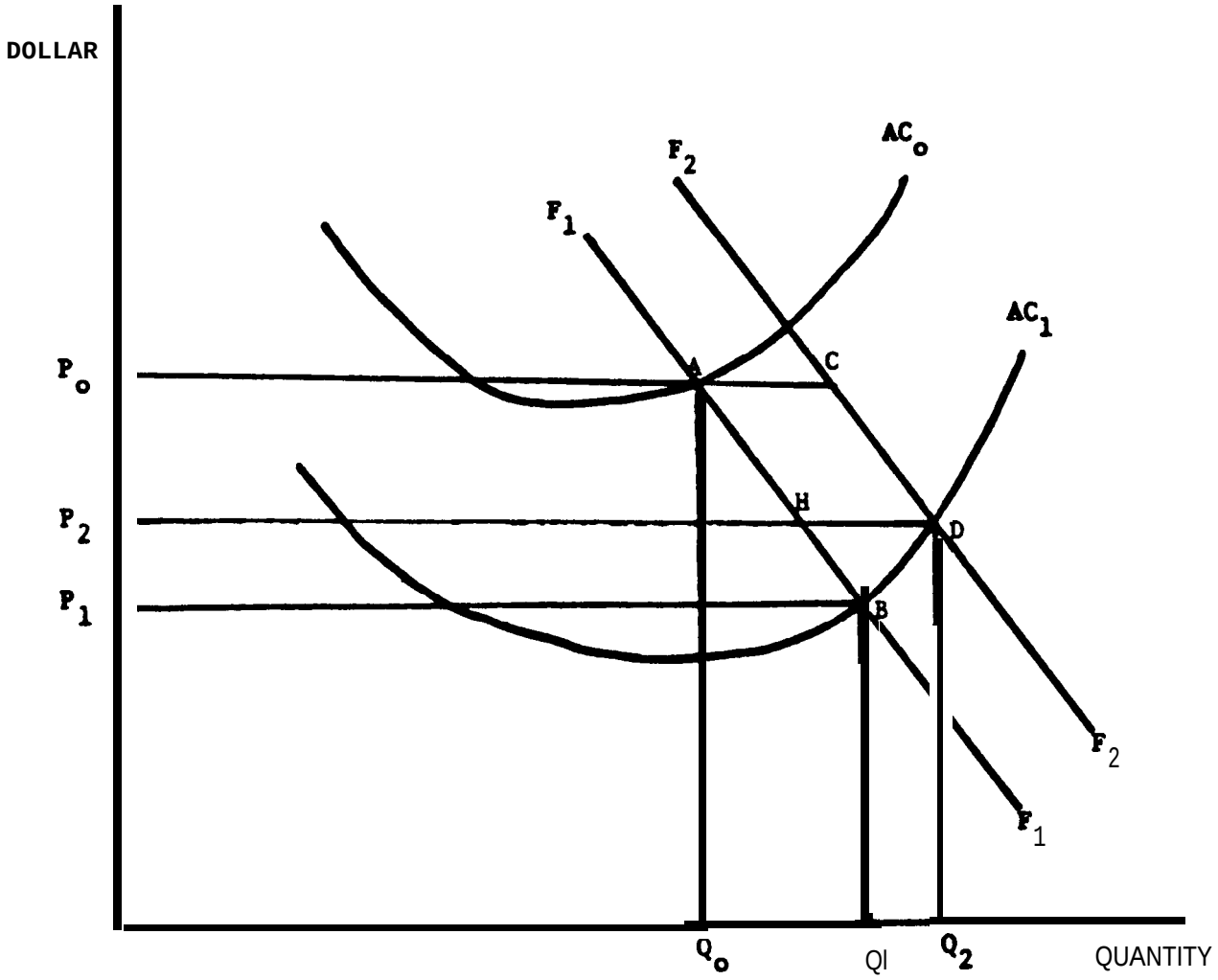
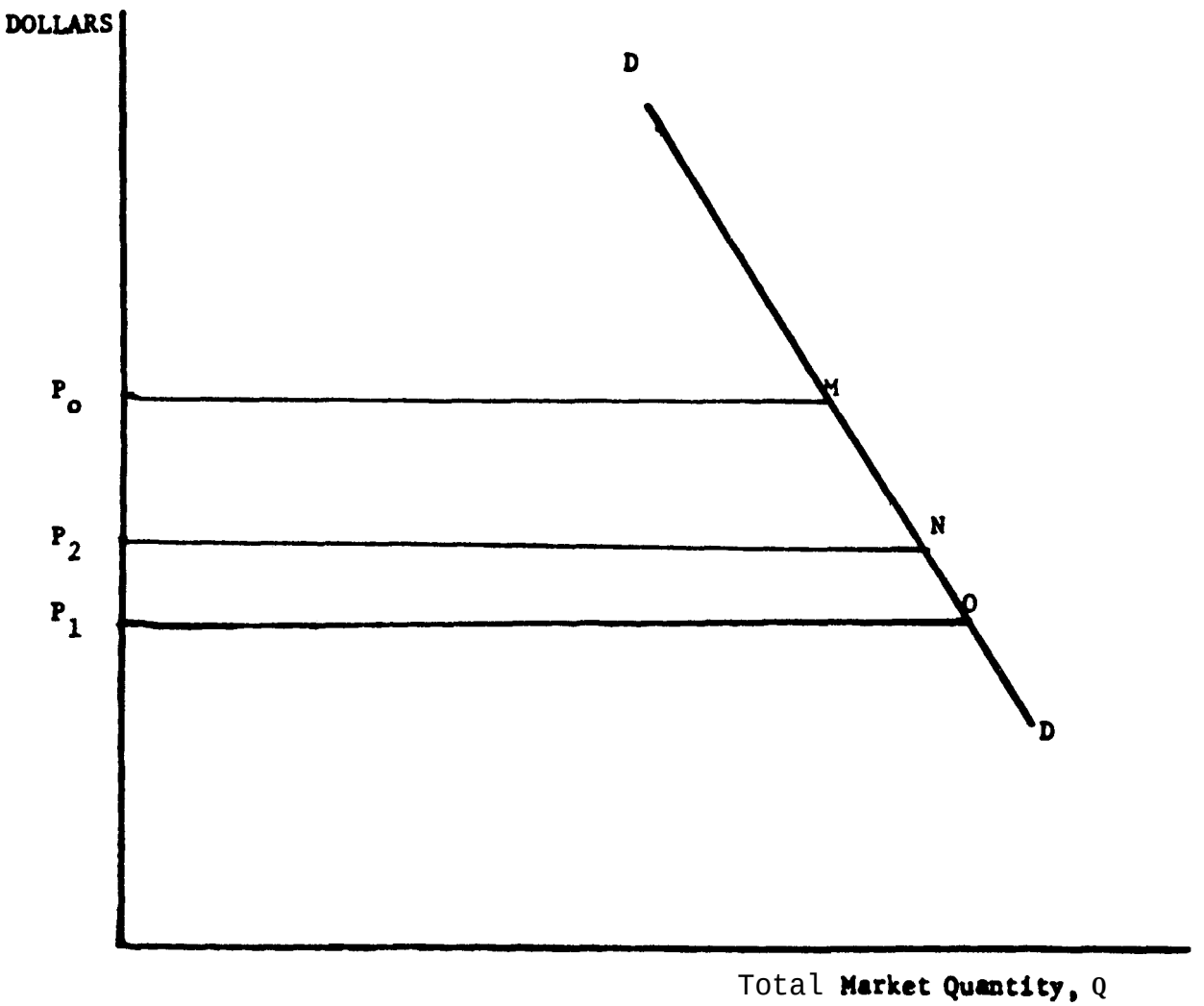


Figure 13--Measuring total benefits from a cost-reducing investment in an industry



