

PROPERTY RIGHTS AND THE INVESTMENT BEHAVIOR

OF

U.S. AGRICULTURAL COOPERATIVES

by

Andrew Michael Condon

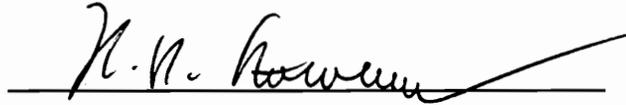
Dissertation submitted to the Faculty of the  
Virginia Polytechnic Institute and State University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

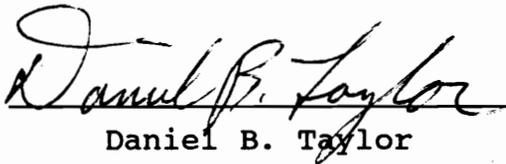
in

Agricultural Economics

APPROVED:



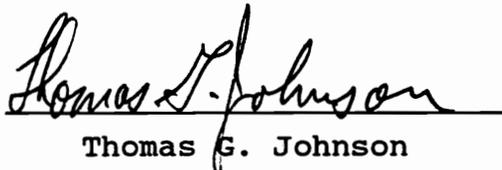
Herbert H. Stoevener, Chairperson



Daniel B. Taylor



J. Paxton Marshall



Thomas G. Johnson



Leon L. Geyer

October, 1990

Blacksburg, Virginia

THE IMPACT OF PROPERTY RIGHTS ON THE INVESTMENT  
BEHAVIOR OF U.S. AGRICULTURAL COOPERATIVES

by

Andrew Michael Condon

Committee Chairperson: Herbert H. Stoevener

(ABSTRACT)

Current economic theory describing the behavior and performance of agricultural cooperatives is not capable of addressing many of the crucial issues facing these institutions in today's environment of declining government involvement in price and income support of U.S. agriculture. This dissertation seeks to incorporate those factors which uniquely define a cooperative as different from other forms of organizing business activity into a model of cooperative investment behavior.

In this study, the set of property rights governing ownership and control of cooperatives is identified and formally built into a neoclassical model of firm investment. The property rights approach is used to establish the core of a theory of cooperatives. This theory is used to construct a set of hypotheses about cooperative behavior, particularly with respect to investment behavior and the relative competitive position of cooperatives and competing forms of business organization. The approach lends insight into the economic incentives for forming cooperatives and the reasons why cooperative corporation ownership and control structures are unique from those observed in investor owned corporations.

The resulting analysis indicates four key issues impacting the cooperative institution's ability to compete with investor owned firms in the agribusiness sector of the economy. These issues are (1) the decision control problem, (2) the common property problem, (3) the investment portfolio problem, and (4) the residual horizon problem. These conditions, if active, will act so as to restrain cooperatives from investing at the same rate and scope as investor owned firms.

Policy makers interested in promoting the role of cooperatives as an organizational form to assist and protect the interests of entrepreneurs such as farmers and at the same time provide an orderly and efficient flow of goods and services to consumers, need to understand the precise conditions of competitive environment, economic sector type, and investment requirements in which cooperatives will be able to fulfill these dual roles and those in which they cannot. Empirical research into these areas will require both case study and traditional quantitative approaches which permit in depth analysis of the hypotheses generated by this study which seek to explain and predict cooperative business organization behavior.

## ACKNOWLEDGEMENTS

Choosing who to thank for the enormous amount of assistance I have received in this endeavor would be a long task indeed. Errors of omission are mine alone, so if you thought you helped, you probably did.

I owe an debt of gratitude to Peter Vitaliano, who though he did not finish as my committee chairperson, is most responsible for guiding me in down a thousand corridors of enlightening thought. Without his help, I literally would not have reached this goal.

To the other members of my committee, your assistance has made this work possible and better. J. Paxton Marshall, the best editor I have known, spent countless hours making sure my words were clear. Dan Taylor gave a great deal of time and showed tremendous patience when I became frantic. Tom Johnson and Leon Guyer provided helpful and constructive criticism which has made this a better work. Finally, Herb Stoevener as committee and department chair has given me invaluable assistance and has shown more patience with me than I had with myself.

My fellow graduate students at Tech deserve credit for keeping me sane, or just insane enough! A sense of humor at 4:00 am is invaluable.

A debt of gratitude is owed to the U.S.D.A. Agricultural Cooperative Service who provided financial support for this work. I hope the investment repays many times.