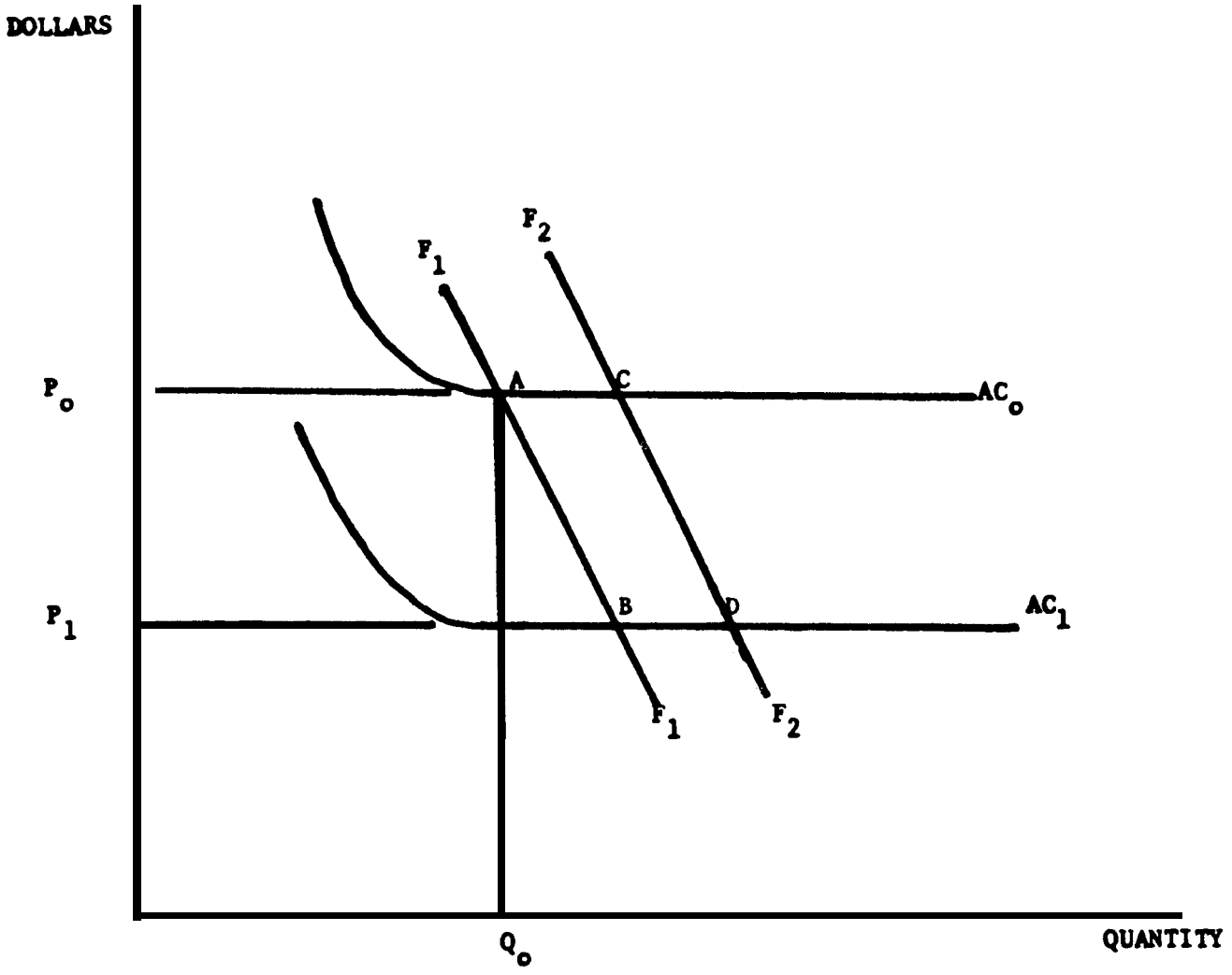
members has led some analysts to suggest that there is a free-rider problem. This contention needs to be analyzed carefully. A free rider is an individual who benefits from a collective action but does not pay his or her share of its costs. Free-rider behavior materializes when benefits are nonappropriable. The competitive yardstick effect of a cooperative on market price is an example of a nonappropriable benefit. All farmers who use the product sold by the cooperative enjoy it--members and nonmembers alike. Does the fact some farmers are free riders, i.e., not members of the cooperative, result in economic inefficiencies? Does it mean members somehow are unfairly shouldering the cost of ensuring desirable performance? The ghost of Sapiro, the advocate of industry-wide cooperation, reappears on the scene when these questions are raised.

Although in specific situations the free-rider problem may lead to inefficiencies or inequities, in general this is not true. Consider how the benefits and costs of a cooperative that has a competitive yardstick effect on the market are distributed. Members and nonmembers receive benefits from market price reductions.[16] For members, this is the security value component of their global value. Members, of course, must provide the equity capital for the cooperative. This is a cost they bear, but they are compensated at the market rate of interest. A member would be no better off if he or she exited the cooperative and invested his or her money elsewhere. Conversely, a nonmember would be no better off if he or she disinvested elsewhere in the economy and joined the cooperative.

The example illustrated in figure 12 proves that the free-rider problem is not a general tenet of cooperative theory. If some farmers join the cooperative, possibly because of a belief in Sapiroism, the followship demand curve shifts out to F_2F_2. The cooperative's market share expands--rivals react and follow the cooperative to equilibrium at point D. The cooperative and other firms now charge P_2 in equilibrium, which is higher than Pl. Old member benefits are less, amounting only to area P_oAHP_2. Total member benefits are area P_oCDP_2, which may be greater or less than member benefits when equilibrium was established at B. Total benefits for all farmers in figure 13 are measured by area P_oMNP_2, which is clearly less than before. Therefore, there is no free-rider problem. In fact, the cooperative would enhance member and nonmembers alike if it aided another firm, preferably a cooperative, to enter and serve approximately one half of its members.

If the cooperative's cost curve is L-shaped, expanded membership does not raise the price and the cooperative still does not encounter a free-rider problem. This situation is illustrated in figure 14. Without expanded membership, equilibrium occurs at B, and member benefits are area P_oABP_1. Total marketwide benefits still are P_oMOP_1 in figure 13. Now, if the cooperative's membership expands to followship demand curve F_2F_2 before rivals respond, equilibrium is attained at point D. Note the old member benefits and total market benefits are the same as before. Increasing cooperative membership does not increase total benefits, although it does internalize more of them in the cooperative. Do these increased internal benefits mean that the cooperative would now undertake the investment, whereas it would not have before the membership expanded? The

Figure 14--L-shaped cost curve case for measuring benefits from a cost-reducing investment for an open membership purchasing cooperative in an oligopolistic industry



answer is no because the cooperative would logically undertake any investment that has positive net present value to old members. Because the cost curves contain the cash flow necessary to cover the opportunity cost interest expense of capital, old members will benefit as long as the project reduces the equilibrium market price of Q. The project has positive net present value, and it will be undertaken. No free-rider problem exists.

The Public Interest and Public Support of Comoetitive Yardstick Cooperatives--The results of this section point toward a fundamental difference between competitive yardstick cooperatives and IOFs. That difference argues for public policies supportive of such cooperatives if increased economic efficiency and a more equal distribution of wealth are desirable. Farming is, on the whole, a competitive industry. Over the long run, the constant farm market price assumption used in the global value analysis may not hold. As farm output increases, the prices of farm products, assuming no government price support programs, will decline. Benefits will be passed on to downstream firms in the food system. If downstream industries are competitive and all other factors are inelastic supply so no rents accrue, consumers ultimately receive all of the benefits measured by this method. Of course, both of these assumptions often do not hold in an absolute fashion. Consumers then receive only part of the total benefit. Nonetheless, compare this result to the performance of an oligopolistic industry without a cooperative. Most, but not all, of the benefits of such a cost-reducing investment would flow to stockholders as increased rents from the shared monopoly. Therefore, cooperatives not only increase economic efficiency, but they tend to redistribute wealth toward lower income persons. This may be a desirable result and, if it is, public support for competitive yardstick cooperatives would help attain it.

Conclusions

To conclude this section, perhaps it is useful to stress that ex post, or after the fact of investment, one often cannot use the observed cash flows of the cooperative to evaluate whether cooperative management has made wise investment decisions. If the cooperative is performing its historic role, prices and quantities, and possibly membership, will change to ensure that ex post the net present value of a desirable investment will be zero. Any positive result would be due to rigidities in the adjustment process to the new long-run equilibrium. Cooperatives must look to changes in consumer surplus under the demand curve for its product to evaluate the ex post impact of investment. Even then, they cannot be certain that all benefits flow to their members if farm prices change or factors of production are in limited supply and not owned by members.

Cooperative managers who wish to evaluate investment decisions ex ante, (before the fact) must forecast where the new cooperative equilibrium will occur and estimate the resulting benefit streams. As figures 12 and 13 suggest, this is a complex measurement problem for cooperatives. Nonetheless the problem of forecasting benefits may be nearly as complex for IOFs in oligopolistic industries. An investment may destabilize the market and cause prices to decline. Like cooperatives, IOFs must consider these price effects when measuring cash flows in such industries.

In figures 12 and 13, the benefit areas have been made very large. Under actual conditions, they may be very small and certainly they will be negative in some areas. These latter investments have negative net present values, and should not be undertaken. Such borderline cases take an added importance when risk is introduced to the theory. A cooperative may choose an investment with positive expected net present value and large variance, including significant chances of not returning to members the opportunity cost rate of interest. If a cooperative's investments are this risky, members will require a return on their equity capital that includes a large risk premium as well as the risk-free interest rate. This is the issue addressed in the next section.

Coonerative Eauilibrium with Risky Investment

> What if economics as a theory of efficiency opens up problems requiring evidence not amenable to academic canons of accurate and absolute demonstration? What does scientific procedure demand. Scientific tactics says: "limit the study to evidence about which absolute and accurate statements can be made." But scientific strategy says "It is unscientific to exclude any evidence relevant to the problem in hand. This comprehensiveness is scientific even if it involves some sacrifice of other qualities for which science likes to strive. (Clark, pp. 74-75)

Introduction

Expanding the theory of the previous section to encompass investments for which returns are not known with certainty is challenging. Considerable controversy has been generated concerning the empirical measurement and testing of the capital asset pricing model which is the starting point for the theory elaborated here (Roll; Drymes). This section does not intend to test as well as develop a cooperative capital asset pricing theory, but the question of the testability and the empirical validity of the approach taken here undoubtedly is an issue. Clark's admonition on scientific method is thus appropriate. The focus here is developing a theory. It is admittedly an exploratory effort.

In an economy where investment income streams are known with certainty, the required rate of return in equilibrium is the risk-free rate of return. How does one generalize the concept of a required rate of return to an economy where investment income streams are not known with certainty?

Knight in his classic book completed in 1927, Risk, Uncertainty and Profit, was the first economist to focus on the relationship between the competitive rate of return and two general states of knowledge about the future. In a risky situation, future outcomes are not known but the probability that each particular outcome will occur is known. Gambling on one's ability to pull an ace from a deck of cards, for example, is a risky situation. Assuming the dealer has not stacked the cards, one has 4 out of 52 chances of winning.