My final, and best thanks and love go to my family. My wife and friend Linda supported and loved me through many years of impoverished

graduate student existence. There are not enough words... Ali, my daughter has given me new reasons to excel. My parents, Marjorie and Chester have always provided me with financial and moral support and guidance for all these years. It is to you all, my family, that I would dedicate this dissertation.

TABLE OF CONTENTS

	Page
ABSTRACT . . . . .	ii
ACKNOWLEDGEMENTS . . . . .	iv
TABLE OF CONTENTS . . . . .	vi
List of Tables . . . . .	ix
List of Figures . . . . .	x
CHAPTER 1.0 INTRODUCTION TO STUDY . . . . .	1
1.1 THE ROLE OF COOPERATIVES IN THE UNITED STATES ECONOMY. . . . .	1
1.2 GENERAL PROBLEM STATEMENT. . . . .	7
1.2.1 Treatment of Rochdale Principles in Cooperative Theory Literature. . . . .	10
1.3 SPECIFIC PROBLEM STATEMENT . . . . .	17
1.4 OBJECTIVES AND PROCEDURES. . . . .	18
1.4.1 Objectives. . . . .	18
1.4.2 Summary of Procedures. . . . .	18
CHAPTER 2.0 THE ROLE OF PROPERTY RIGHT ASSUMPTIONS IN ECONOMIC THEORY . . . . .	22
2.1 INTRODUCTION . . . . .	22
2.2 A BRIEF HISTORY OF THE METHODOLOGY OF ECONOMIC ARGUMENT . . . . .	24
2.2.1 The Structure of Economic Argument According to Classical Economists . . . . .	25
2.2.2 The Structure of Economic Argument According to Neoclassical Economists . . . . .	27
2.2.3 The Testing of Assumptions in Economic Theory . . . . .	30
2.3 COMPONENTS OF ECONOMIC THEORY . . . . .	41
2.4 THE STRUCTURAL AND FUNCTIONAL ROLES OF PROPERTY RIGHTS IN ECONOMIC THEORY . . . . .	53
2.4.1 A Definition of Property Rights . . . . .	53
2.4.2 The Nature and Function of Property Rights to the Resources of a Firm . . . . .	55
2.4.4 The Methodological Role of Property Rights in Economic Theory . . . . .	65
2.5 CHAPTER SUMMARY . . . . .	68
CHAPTER 3.0 A PROPERTY-RIGHTS-BASED THEORY OF COOPERATIVE INVESTMENT BEHAVIOR . . . . .	70
3.1 INTRODUCTION . . . . .	70
3.2 FUNDAMENTALS OF A PROPERTY-RIGHTS-BASED THEORY OF COOPERATIVES . . . . .	72
3.2.1 The Cooperative as an Economic Organization . . . . .	72
3.2.1.1 Agent roles in a cooperative . . . . .	73
3.2.1.2 Organizational complexity in cooperatives . . . . .	74

3.2.2	Characteristics of the Decision Process in Cooperatives . . . . .	75
3.2.3	Characteristics of Residual Claims in Cooperatives . . . . .	80
3.2.3.1	Separation of the ownership of residual claims from other roles in the firm . . . . .	81
3.2.3.2	Alienability of Residual Claims . . . . .	84
3.2.3.3	The degree of redeemability . . . . .	87
3.2.3.5	The effective horizon of residual claims . . . . .	88
3.2.4	Summary of the Potential Advantages of Cooperative Property Right Structure . . . . .	90
3.2.4.1	Control of agency costs between patron and residual claimant . . . . .	91
3.2.4.2	Control of agency costs between residual claimants and management . . . . .	92
3.2.5	Summary of the Potential Disadvantages of the Cooperative Property Rights Structure . . . . .	94
3.2.5.1	The decision-control problem . . . . .	95
3.2.5.2	The investment portfolio problem . . . . .	96
3.2.5.3	The common-property problem . . . . .	97
3.2.5.4	The residual-horizon problem . . . . .	98
CHAPTER 4.0	A MODEL OF COOPERATIVE INVESTMENT BEHAVIOR . . . . .	100
4.1	INTRODUCTION . . . . .	100
4.2	BASIC ASSUMPTIONS . . . . .	100
4.2.1	Individual Member Behavior . . . . .	102
4.2.2	Cooperative Behavior. . . . .	104
CHAPTER 5.0	THE COMMON-PROPERTY PROBLEM. . . . .	117
5.1	SUPPLY RESPONSE TO MEMBER PAYMENTS IN COOPERATIVES . . . . .	117
5.2	THE COMMON-PROPERTY PROBLEM IN OPEN- AND CLOSED-MEMBERSHIP COOPERATIVES . . . . .	125
CHAPTER 6.0	THE INVESTMENT PORTFOLIO PROBLEM . . . . .	127
CHAPTER 7.0	THE RESIDUAL HORIZON PROBLEM . . . . .	134
CHAPTER 8.0	THE RESIDUAL HORIZON PROBLEM: AN EXAMPLE . . . . .	145
8.1	THE INVESTOR-OWNED-FIRM (IOF) CASE . . . . .	145
8.2	THE COOPERATIVE CASE . . . . .	149
8.3	COMPARISON OF COOPERATIVE AND IOF INVESTMENT . . . . .	151
8.4	IMPACT OF RISK ON THE RESIDUAL HORIZON PROBLEM . . . . .	158
8.5	THE IMPACT OF DEBT FINANCE ON THE RESIDUAL HORIZON PROBLEM . . . . .	163
CHAPTER 9.0	SUMMARY OF DEVELOPED HYPOTHESES, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH . . . . .	171
9.2	HYPOTHESES REFLECTING COOPERATIVE ORGANIZATION . . . . .	171
9.3	HYPOTHESES REFLECTING COOPERATIVE RESIDUAL CLAIMS . . . . .	174
9.4	SUMMARY OF STUDY . . . . .	176
9.5	RECOMMENDATIONS FOR FUTURE RESEARCH . . . . .	183

BIBLIOGRAPHY . . . . .	186
VITA . . . . .	194

LIST OF TABLES

Table 1. Net Business Volumes for Marketing, Supply, and Service Cooperatives. . . . .	2
Table 2. Cooperative Market Shares for Selected Years. . . . .	4
Table 3. Attributes of Cooperative, IOF, and Proprietorship Property Rights to the Decision Process. . . . .	78
Table 4. Attributes of Cooperative, IOF and Neoclassical Proprietorship property Rights to Residual Claims. . . . .	83

LIST OF FIGURES

Figure 1.	The Phillips Model of Cooperative Enterprise. . . . .	12
Figure 2.	Machlup's Model of the Components of Economic Theory . .	49
Figure 3.	The Common-Property Problem in a Helmsberger Cooperative	123
Figure 4.	Member Investment Decision in Cooperative Organization.	141
Figure 5.	IOF Discounted Income Stream for Proposed Investment. .	152
Figure 6.	Coop Discounted Income Stream for Proposed Investment; Member Horizon = 6 Years . . . . .	153
Figure 7.	Coop Discounted Income Stream for Proposed Investment; Member Horizon = 10 Years . . . . .	154
Figure 8.	Coop Discounted Income Stream for Proposed Investment; Member Horizon = 12 Years . . . . .	155
Figure 9.	Effect of Residual Horizon on Net Present Value of Example Cooperative Investment . . . . .	157
Figure 10.	Cooperative and IOF Net Income Streams; Horizon = 10 years, Discount Rate = .06 . . . . .	159
Figure 11.	Cooperative and IOF Net Income Streams; Horizon = 10 years, Discount Rate = .15 . . . . .	160
Figure 12.	Coop Discounted Net Income Streams with Debt and Equity Financing; Horizon = 14 Years . . . . .	164
Figure 13.	Coop Discounted Net Income Streams with Debt and Equity Financing; Horizon = 12 Years . . . . .	165
Figure 14.	Coop Discounted Net Income Streams with Debt and Equity Financing; Horizon = 10 Years . . . . .	166
Figure 15.	Coop Discounted Net Income Streams with Debt and Equity Financing; Horizon = 6 Years . . . . .	167
Figure 16.	Impact of Horizon and Debt on Net Present Value of Example Investment . . . . .	169

## CHAPTER 1.0 INTRODUCTION TO STUDY

### 1.1 THE ROLE OF COOPERATIVES IN THE UNITED STATES ECONOMY.

Among the ways of organizing economic activity in the United States (U.S.) economy, cooperatives represent a relatively rare form. Cooperatives comprise approximately 2.7% of nonretail business sector sales.<sup>1</sup> However, within the agricultural sector cooperatives are often an important, and sometimes dominant, way of organizing business (24.6% of farm sector nonretail sales), especially in the input supply and first-handler output markets. A cooperative will be defined throughout this dissertation as a firm that operates under the modern interpretation of the Rochdale Principles, that is, member-patron ownership, member-patron control, operation at cost, limited returns on invested capital, and, often, the duty to educate membership.<sup>2</sup>