The odds are known. Knight's other general state of knowledge, uncertainty, exists when it is not possible to compute the probability of particular outcomes. The probability of a total nuclear war is a good example. One reason for this is the structure of the problem is not known. Using the deck of cards analogy, we do not know how many cards and how many aces are in the deck. Another reason is that, fortunately, we have no prior occurrences of the event on which to base an estimate of its occurrence. The theory developed below deals with risk.[17]

The Market Eauilibrium Approach

It seems plausible that if the level of risk varies among cooperatives, the required rate of return for capital also would vary. A cooperative with large swings in net cash flow is a riskier investment. Members would require a larger risk premium, and this would establish a higher required rate of return than required from a firm with smaller swings in net cash flow. Cooperative members that seek to maximize their welfare now maximize expected utility because cash flows from risky assets are random variables. The variance as well as the expected (average) return on investment now matter. Stated another way that is more operational for many analytical queries, the opportunity cost of member equity investment in a cooperative now consists of the risk-free rate of return plus a risk premium.

The market equilibrium approach to cooperative finance requires that the total cash income (net cash flow) for a member farm be partitioned into two components: cash income from farm operations and cash income from cooperative membership. Separate degrees of risk usually will exist for each of these economic activities. Cash income from cooperative membership must be further partitioned. The total or global income a farmer receives from cooperative membership is the cash flow he or she would lose if there were no cooperative in the market place. The core income that the farmer receives is the actual cash flow he or she would receive from the cooperative if it were in a competitive industry that is in long-run equilibrium. Therefore, from the member farmer's viewpoint, his or her cash income has two major components: income from farming and global income from cooperative membership. The latter component is further subdivided into core income and security income just as global value was subdivided into the core value and the security return in the last section.

Basic Assumntions--The task at hand is to provide a theory that predicts the required rate of return for cooperative firms and investments in those firms when they have different levels of risk. To keep the analysis manageable and consistent with the method of the preceding section, the same assumptions will be maintained. They are listed in table 5. In addition, it is assumed the cooperative is an open membership organization.

Assumntions Underlying Asset Pricing Models--The fundamental insight into risk management was made by Markowitz. An individual, including a cooperative member, can avoid a certain amount of risk without any loss in return by holding a portfolio of diversified assets. Using this insight, finance theorists have developed two theories to measure the required rate of return or price for a risky asset: the arbitrage pricing theory (APT) and

the capital asset pricing model (CAPM). The assumptions underlying these theories are listed in table 6. Each will be explained with special concern for the fact that some of the firms are now cooperatives and some of the investors are now cooperative members. APT, the most general theory, was developed by Ross in 1976. Both APT and CAPM rely on the first eight assumptions in table 6. First, all individuals, now including cooperative members, maximize expected utility of their wealth or income (changes in wealth). Second, all individuals, including cooperative members, are assumed to be risk-averse. Third, all individuals, including cooperative members, are assumed to have homogenous expectations with regard to the occurrence of future events.

Fourth, it is assumed, as it has been throughout this paper, that capital markets are perfect or efficient.[18] In real markets, this assumption does not hold because there is a need for financial intermediaries. Banks and brokers, for example, introduce transactions costs. To cover such costs, these intermediaries lend funds at a higher rate than the rate at which they borrow them. When rates multiply because of transactions costs, the capital market no longer is an efficient mechanism an individual can use to borrow or lend funds to maximize utility over time. The separation theorem proved later no longer holds.

Corporate finance theorists commonly recognize that the efficient market assumption is often violated.

> The theory of finance is greatly simplified if we assume that capital markets are perfect. Obviously they are not. The relevant question then is whether the theories which assume frictionless markets fit reality well enough to be useful or whether they need to be refined in order to provide greater insights into reality. This is an empirical question. (Copeland and Weston, p. 14)

At this stage, theorists in this area obviously espouse a positive approach to theory.

The fifth assumption is straightforward for IOFs, given there are no taxes, as assumed earlier. This assumption is not relevant for cooperatives, because cooperatives do not generate capital gains.

The sixth assumption, a homogeneous planning horizon, is equally straightforward. Adding cooperatives and cooperative members to the problem creates no need for modification in the one-period model. Over a longer period, the planning horizons of cooperative members may differ. However, the length of an individual's planning horizon should not be confused with a member's decision to exit the cooperative. Such decisions may be made at any time during the planning period. When members exit the cooperative, it is assumed they receive all monies due them at that time. In fact, many cooperatives do not redeem equities this promptly.

The seventh assumption, that everyone in the market has the same opportunity to invest, also requires extra consideration when agricultural cooperatives are added. Its purpose is to ensure no one can corner the market by

Table 6.--Assumptions Necessary for Estimating the Required Rate of Return for a Risky Asset: The Abritrage Pricing Theory and Capital Asset Pricing Model Approaches[a]

APT and CAPM

1. Individuals maximize expected utility.
2. Individuals are risk-averse.
3. Individuals have homogenous expectations with regard to the probability distributions of future returns to assets.
4. The capital market is efficient.
5. Individuals are indifferent between equal dollar amounts of dividend or capital gains income (because they can always their shares or bonds).
6. All individuals have the same horizon period; in this paper it is assumed to be one period.
7. Everyone in the market has the same opportunities to invest although the amounts invested may differ from person to person.
8. The stock of risky securities in the market is given, all securities that were to be issued for the coming period have been issued, and all firm financial decisions have been made.

Additional Assumption for CAPM

9. Individual utility functions are quadratic or the distribution of assets' returns is joint-normal.

[a] These have been assembled from Haley and Schall, p. 144, and Copeland and Weston, chap. 7.

excluding investors. As such, it is an extension of the efficient market assumption. One might think that agricultural cooperatives, and especially closed membership ones, would violate this assumption. They do limit membership to farmers who use their product or services. Nonetheless, as long as the membership can expand or as long as members can expand output, i.e., there are no quotas or other output restrictions, the investment necessary to ensure equilibrium at the capital market's level of return for firms of the cooperatives risk level will be forthcoming.

Assumption eight ensures the problem's boundaries are defined. It does this by fixing the stock of securities and the financial decisions of the firms. For a cooperative, financial decisions also include farmer decisions to join or leave the cooperative, the decision to allocate patronage refunds to members' investment accounts, and the decision to use unallocated retained earnings. Given such decisions have been made, the theory analyzes their impact on the required rate of return and other performance variables.

Assumption nine is required only for the CAPM approach. If utility functions are quadratic, investors are concerned only about expected value and standard deviation or variance of their portfolio performance. This means that the theory can be reduced for trade-offs in these two dimensions. One can obtain the same attractive feature by assuming that the distribution of asset returns is joint-normal. The multivariate normal distribution can be described completely by its first two moments, the expected value vector and the variance vector. Because all higher moment vectors are zero, it does not matter whether individuals actually consider them in their utility functions. They do no vary. Adding cooperatives to the problem requires no changes to this assumption.

The following analysis focuses on a market economy with two types of firms, cooperatives and IOFs. Individuals differ in their attitudes toward risk and the amounts they will be investing, but they agree on the characteristics of securities available. All individuals are averse to risk and agree on what constitutes risk. Except for the restrictions imposed by agricultural cooperative membership policies, individuals can freely invest in any combination of securities desired and can borrow and lend at the same risk-free rate of interest.

Comparing the Arbitrage Pricing Theory and Capital Asset Pricing Model--The essential concept of the arbitrage pricing theory is the market is not in equilibrium if a portfolio holder can for a given risk level increase his or her return by redeploying wealth. In equilibrium, no arbitrage opportunities exist in the market. From this equilibrium condition, one can derive the required rate of return for each asset as a function of several risk factors (Copeland and Weston, pp. 211-20).

CAPM is a special case of the more general APT. Under CAPM, the required return is a function only of risk defined as a single factor that shifts the value of the market portfolio up and down over time. This is termed systematic risk. Risk that can be avoided through diversification is called unsystematic risk. The APT model decomposes the single risk measure of CAPM

into several statistically independent subcomponent risk variables. It then analyzes how asset prices vary as each of these specific risk levels vary.

Empirical studies have found that APT explains observed returns on equities more accurately than CAPM (Copeland and Weston, chap. 7). From an econometric standpoint this should not be surprising. A theory that admits multiple explanatory factors usually will explain more variation than a theory that relies on a single explanatory variable. However, for the expository purposes of this section, the focus will be on the single-risk-factor CAPM.

The Capital Asset Pricing Model--Applying a capital asset pricing model to a cooperative may seem useless. If the asset is equity investment in a cooperative, its market value does not change over time. Its market value is its face value. Thus it may seem odd to develop a pricing model for cooperative equity. The purpose, however, is not to determine the value of equity. It is to use the CAPM theory to determine the risk-adjusted rate of return members require on equity investments in the cooperative. Because of a cooperative's unique business structure, equilibrium is attained through adjustments in price and quantity in the product market rather than adjustments to the value of cooperative equity. This difference in equilibrium adjustment mechanisms does not preclude the measurement of members' required rate of return. For the reader's convenience, table 7 identifies all of the symbols used in the following analysis.

An approprlate place to begin the analysis of the value of an asset, be it a firm or an investment project contemplated by a firm, is the definition of the rate of return r_j for an asset in the one-period model. It is

$$(29)\quad r_j = \frac{Y_1}{V_j} - 1.$$

where Y_1 is the dollar return at t_1 and includes any cash distributions made at that time plus the market value of the asset at t_1. The tilde will be used to designate random variables. In equation (29), dollar return at tl is random so the rate of return also is random. Equation (29) also can represent a set of assets, i.e., a portfolio.

The current value of the investment, V_j, is known with certainty so it is not random. Computing the expected value and standard deviation of $\tilde{r}_j$ gives

$$(30)\quad \bar{r}_j = \frac{Y_1}{V_j} - 1 \text{ and}$$

$$(31)\quad \sigma_j = \frac{\sigma_Y}{V_j}.$$

Throughout this section a bar over a variable denotes its expected value, σ_j denotes the standard deviation of j, and σ_j^2 denotes the variance of j.

Table 7.--A Key to Symbols Used in the Analysis of Cooperative Equilibrium with Risky Investment (Equations (29) Through (53))

Equation where first introduced	Symbol	Definition
(29)	r_j	rate of return on jth asset
	Y_1	dollar return of jth asset at time t_1
	V_j	value of jth asset at time t_0
(31)	σ_j	standard deviation of jth asset's rate of return
	σ_Y	standard deviation of dollar return of jth asset
(32)	i	risk-free interest rate
	λ'	slope of capital market line (CML)
	σ_m	standard deviation of market portfolio rate of return
	r_m	market portfolio's rate of return
(33)	β_j	beta volatility coefficient for jth asset
	σ_m^2	variance of market portfolio rate of return
(39)	λ	risk parameter (slope of capital market line λ' divided by standard deviation of market portfolio σ_m.
(40)	V_1^o	expected net present core value of cooperative activity during t_1
(41)	V_0^o	expected net present core value of cooperative at time t_0
	C_0	cash patronage refunds at time t_0

(Continued)

Table 7.- -A Key to Symbols Used in the Analysis of Cooperative Equilibrium with Risky Investment (Equations (29) Through (53)) (Continued)

Equation where first introduced	Symbol	Definition
(42)	I_t	total equity investment in cooperative at time t_0
	I_p	equity investment in cooperative prior to time t_0
	I_0	equity investment in cooperative at time t_0
(43)	α_n	nth member's share of cooperative sales at time t_1
	r_c	required rate of return for an investment with cooperative's riskiness
(44)	X_1	cooperative's net cash flow at time t_1
	Q_1	sales volume of cooperative at time t_1
	P_1	transaction price of cooperative at time t_1
(45)	X_0	cooperative's net cash flow at time t_0
	F	amount of equity capital provided by new members at time t_0
	B	amount of outside financing undertaken at time t_0
(46)	Cl	cash flow to old members at time t_1
	Y^F	cash flow to new members at time t_1
	Y^B	cash flow to outside suppliers of funds at time t_1

Given assumption 9 in table 6, the only characteristics of portfolios that matter to the individual are the expected returns and standard deviation (or variances). Thus one can display capital market equilibrium on a two dimensional graph as in figure 15. EE' is the efficient frontier. Portfolios that lie on it are efficient in that they pay the highest expected return for a given level of risk. Alternatively, they have the least risk for a given expected rate of return. Inefficient portfolios are located to the right of EE'.

The risk-free rate of interest i combines with the market portfolio M to produce the capital market line (CML). The construction of the CML will be explained in the proof of the separation theorem. First, however, note that a single portfolio M will be held by all individuals. It may seem counterintuitive that individuals with different risk and income preferences hold the same portfolio of securities. The separation theorem proves that it is not. It states:

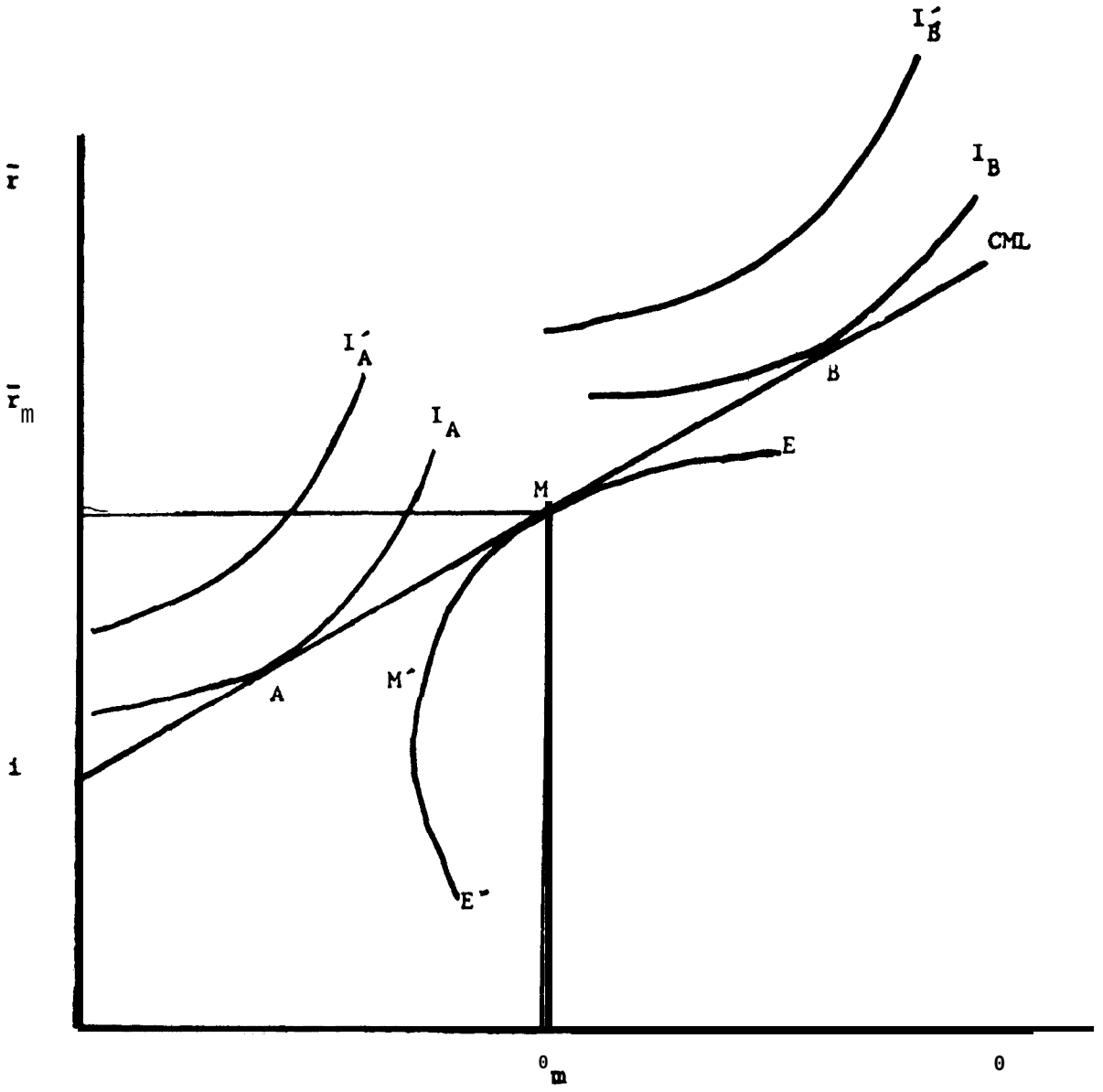
> The individual's choice of a portfolio of risky securities to hold is independent (separate) of the individuals attitude toward risk. (Haley and Schall, p. 132)

To prove this, note the indifference curve sets for two individuals A and B in figure 15. By construction, indifference curves for an individual cannot cross. Moreover, given all individuals are risk-averse, each curve has a concave shape. For individual A, indifference curve I_A' indicates a higher level of expected utility than indifference curve IA' Similarly I_B' provides more expected utility than IB for individual B. Only two indifference curves for each individual have been drawn, however, each has an infinite number of such curves, essentially one for each level of satisfaction. The indifference curve set for each person covers every point in figure 15, and it is the goal of each person to attain the highest indifference curve possible. This expected utility maximization goal, along with the indifference curve set and the boundary of possibilities offered by the capital market, determines each individual's risk-rate of return choice.

Without access to funds at the risk-free rate i, individuals A and B would make two distinctly different portfolio choices because their preferences toward risk differ. The particular portfolio each would choose would be determined by the tangency of the efficiency frontier with their highest attainable indifference curve, The location of their indifference curves in the figure indicate that individual A prefers less risk with corresponding lower expected returns than individual B.

Access to funds at the risk-free rate i establishes the capital market line. Individuals can attain an expected rate of return-risk combination on the CML between i and M by investing a proportion of their assets at the risk-free rate i and the remaining proportion in the market portfolio M. Individuals can move up the CML beyond M by borrowing funds at the risk-free rate i to invest more in the market portfolio M. This financial leverage increases the expected rate of return as well as the risk. In figure 15 individual A maximizes expected utility at point A by investing approximately 50 percent of his or her assets in M and 50 percent in risk-free assets. Individual B

Figure 15--Equilibrium in the capital market



borrows money at interest rate i to leverage his or her funds and attains maximum expected utility at point B. Note that although their attitudes toward risk are different, both in their drive to maximize satisfaction desire to hold only the market portfolio M rather than some other portfolio such as M'. This proves the separation theorem.

For the capital market to be in equilibrium, all securities must be held by someone, i.e., they must be in portfolio M. This requirement implies a pricing process for each security, including equity securities of cooperatives held by members. If the expected return on a security of an IOF is too low given its riskiness, more individuals will wish to sell rather than buy it. The current price (value) of the security will fall until the expected rate of return as computed with equation (30) equals investors' required return for a security of that risk class.