Tables 1 and 2 provide two measures of the historical importance and growth of cooperatives in the agricultural sector. Two important trends are indicated in these tables. Table 1 indicates the net volume of business of agricultural marketing, supply, and service cooperatives in the United States. In addition, a measure of average firm size,

---

<sup>1</sup>Compiled from: Agricultural Cooperative Service, Farmer Cooperative Statistics, U.S.D.A. Cooperative Information Report 21, Section 27, March, 1984; Cooperative League of the United States of America; and Council of Economic Advisors, Economic Report to the President, 1984.

<sup>2</sup>Abrahamsen, Martin, Cooperative Business Enterprise, New York: McGraw-Hill, 1976, p. 50

Table 1. Net Business Volumes for Marketing, Supply, and Service Cooperatives. (mil. dollars)

COOP TYPE	No. 1978	NET VOL. 1978	NET VOL. PER COOP 1978	No. 1987	NET VOL. 1987	NET VOL. PER COOP 1987	PERCENT INCREASE VOLUME	PERCENT INCREASE PER COOP
Poultry	85	873.3	10.155	43	1146.2	26.65	131.2	262.4
Grains & Prods.	2475	12816.7	5.18	2065	10747.5	5.20	-16.1	0.0
Cot. and Prods.	485	1305.0	2.69	401	1570.7	3.91	120.0	145.4
Dairy	530	9912.6	18.70	317	16100.0	50.79	162.0	272.0
Livestock	460	3966.7	8.62	340	3158.4	9.28	-20.5	107.1
Sugar	50	1133.2	22.66	40	1714.1	42.8	151.0	188.8
Rice	60	743.9	12.39	56	847.7	15.1	114.0	122.0
Fruits & Veg.	415	3240.1	7.81	340	5559.0	16.35	171.6	209.3
Nuts	42	731.7	17.42	39	941.0	24.10	129.0	138.3
Beans & Peas	55	96.6	1.76	55	127.7	2.32	132.1	131.8
Wool	160	27.5	.17	160	22.6	.14	-11.9	-11.7
Tobacco	33	211.0	6.39	35	607.7	17.4	287.6	272.3
<b>Total Mkt. Coops</b>	<b>4498</b>	<b>35305.6</b>	<b>7.85</b>	<b>3612</b>	<b>43278.5</b>	<b>11.98</b>	<b>122.5</b>	<b>152.6</b>
Chemicals	3783	753.7	.20	3005	1291.2	.42	171.2	210.0
Fert.	3940	2378.3	.60	3015	2731.8	.90	114.8	150.0
Petro. Prods.	3043	2910.6	.95	2406	4175.1	1.73	143.5	182.1
Meat & Groc.	492	126.7	.26	378	130.1	.34	103.2	130.7
Build. Mat.	2258	394.0	.17	1794	372.3	.21	-5.6	123.5
Seed	3741	381.2	.10	2964	576.6	.19	151.2	190.0
Other	4462	926.7	.21	3464	1523.4	.44	164.4	209.5
Feed	3808	2765.2	.73	2914	2712.6	.93	-2.0	127.4
Mach. & Equip.	1873	311.7	.17	1616	316.0	.20	102.0	117.6
Containers	664	103.8	.15	507	167.5	.33	162.0	220.0
<b>Total Supply</b>	<b>5266</b>	<b>11051.9</b>	<b>2.1</b>	<b>3963</b>	<b>13966.6</b>	<b>3.52</b>	<b>126.4</b>	<b>167.6</b>
<b>Total Services</b>	<b>4773</b>	<b>947.7</b>	<b>.20</b>	<b>3719</b>	<b>1891.2</b>	<b>.51</b>	<b>199.6</b>	<b>255.0</b>
<b>Total All Coops</b>	<b>6600</b>	<b>47305.1</b>	<b>7.17</b>	<b>5109</b>	<b>59166.3</b>	<b>11.58</b>	<b>125.1</b>	<b>161.5</b>

Original Data from: U.S.D.A. Agricultural Cooperative Service, "Farmer Cooperative Statistics 1987," ACS Service Report #24 1989

measured in net business volume, is provided for each category.

The information in Table 1 demonstrates that cooperative business volume and average firm size has increased in almost every sub-sector over the ten-year period 1978 through 1987. Wool and tobacco cooperatives are notable exceptions, reflecting an overall decline in the former case and a reaction to government programs in the latter. Table 2 presents data on cooperative market shares for selected agricultural sub-sectors. In addition to growth in absolute size, cooperatives have demonstrated significant gains in relative market share. Given the importance and growth of cooperatives in the agricultural sector, one is prompted to ask why cooperatives are such an important form of organizing business in agriculture, but not in other sectors of the economy?

Many authors have attempted to identify the economic reasons why agricultural producers would choose to vertically integrate through cooperatives. Edwin Nourse stressed the cooperative as an institution for promoting economic efficiency in agricultural markets characterized by atomistic farm producers and high degrees of concentration in processing, supply, and distribution sectors. Nourse believed that by integrating into the market and supply chains, achieving economies of scale, and transacting in an efficient manner producers could force rival firms into more competitive behavior to the ultimate benefit of both producers and society at large. This philosophy became known as

Table 2. Cooperative Market Shares for Selected Years.

COOP TYPE	SHARE 1951 %	SHARE 1972 %	SHARE 1981 %
Dairy	45.0	71.9	71.5
Grains	31.0	33.2	47.7
Cotton	11.0	23.2	36.9
Livestock & Wool	21.0	10.0	12.2
Poultry	7.0	10.0	8.6
Total Mkt. Coops	20.0	25.5	32.6
Fert.	15.0	31.2	36.1
Petro	22.0	34.9	35.2
Total Supply Coops	12.0	16.5	20.0

Original Data from Farmer Cooperatives, 49(Feb. 1983),  
and Abrahamsen, M.A., Cooperative Business Enterprise,  
New York, McGraw-Hill, 1976.

the "competitive yardstick".<sup>3</sup>

Aaron Sapiro believed that cooperatives should not stop at encouraging competition among other firms. He sought to form commodity - based cooperatives which could exploit market power over a defined geographical area and commodity type in order to extract economic rents to the members' benefit.<sup>4</sup> Though most of these early "Sapiro" cooperatives failed, the potential for creating and exercising market power remains a major concern of antitrust policy to the present.

More recently, Staatz<sup>5</sup> has attempted to sum up what is known about the economic incentives for forming cooperative in the context of Williamson's transaction cost approach.<sup>6</sup> Staatz lists the following reasons why producers would choose to vertically integrate through cooperatives:

- avoidance of opportunistic exploitation of producer asset fixity,
- preservation of market options,
- flexibility in pricing,
- reduction of risk through pooling,
- preservation of product quality through subsequent market stages,

---

<sup>3</sup>Abrahamsen, op. cit., p79

<sup>4</sup>Ibid. p. 78.

<sup>5</sup>Staatz, John, "Farmers' Incentive to Take Collective Action Via Cooperative: A Transactions Cost Approach," forthcoming U.S.D.A. Agricultural Cooperative Service publication.

<sup>6</sup>See for example: Williamson, Oliver, "Transaction Cost Economics: The Governance of Contractual Relations," Journal of Law and Economics 22(1979):233-261 and Williamson, Oliver, "The Modern Corporation: Origins, Evolution and Attributes," Journal of Economic Literature 19(1981):1537-1568.

- provision of public goods to agricultural markets (that is, the competitive yardstick), and
- efficiency in decision costs by maintaining farm-level decision independence and cooperative level specialization of management.

Perhaps the most important of these incentives is the avoidance of opportunistic exploitation due to asset fixity. Farming is a unique activity where an individual must invest in significant quantities of specific-use assets, for example, agricultural land, farm structures, and machinery. Unlike the investor who holds a relatively mobile portfolio in the stock or securities market, the relative size of the fixed investment required in production agriculture and its single owner-operator character makes nonagricultural diversification to reduce risk difficult. In addition, farm-level assets may become fixed in the sense that their acquisition value and resale value may diverge because of their specific-use nature. This condition is particularly true in markets characterized by many sellers and few buyers.<sup>7</sup> The opportunistic purchaser of agricultural products, realizing that producers may have no good second alternatives, may be in a position to extract rents. Because farmers must generally have all their "eggs in one basket", it is not surprising to find that they would seek out institutions to protect their investment against risk and exploitation by vertically integrating to countervail market power and preserve quality markets for inputs and outputs.