The equilibrium adjustment process for a supply cooperative is different, but it produces the same result. As explained in the previous two sections, when patronage and the associated investment imply an expected return above that earned by investments with similar risk levels, demand for the cooperative's output will expand and the price will fall to reduce the cooperative's competitive advantage until members earn only the rate of return required for assets of that risk class. Thus the equity security's net cash flow rather than its market value changes to reestablish the required rate of return.

The derivation of the asset pricing equation from the capital market equilibrium condition is reasonably complex, but readily available in advanced corporate finance texts (Haley and Schall, chap. 7; Copeland and Weston, chap. 7). The pricing equation, called the security market line (SML), for the jth asset is

$$(32)\quad \tilde{r}_j = i + \frac{\lambda'}{\sigma_m}\,\mathrm{cov}(\tilde{r}_j, \tilde{r}_m)$$

where

r_j is the expected price of asset j;

i is the risk-free interest rate;

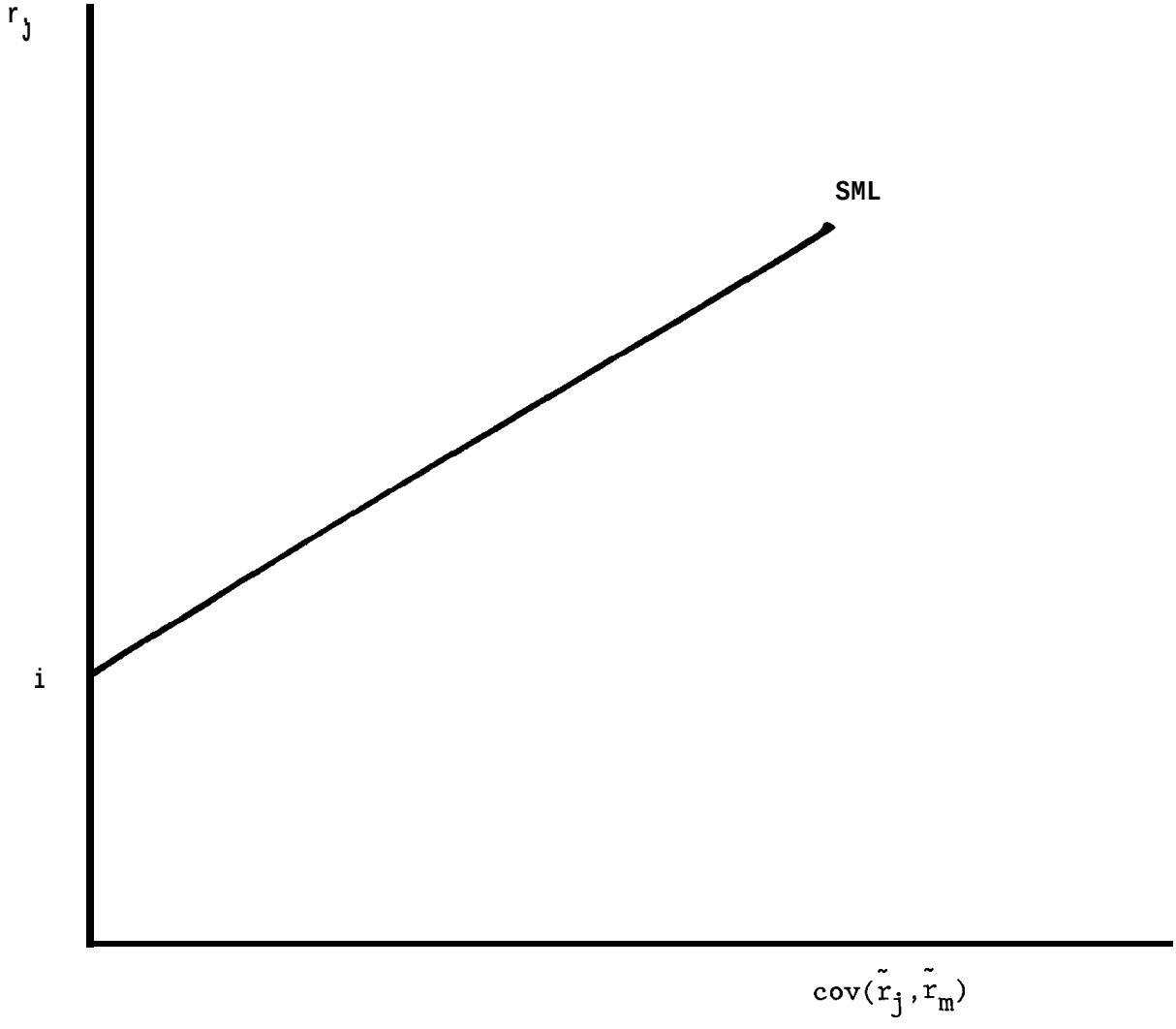
λ' is the slope of the CML;

a, is the standard deviation of the market portfolio M; and

$\mathrm{cov}(\tilde{r}_j, \tilde{r}_m)$ is the covariance of the return on j with the return on the market portfolio M.

Graphically one can represent the SML as in figure 16. Note that the expected rate of return is not a function of the asset's variance. Because the unsystematic or idiosyncratic portion of an asset's variance can be avoided through diversification, only systematic risk as measured by the covariance term matters.

Figure 16--Security market line for jth asset using covariance



An alternative form of the SML often appears in the literature because it suggests a direct empirical method to compute $\tilde{r}_j$.[19] Define the following volatility coefficient:

$$(33) \quad \beta_j \equiv \frac{\text{cov}(\tilde{r}_j, \tilde{r}_m)}{\sigma_m^2}.$$

Solving (33) for $\text{cov}(\tilde{r}, \tilde{r})$, substituting it into (32), and using the point-slope formula for the slope of a straight line to eliminate X', one obtains

$$(34) \quad \bar{r}_j = i + \beta_j(r_m - i).$$

$\bar{r}_j$ is computable from observed data (Copeland and Weston, pp. 204-g). Figure 17 illustrates this second form of the SML. Note when the beta equals one, the asset has the same risk as the market portfolio. As a result, the expected rate of return on j equals the expected market rate of return in equilibrium. If the beta is greater than one, the jth asset is more volatile than the market and its rate of return is higher. The converse holds for a beta less than one.

Deriving the Valuation Eauation--The CAPM enables a parallel examination in a risky world of the valuation, finance, and investment issues covered in the previous section under certainty. The first step is to derive the valuation equation for a risky asset. Equating equations (30) and (32), one obtains

$$(35) \quad \frac{Y_1}{V_j} - 1 = i + \frac{\lambda' \text{cov}(\tilde{r}_j, \tilde{r}_m)}{\sigma_m}$$

Substituting equation (29) for $\tilde{r}_j$ into (35) gives

$$(36) \quad \frac{Y_1}{V_j} - 1 = i + \frac{\lambda'}{\sigma_m} \text{cov}\left(\frac{Y_1}{V_j} - 1, \tilde{r}_m\right).$$

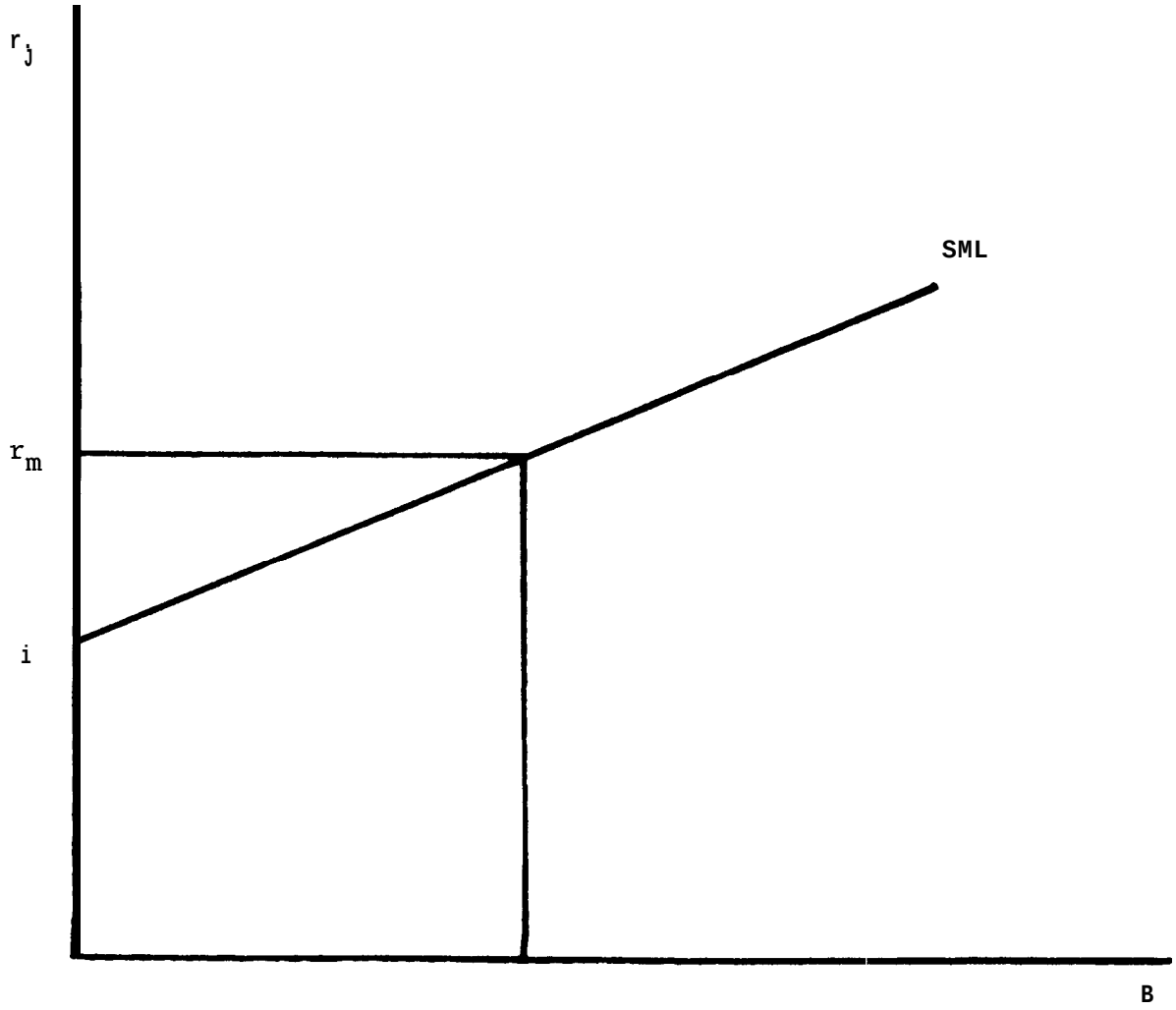
Because V_j and 1 are constants, the covariance term simplifies to