---

<sup>7</sup>Staatz, John, op.cit., pp. 3-6.

## 1.2 GENERAL PROBLEM STATEMENT.

Agricultural cooperatives face an uncertain future as a result of significant changes in national and international economic forces which have direct impacts on agriculture. These changes offer a conflicting picture with respect to the demand for cooperatives and the ability of cooperatives to compete in agricultural markets with alternative forms of organizing economic activity. Currently, a good deal of uncertainty exists over the effectiveness and future of government policies applicable to regulation and income stabilization in agricultural markets. Pressure continues to exist for a return to the use of price as the principal regulator of resource use in the agricultural sector. Such a trend is likely to increase the level of risk exposure faced by agricultural producers and, therefore, to increase their incentive to rely on cooperatives as marketing and supply alternatives in order to both manage risk and maintain their economic positions in markets characterized by high levels of concentration.

Conversely, cooperative managers and directors are becoming increasingly concerned with a trend towards a relative decline of what has traditionally been their strongest membership base - medium-sized producers. A manager of a large agricultural supply cooperative writes:

In my area, there are two subjects universally discussed at cooperative meetings: How much effort should be exerted to secure the business of the urban customer and how should we serve

the large farmer.<sup>8</sup>

This decline in the numbers of medium size farms is contrasted with a corresponding perception of an increase in the relative number of small and large producers. Larger volume members, by virtue of their size, can command volume discounts for inputs and transportation costs. Cooperatives are faced with the dilemma of attracting larger volume members in order to achieve economies of scale, without alienating the majority membership base.

The agricultural economy in which farmers must operate finds itself in an environment of a floating dollar, an increasingly competitive and uncertain export market, and chronic over-supply. Every year, more producers are falling into severe financial stress. In an era of deregulation, cooperatives will have to compete even more keenly in order to maintain or increase market share. Whether member-patrons of cooperatives will be in a position to capitalize their organizations for sustained, long-term growth is unclear.

In order to understand the impact of a potentially expanded role for cooperatives, particularly in a dynamic context, economists must have a sound and comprehensive theory of cooperatives from which to interpret and predict behavior. Such a theory should at a minimum, address the following issues:

---

<sup>8</sup>Swann, Harris, "Serving Small and Large Farmers Equitably: Managements Viewpoint," American Cooperation 1985, American Institute of Cooperation, Washington, D.C., 1985, p. 11.

1. The objective, if any, of the cooperative as a business unit,
2. The motivations, incentives, and objectives of the participant agents in cooperatives, that is, members, management, directors and employees,
3. The internal processes whereby agent interests are expressed, reconciled, and operationalized by the cooperative,
4. The organizational structure of cooperatives and why it differs from other firm types,
5. How market conditions, for example, the degree of competition, barriers to entry, nature of commodities, will affect the performance of cooperatives relative to other firm types. Why do cooperatives succeed under some circumstances and in some sectors of the economy, but not in others?
6. As a result of 1 through 5, how will cooperatives differ in various aspects of performance, such as short-run pricing and resource allocation, returns to producers, and dynamic functions such as capital use, financial structure, and investment behavior?

The existing body of theory guiding our understanding of cooperatives is not well suited to the task of addressing many of the above issues. In the effort to predict and explain how cooperatives will perform in alternative market settings, modern cooperative theory tends to abstract from many economic and structural factors which make these organizations unique. Current models of cooperative behavior are particularly lacking in treatment of the institutional economic factors that distinguish cooperatives from other forms of organizing economic activity. As a result, there exists little or no theoretical treatment of cooperatives in a dynamic context, because analysts do not yet recognize that cooperative ownership and organization may have a direct impact on these firms over time in such areas as the incentive structure for attracting

member-patron investment capital.

The Rochdale Principles, to the degree followed by modern cooperatives, suggest a basic set of property rights governing ownership and control of resources used by cooperatives that are quite different from those usually employed by the neoclassical theory of the firm (TOF). A short discussion of how major historical treatments of cooperative theory have dealt with the Rochdale principles and property rights will serve to demonstrate the the shortcomings of existing theory and the importance of property rights in understanding cooperatives in a dynamic context.

#### 1.2.1 Treatment of Rochdale Principles in Cooperative Theory Literature.

Formal economic theories of cooperative behavior did not appear until the late 1940s. The evolution of this literature can be classified according to the extent to which authors incorporated the Rochdale principles into their models.