$$(37) \quad \text{cov}\left(\frac{Y_1}{V_j} - 1, \tilde{r}_m\right) = \frac{\text{cov}(\tilde{Y}_1, \tilde{r}_m)}{V_j}.$$

Substituting (37) into (36) and solving for V_j gives

$$(38) \quad V_j = Y_1 \frac{(\lambda'/\sigma_m)\ \text{cov}(\tilde{Y}_1, \tilde{r}_m)}{1 + i}.$$

Figure 17--Security market line for jth asset using beta



The standard deviation of the market, σ_m, is a constant in equilibrium. Therefore, one can define a new "price of risk," $\lambda = \lambda' / a$,. Also, dropping the subscript j, one obtains the following general equation valuation equation;

$$(39)\quad V = \frac{Y_1}{1 + i} - \frac{\lambda \operatorname{cov}(\tilde{Y}_1, \tilde{r}_m)}{1 + i}.$$

Note that if the covariance between an asset's period one income $\tilde{Y}_1$ and the market rate of return is zero, the valuation equation reduces to the first term. Such an asset is equivalent over time to a risk-free investment. No risk premium is subtracted from the net present value of its expected return. Alternatively $\tilde{Y}_1 - \lambda \operatorname{cov}(\tilde{Y}_1, \tilde{r}_m)$ is the-cash or certainty equivalent of the random cash payment $\tilde{Y}_1$.

Applying CAPM to Cooperatives: The Core Value of an Open Membership Cooperative--The general valuation equation can be used to analyze the core value of a cooperative. As explained in the previous section, if we are examining an open membership cooperative and the cooperative prices at the industry level, the cooperative's observed net cash flow can be used to determine the cooperative's core value. That example is continued here. Assume that at t_1 the cooperative liquidates by paying a cash patronage refund C_1 to old members. It is a random variable. Old members are members who were members during t_0. Also assume that the cash patronage refund at t_0, C_0, is known and has been paid. Then the expected net present core value to old members at t_0 of the cooperative's activity during t_1 and dissolution at t_1, V_1^o, is

$$(40)\quad V_1^o = \frac{Cl}{1 + i} - \lambda \frac{\operatorname{cov}(\tilde{C}_1, \tilde{r}_m)}{1 + i}.$$

The total expected net present core value of the cooperative to old members at t_0 is

$$(41)\quad V_0^o = C_0 + V_1^o.$$

It is the sum of current patronage refunds plus the expected net present core value of period t_1 activity and dissolution.

To establish cooperative equilibrium in a risky environment, recall from the previous section the analysis of potential member's decision to join the cooperative. Briefly, total cooperative investment is the sum of previous investment plus current investment:

$$(42)\quad I_t = I_p + I_0.$$

The nth new member will receive $\alpha_n C_1$ as cash patronage refund for an investment of $\alpha_n I_t$. α_n is the patron's percent of cooperative volume in period one. A potential member will join if the expected return on

cooperative investment is greater than or equal to the required rate of return for an investment of the cooperative's risk level $\bar{r}_C$, that is,

$$(43)\quad \frac{\alpha_n \bar{C}_1}{\alpha_n I_t} - \frac{C_1}{It} \geq 1 + rc.$$

In this example, because there is no investment in tl and the cooperative dissolves at tl, period one cash patronage refunds $\tilde{C}_1$ equal period one net cash margins plus any cash received at dissolution $\tilde{X}_1$. Moreover, the cooperative equilibrium process implies that

$$(44)\quad Xl = X_1(\tilde{Q}_1, \tilde{P}_1).$$

Period t_0 cash flow is known with certainty and can be written as follows:

$$(45)\quad CO = X_0 - IO + F + B.$$

CO is current cash patronage refund. X_0 is current investment. F is the amount of capital provided by members that join at t_0. B is the amount of outside financing undertaken at t_0. Because risk exists, B could be bonds, other long-term debt, or more risky preferred stock.

Cash flow at tl is a random variable and given there is no investment, it can be written as

$$(46)\quad \tilde{X}_1 = Cl + \tilde{Y}^F + \tilde{Y}^B.$$

$\tilde{C}_1$ is the random cash flow to old members, $\tilde{Y}^F$ is the random cash flow to new members, and $\tilde{Y}^B$ is the random cash flow to outside suppliers of funds. A random cash flow to outside suppliers of capital is appropriate because most cooperatives borrow at floating interest rates. Solving for period tl cash patronage refunds gives

$$(47)\quad Cl = Xl - \tilde{Y}^F - YB.$$

The expected cash flow at t_1 is

$$(48)\quad \bar{C}_1 = Xl - \bar{Y}^F - \bar{Y}^B.$$

Substituting (48) and (47) into the general valuation equation (40) and simplifying, using the additive property of covariance, gives

$$(49)\quad V_1^o = \frac{X_1 - \lambda\ cov(\tilde{X}_1, \tilde{r}_m)}{1 + i} \quad \frac{\bar{Y}^F + cov(\tilde{Y}^F, \tilde{r}_m)}{1 + i} - \frac{\bar{Y}^B + cov(\tilde{Y}^B, \tilde{r}_m)}{l+i}.$$

The expected net present core value at t_0 of the cooperative activity in period tl and its dissolution at t_1 to old members is composed of three parts: the net present value of the certainty equivalent of cash income, minus the present value of the certainty equivalent of payments to new

members, minus the net present value of the certainty equivalent of payments to outside suppliers of capital.

Equation (49) can be further simplified by noting that the raising of outside funds and new decisions to join occur in markets that are in equilibrium. Thus the net present value of expected bond repayment plus interest equals the amount of outside funds raised, B. Market equilibrium also combines with equation (43) to establish that the net present value of expected cash patronage refunds to new members equals the amount of capital provided by new members, F. Therefore, equation (49) can be rewritten as

$$(50)\quad V_1^o = \frac{Xl - \mathrm{cov}(\tilde{X}_1, \tilde{r}_m) - F - B}{1 + i}$$

The total expected net present core value of the cooperative to old members at t_0 is now obtained by substituting (45) and (50) into (41) to obtain

$$(51)\quad V_0^o = C_0 + V_1^o = X_0 - I_0 + \frac{X_1 - \lambda\ \mathrm{cov}(\tilde{X}_1, \tilde{r}_m)}{l+i}.$$

In cooperative equilibrium, another relationship holds:

$$(52)\quad I, = I_p + IO = \frac{X_1 - \lambda\ \mathrm{cov}(\tilde{X}_1, \tilde{r}_m)}{1 + i}.$$

Total investment in the cooperative earns only the competitive rate of return for assets of that risk level. Therefore, the old member core valuation equation reduces to

$$(53)\quad V_0^o = I_p + X_0.$$

The expected net present core value of the cooperative to old members equals the sum of prior investments I_P made by old members plus the current net margins X_0 of the cooperative. This result corresponds to the result obtained in the certainty case analyzed in the previous section. There the actual value of the cooperative to old members was equal to prior investment plus current net margins.

Risk-Adiusted Discount Factors for Cooperative Investmont Analysis--The analysis of changes in global value arising from a cooperative investment given risk also corresponds to that of the certainty case presented in the previous section. It will not be generalized here because it adds little new insight. The CAPM approach does, however, provide a measure of the appropriate discount factor for a proposed investment. It also can be used to measure members' required rate of return on cooperative equity. The security market line identified in equation (34) and figure 17 provides answers. If the jth asset is a proposed cooperative investment, one would proceed as follows. First, estimate the investment's beta. Then estimate

the SML of figure 17 and employ it to determine the required rate of return on an investment of the proposed investment's risk level. If the jth asset is the equity capital of the cooperative firm, this procedure gives the members' required rate of return.

An important result of this approach is that two investment projects with different levels of risk will have different risk-adjusted discount rates. The traditional weighted average cost of capital (WACC) approach does not adjust for different levels of risk associated with projects. It computes one discount rate for a firm by weighting the required return for each type of security by the proportion of total assets. If 75 percent of the firm is financed with debt bearing an interest rate of 10 percent and equity capital which requires a 20 percent return accounts for the remaining 25 percent of assets, the weighted average cost of capital is

$$(54)\quad WACC = .75(10) + .25(10) = 12.5\%.$$

This discount rate is then used to evaluate all investment projects. This approach is only acceptable if the proposed investments have the same risk level and that risk level equals the current risk of the cooperative firm (Haley and Schall, p. 177). In general, WACC is no longer considered to be an appropriate method for adjusting investment analysis for risk.