An early school of thought, associated with writers such as Emelianoff,<sup>9</sup> Phillips,<sup>10</sup> and Robotka,<sup>11</sup> sought to explicitly incorporate the principles of member-patron ownership, member-patron

---

<sup>9</sup> Emelianoff, Ivan, Economic Theory of Cooperation, Washington, D.C., published by author, 1948.

<sup>10</sup> Phillips, Richard, "Economic Nature of the Cooperative Association", Journal of Farm Economics 35(Feb. 1953):74-87.

<sup>11</sup> Robotka, Frank, "A Theory of Cooperation", in M. Abrahamsen and Claude Scroggs, eds., Agricultural Cooperation, Minneapolis, University of Minnesota Press, 1957, 121-142.

control and to some extent, operation at cost into a formal model of cooperatives. The approach taken focused on establishing the internal economic structure of the cooperative and then determining the impact of that structure on the individual member's pursuit of a profit maximizing, equilibrium level of production. The cooperative was not considered an independent firm but rather an aggregation of jointly undertaken activities by its members.<sup>12</sup> Members had sole decision authority over the operation of the jointly owned enterprise. There was no role for centralized or independent decision making at the cooperative level.

In order to operationalize this concept of a cooperative, it was necessary to make some unusual assumptions reflecting the joint decision process. Members were assumed to have complete and independent control over their own operations as well as some tangible piece of the joint cooperative. Figure 1 illustrates how Phillips conceived of this kind of cooperative organization. Each member firm consisted of a slice of the pie such as is defined in area ABC. The area inside the inner circle constituted the jointly owned cooperative. A member is free to withdraw his own firm plus his segment of the cooperative from the organization at any time. Members found a production equilibrium by considering their own individual operations and their unique piece of the joint activity. The contribution of these authors toward

---

<sup>12</sup> Emelianoff, op. cit., p.248; Robotka, op. cit., pp.131-132; and Phillips, op. cit., p.76.