Unallocated Retained Earnings Given Riskv Investment--The analysis of unallocated retained earnings in a risky environment produces results that correspond closely to those derived under certainty in the previous section. A cooperative that retains all net margins in excess of the amount necessary to meet the required return of security holders will provide members an expected net present core value equal to prior investment $-I_p$ plus current net margins X_0. As in the prior analysis, this also will be the members' expected net present global value. The cooperative can evaluate investment performance by noting how the amount in the retained earnings account changes.

Under risk there is, however, one additional possibility for the cooperative. If one assumes in the one-period model that the cooperative had unallocated retained earnings at t_0, it has an extra degree of flexibility when determining cash flow to members at t_1. It can manage the benefit flow to members, but because unallocated retained earnings are finite, the cooperative cannot raise the cash flow to members permanently in a multiperiod model. This suggests three testable hypotheses. First, a retained earnings cooperative might use a buffer stock approach, drawing down retained earnings in bad years, and adding to them in good ones, to reduce the riskiness of the cooperative's payments to members for equity capital furnished. The member's required rate of return on equity capital could thus be lowered. A retained earnings cooperative could conceivably reduce beta to zero so members would be satisfied receiving the risk-free rate of return. In a multi-asset, efficient capital market, however, this type of manipulation of the required rate of return may not increase members' expected utility.

A second hypothesis is: Cooperatives that have accumulated a pool of unallocated retained earnings would have more stable patronage refund streams with, on average, a lower cash refund value than comparable cooperatives that do not have and use retained earnings as a buffer stock. Lowering the required rate of return also suggests these cooperatives would find more investment projects with positive net present values. Retained earnings cooperatives that buffer refunds may expand more rapidly than other cooperatives.

Future Research

The theory presented in this paper is very abstract. Some may reject it out of hand because its assumptions strip away many of the "real" world features of cooperative pricing and finance methods. Yet for progress in the theory of cooperative enterprise activity, perhaps more research on specific pricing and finance methods should be conceptualized within the context of the linked product and capital market equilibrium theory developed in this paper. In fact, this paper suggests several fruitful avenues for research. The price output models of the second section can be seen as the core of a set of strategic planning models. They can be expanded by incorporating other internal organization and policy features to complement the pricing membership and retained earning features analyzed here (Cotterill 1987). Specific cooperative finance plans such as the revolving fund or base capital plans could be incorporated to produce a more detailed model of price and finance. This would require a more complex multiple-period model. Adding corporate and personal income taxes also would produce more refined results. Ultimately this work could lead to empirical testing and measurement of the parameters in these models.

Applied research along this avenue could provide cooperatives with operational strategic planning and investment analysis models that incorporate risk. Members' required rates of return could be estimated. Managers and directors as a result should be able to improve cooperatives performance.

The theory suggests several ways to evaluate the performance of cooperatives that use tax-paid surpluses such as retained earnings or income from nonpatronage business units. Comparing their performance to cooperatives that use other types of financial strategies might provide useful insights. The theory also generates insights that can serve as the basis for antitrust analysis of cooperative activity and for member education on strategic pricing and financial issues. Certainly this type of information would be useful.

Notes

1. The work of Helmberger, and Helmberger and Youde on market impacts, especially the relationship between cooperative membership policies and the ability of marketing cooperatives to raise price to members is a notable exception, as is the 1977 NC-117 monograph Agricultural Cooperatives and the Public Interest.

2. Except for the first principle, which is curiously omitted, these are from Abrahamsen, p. 48.

3. See Berle and Means for a classic discussion and Cotterill (1987) for a recent analysis of this subject in IOFs. For a discussion of the same concerns for cooperatives, see Vitaliano and Condon.

4. It is worth noting that there is a difference between the political process in an organization such as a cooperative and a country. A member can exit a cooperative, but a citizen cannot exit a country very easily. Citizens essentially have only the voice option.

5. Later Robotka (1957) retrenched toward Emelianoff's view of cooperation. This revision was in response to Phillips's rigorous theory of a cooperative as a "joint economic plant" operated by members of a cooperative association without a central coordinating agent.

6. See Ladd for an example of this approach. His bargaining cooperative seeks to provide services including political representation of farmers' interests as well as to raise the prices that farmers receive.

7. Royer's criterion is the same as Enke's, which is the sum of producer surplus and cooperative net margins, because producer surplus and profits from farm operation are identical.

a. Recall that for the interim we are assuming that members purchasing behavior is not a function of patronage refunds. When this assumption is later relaxed, this pricing rule no longer produces maximum welfare.

9. If the long-run average cost curve is flat at the point of intersection with the demand curve, price also equals long-run marginal cost and we have an exact duplication of the properties of long-run competitive equilibrium.

10. One also can measure the total social welfare value of the cooperative by including the net gains in consumer and producer surplus throughout the economy. One component of this is gains that nonmember farmers enjoy because of the yardstick effect of the cooperative rival IOFs. Core and global value are critical for cooperative investment decisions; total social welfare value is not.

11. One may be able to view these two approaches as valid for the end points of a price-cost spectrum that has the shared monopoly margin as one end and the competitive price-cost margin (zero) as the other extreme. When the equilibrium price-cost margin settles between these two values, the cooperative has had a partial competitive yardstick effect and the resulting net cash flow measures neither the global nor core value. Cooperative investment analysis is even more challenging if this is the case.

12. This specification and the related mathematical analysis follows Haley and Schall. I also have tried to follow their notation. Reading

chapters 1 and 2 of that book may be helpful for readers who are unversed in mathematical finance models.

13. F and B are stock variables that occur at t_0. They could have zero subscripts, but because this is a one-period model, no new member equity or new debt is contemplated at time t_1. As a result, there is no need to distinguish between transactions at t_0 and t_1, so no subscripts are used on F and B. Also, it is assumed, without loss of generality, that prior investment is net of any prior bond financing. Only current financing decisions are analyzed.

14. Changes in the cooperative's unit cost structure are implicitly included because they occur as purchase volume Q_1 changes.

15. Cases where farm product prices remain unchanged after a cooperative lowers an input price may not be uncommon. If the cooperative operates in one of several production areas, the production response to lower the cooperative input price may not affect the national market price of the farm product. On the other hand, if farm product prices adjust immediately to the input price, benefits over the opportunity cost of capital are passed on to others in the food system. If all downstream industries are competitive then consumers and the owners of productive factors in less than perfectly elastic supply are the ultimate beneficiaries. High quality farmland, for example, is not in elastic supply so returns to it would be higher in equilibrium and its owners would benefit.

16. Recall it is assumed that members purchase at the cooperative and nonmembers purchase from IOFs.

17. See Vickers for an iconoclastic attempt to develop a theory of profit that deals with uncertainty.

18. See Copeland and Weston, chaps. 1, 9, and 10, and Haley and Schall, chap. 14, for further explanations of what an efficient capital market is and evidence as to how lack of efficiency can be controlled in these models.

19. Using the model to compute required rates of return is different than testing the model to establish its validity.

References

Abrahamsen, Martin A. Cooperative Business Enterprise. New York: McGraw-Hill Book Co., 1976.

Aresvik, Oddvar. "Comments on 'Economic Nature of the Cooperative Association."' Journal of Farm Economics 37(1955):140-44.

Bakken, Henry H. "Principles and Their Role in the Statutes Relating to Cooperatives." Wisconsin Law Review (1954):549-70.

_____. Basic Concents. Principles and Practices of Cooperation. Madison, Wis.: Mimir Publishers, 1963.

Bakken, Henry H., and Marvin A. Schaars. The Economics of Cooperative Marketing. New York: McGraw-Hill Book Co., 1937.

Beierlein, James G., and Lee F. Schrader. "Patron Valuation of a Farmer Cooperative Under Alternative Financial Policies." American Journal of Agricultural Economics 60(1978):636-41.

Berle, Adolf A., and Gardner C. Means. The Modern Cornoration and Private Property. New York: Macmillan Co., 1932.

Bodenhorn, Diran. "A Cash Flow Concept of Profit." Journal of Finance 19(1964):16-31.

Briscoe, Robert. "Traders versus Idealists." Ph.D. dissertation, Harvard University, 1971a.

_____. "Utopians in the Marketplace." Harvard Business Review, Sept.-Oct. 1971b, pp. 4-10.

Chamberlin, Edwin. The Theory of MonopolisticCompetition. Cambridge, Mass.: Harvard University Press, 1935.

Clark, John Maurice. Economics of Overhead Costs. Chicago: University of Chicago Press, 1923.

Cobia, David, et. al. Eauitv Redemntion: Issues and Alternatives for Farmer Cooperatives. Washington, D.C.: USDA ACS Res. Rep. 23, Oct. 1982.

Condon, Andrew M., and Peter Vitaliano. "Agency Problems, Residual Claims and Cooperative Enterprise." Cooperative Theory Working Pap. 4, Dept. of Agricultural Economics, Virginia Polytechnic Institute, 1983.

Copeland, Thomas E., and J. Fred Weston. Financial Theory and Cornorate Policy, 2nd ed. Reading, Mass.: Addison-Wesley, 1983.

Cotterill, Ronald W. "The Competitive Yardstick School of Cooperative Thought." In American Cooneration 1984, pp. 41-53. Washington, D.C.: American Institute of Cooperation, 1984.

_____. "The Economic Efficiency of Alternative Enterprise Forms." In Economic Efficiency in Agricultural and Food Marketing, ed. Richard L. Kilmer and Walter J. Armbruster, pp. 109-30. Ames, Iowa: Iowa State University Press, 1987.

Craig, John G. "Representative Control Structures in Large Cooperatives." Annals of Public and Cooperative Economy 47(1976):160-79.

Croteau, John T. The Economics of the Credit Union. Detroit: Wayne State University Press, 1963.

Dahl, Wilmer A., and William D. Dobson. "An Analysis of Alternative Financing Strategies and Equity Retirement Plans for Farm Supply Cooperatives." American Journal of Agricultural Economics 58(1976):198-208.

Davidson, Donald R. How Farm Marketing Cooperatives Return Savings to Patrons. Washington, D.C.: USDA FCS Res. Rep. 7, Dec. 1969.

Drymes, Phoebus J. "A Critical Re-examination of the Empirical Evidence on the Arbitrage Pricing Theory." Paper presented at Fourth Latin American Congress of The Econometric Society, Santiago, Chile, July 20, 1983.

Dunlap and Associates, Inc. Cash Flow Feasibility Analysis. Washington, D.C.: USDA FCS Staff Rep., Dec. 1970.

Emelianoff, Ivan V. Economic Theory of Cooperation. Washington, D.C.: By the author, 1942.

Enke, Stephen. "Consumer Cooperatives and Economic Efficiency." American Economic Review 35(1945):148-55.

Erdman, Henry E., and Grace H. Larsen. Revolving Finance in Agricultural Cooperatives. Madison, Wis.: Mimir Publishers, 1965.

Fenwick, Richard. "Financing Varies by Individual Cooperative." In American Cooperation: 1973-74, pp. 201-11. Washington, D.C.: American Institute of Cooperation, 1974.

Ferguson, Charles E. Microeconomic Theory, rev. ed. Homewood, Ill.: R. D. Irwin, 1969.

Fisher, Irving. The Theory of Interest. New York: Macmillan Co., 1930.

Friedman, Milton. "The Methodology of Positive Economics." In Essays in Positive Economics. Chicago: University of Chicago Press, 1953.

_____. A Theory of the Consumption Function. Princeton, N.J.: Princeton University Press, 1957.

Galbraith, John K. American Capitalism. Boston: Houghton Mifflin Co., 1952.

Greer, Douglas F. Industrial Organization and Public Policy. New York: Collier Macmillan, 1980.

Haley, Charles W., and Lawrence D. Schall. The Theory of Financial Decisions, 2nd ed. New York: McGraw-Hill Book Co., 1979.

Heflebower, Richard B. Cooperatives and Mutuals in the Market System. Madison, Wis.: University of Wisconsin Press, 1980.

Helmberger, Peter. "Cooperative Enterprise as a Structural Dimension of Farm Markets." Journal of Farm Economics 46(1964):603-17.

Helmberger, Peter, and Sidney Hoos. "Cooperative Enterprise and Organization Theory." Journal of Farm Economics 44(1962)275-90.

Helmberger, Peter, and James Youde. Membership Policies and Market Power of Farmer Cooperatives in the United States. University of Wisconsin Exp. Stat. Res. Bul. 267, Aug. 1966.

Hirshman, Albert 0. Exit. Voice. and Loyalty. Cambridge, Mass.: Harvard University Press, 1970.

Jensen, Michael C., and William H. Meckling. "The Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." Journal of Financial Economics 3(1974):305-60.

Kennedy, Liam, ed. Economic Theory of Coonerative Enterprises. Oxford, England: Plunkett Foundation for Cooperative Studies, 1983.

Keynes, John Maynard. The General Theorv of Employment, Interest. and Money. New York: Harcourt, Brace and World, 1936.

Knight, Frank. Risk, Uncertainty and Profit. Boston: Houghton Mifflin Co., 1921.

Knoeber, Charles R., and David L. Baumer. "Understanding Retained Patronage Refunds in Agricultural Cooperatives." American Journal of Agricultural Economics 60(1983):30-37.

Kropotkin, Peter. Mutual Aid: A Factor in Evolution. New York: Alfred A. Knopf, 1916.

Ladd, George W. "The Objective of the Cooperative Association." In Development and Application of Coonerative Theory and Measurement of Coonerative Performance, pp. l-23. Washington, D.C.: USDA ACS Staff Rep., Feb. 1982.

Lambert, Paul. Studies in the Social Philosophy of Cooperation. Washington, D.C.: Cooperative League of the U.S.A. [National Cooperative Business Association], 1963.

Markowitz, Harry. "Portfolio Selection." Journal of Finance 7(1952):77-91.

Mirowsky, Jill. Guidelines for the Restructuring of Growing and Changing Agricultural Cooperatives. Madison, Wis.: University Center for Cooperatives, 1983.

Moore, John C., and Richard S. Fenwick. "Future Cooperative Growth-Capital Requirements." FCA Research Journal 3(1978):25-31.

Myrdal, Gunnar. Against the Stream: Critical Essays on Economics. New York: Vintage Books, 1975.

Nichols, William, H. Imperfect Comoetition within Agricultural Industries. Ames, Iowa: Iowa State College Press, 1941.

Nourse, Edwin G. "The Economic Philosophy of Cooperation." American Economic Review 12(1922):577-97.

Ostergaard, Geoffrey, and A. H. Halsey. Power in Cooperatives. Oxford, England: Basil Blackwell and Mott, 1965.

Phillips, Richard. "Economic Nature of the Cooperative Association." Journal of Farm Economics 35(1953):74-87.

Ratchford, C. Brice. "Competition Among Cooperatives." In Research on Cooperatives in the 1980s, pp. 83-84. Washington, D.C.: USDA ACS Staff Report, 1983.

Rhodes V. James. "Competition Among Cooperatives." In this volume.

Robotka, Frank. "A Theory of Cooperation." Journal of Farm Economics 29(1947):94-114.

_____. "A Theory of Cooperation." In Agricultural Cooperation, ed. Martin Abrahamsen and Claud Scroggs, pp. 121-42. Minneapolis: University of Minnesota Press, 1957.

Roll, R. "A Critique of the Asset Pricing Theory's Tests." Journal of Financial Economics 4(1977):129-76.

Ross, S. A. "The Arbitrage Theory of Capital Asset Pricing." Journal of Economic Theory 13(1976):341-60.

Roy, Ewe11 Paul. Cooperatives: Development, Principles and Management, 3rd ed. Danville, Ill.: Interstate Press, 1976.

Royer, Jeffrey S. "A General Nonlinear Programming Model of a Producers Cooperative Association in the Short-Run." Ph.D. dissertation, Iowa State University, 1978.

_____. "A Model for the Short-Run Production and Pricing Decisions of Cooperative Associations." In Development and Application of Cooperative Theory and Measurement of Cooperative Performance, pp. 24-49. Washington, D.C.: USDA ACS Staff Rep., Feb. 1982.

_____. "Analyzing Cash Patronage Refunds, Equity Redemption, and Growth in Farmer Cooperatives" Unpublished paper, Agricultural Cooperative Service, U.S. Department of Agriculture, Aug. 1983.

Samuelson, Paul A. "An Exact Consumption-Loan Model of Interest With or Without the Social Contrivance of Money." Journal of Political Economy 66(1958):467-82.

Savage, Job K. "Comment on 'Economic Nature of the Cooperative Association."' Journal of Farm Economics 36(1954):529-34.

Schaars, Marvin A. "Basic Principles of Cooperatives--Their Growth and Development." In American Coooeration 1951, pp. 835-52. Washington, D.C.: American Institute of Cooperation, 1951.

_____ Cooperatives. Principles. and Practices. University of Wisconsin-Extension Bul. A1457, July 1980.

Street, Donald W. "A Discounted Cash Flow Framework for Analyzing Cooperative Capital Investment." Washington, D.C.: USDA ACS Staff Rep., June 1983.

Torgerson, Randall E. "Cooperatives vs. Businesses Owned by Farmers: There Is a Difference." Farmer Cooperatives, Aug. 1983, p. 2.

U.S. General Accounting Office, Comptroller General. Familv Farmers Need Cooperatives--But Some Issues Need to be Resolved. Washington, D.C.: Rep. to Congress CED-79-106, July 26, 1979.

VanSickle, John, and George Ladd. "A Model of Cooperative Finance." American Journal of Agricultural Economics 65(1982):273-81.

Vickers, Douglas. Financial Markets in the Capitalist Process. Philadelphia: University of Pennsylvania Press, 1978.

Vitaliano, Peter. "The Cooperative as an Economic Association: An Institutional Analysis with Special Reference to Agriculture." Unpublished paper, Virginia Polytechnic Institute and State University, 1985.

Vitaliano, Peter, and Andrew Condon. "The Economics of Cooperative Enterprises: In Search of a More Comprehensive Theoretical Structure." Paper presented at annual meeting of American Agricultural Economics Association, Logan, Utah, Aug. 4, 1982.

Walsh, Richard G. "A Critique and Extension of Cooperative Theory." In Agricultural Cooperatives and the Public Interest, ed. Bruce W. Marion, pp. 43-68. North Central Regional Res. Pub. 256, Research Division, College of Agricultural and Life Sciences, University of Wisconsin, Sept. 1978.