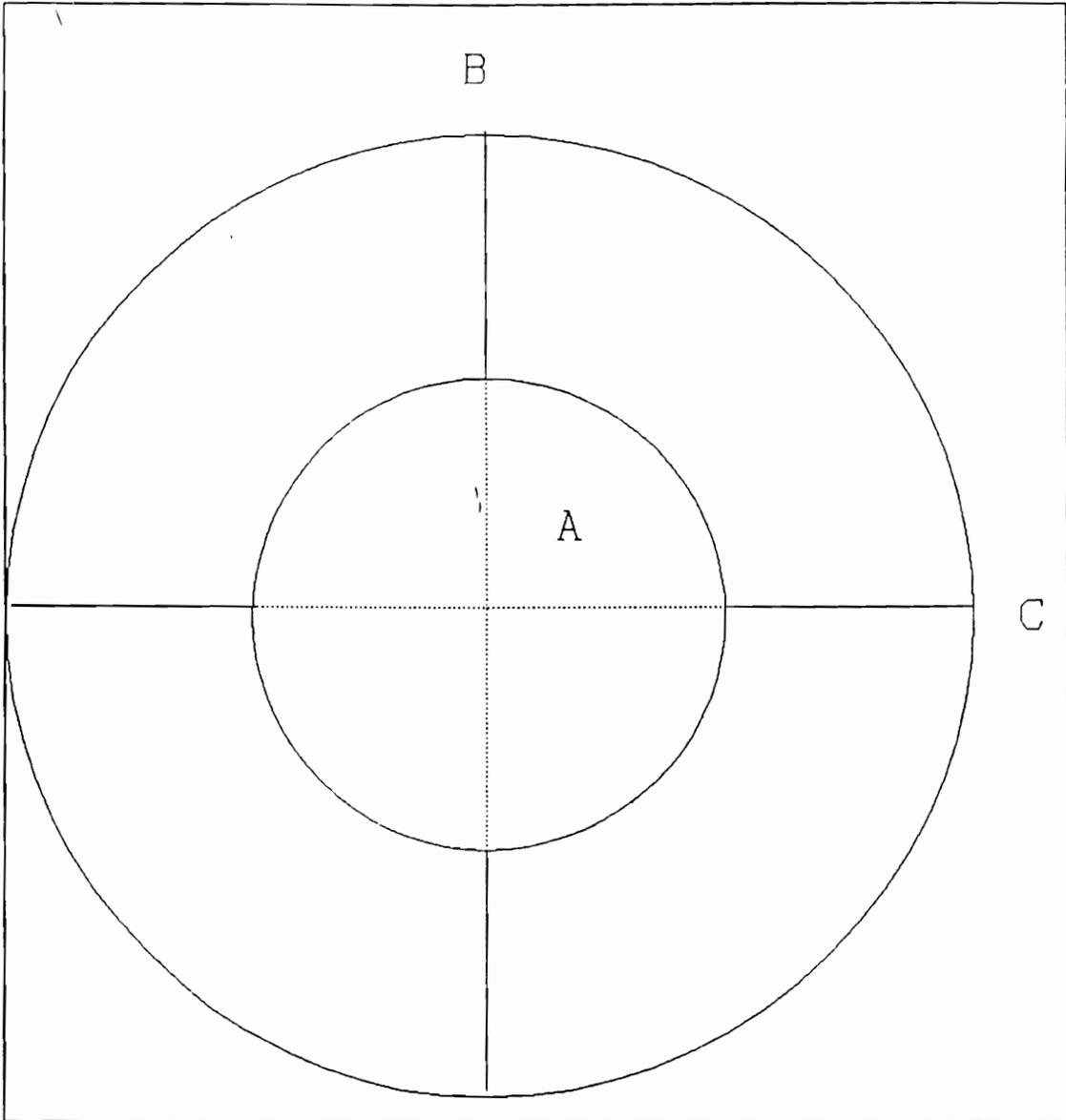


Figure 1. The Phillips Model of Cooperative Enterprise.

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

understanding cooperatives should not be minimized despite their rather awkward organizational assumptions. By attempting to explicitly examine cooperative organizational structure, their approach does begin to explain what makes cooperatives different from other kinds of businesses. For example, by specifying a mechanism for patron control of a cooperative, it is learned that the coalition of members is inherently fragile and that a degree of homogeneity of member interests may be considered almost a precondition for successful operation of the organization. However, the models are naive with respect to the informational requirements placed on members and the dynamics of group decisionmaking in modern cooperatives.

The current understanding of the economic nature of cooperatives has been further shaped by another group of authors including: Enke<sup>13</sup> Kaarlehto,<sup>14</sup> Domar,<sup>15</sup> and especially Helmberger and Hoos.<sup>16</sup> These authors took a fundamentally different approach to the task of building a theory of cooperatives. The school characterized by Phillips focused on the internal organization of cooperatives with the intent of determining the impact of organization on performance. The group

---

<sup>13</sup> Enke, Stephen, "Consumer Cooperatives and Economic Efficiency," American Economic Review 35(1945):148-55.

<sup>14</sup> Kaarlehto, Paavo, "On the Economic Nature of Cooperation," Acta Agriculturae Scandinavica 6(1956):243-352.

<sup>15</sup> Domar, Evsey, "The Soviet Collective Farm as a Producer Cooperative," American Economic Review 56(1966):735-757.

<sup>16</sup> Helmberger, Peter, and Sydney Hoos, "Cooperative Enterprise and Organization Theory," Journal of Farm Economics 46(1964):603-617.

characterized by Helmberger and Hoos treated the cooperative as a special case of the TOF. Cooperatives were considered unique from other forms of business organization only in the specification of the firm's objective, which usually incorporated the principle of operation at cost<sup>17</sup> or some other cooperative goal.<sup>18</sup>

Adaptation of the TOF as the appropriate conceptual framework was accomplished by the implicit assumption that cooperative decision authority was vested centrally in the joint enterprise, not in individual members. The contributions of these models has been significant, particularly in the case of Helmberger and Hoos. The status of a cooperative as an economic entity apart from individual member firms was established.<sup>19</sup> The TOF is a useful abstraction because it allows direct analysis of pricing and allocative efficiency relative to other firm types if the organizational assumptions embodied in the TOF adequately reflect the realities of a cooperative.

The principal difficulty with these models is found in the restrictions imposed by the property rights structure inherent in the assumptions that comprise the TOF. The rights to resource use in the

---

<sup>17</sup> Ibid., p.282

<sup>18</sup> For example, Enke, op. cit. offered a number of alternative goals including: maximization of consumer surplus, maximization of firm profit, and minimization of price paid for goods.

<sup>19</sup> Ibid., pp. 277-281

TOF are assumed to be privately held and fully allocated.<sup>20</sup> Such rights imply that the probability that an owner's specific decision over resource use will result in that use is a certainty. In addition, a privately held right is freely transferable and valid for the life of the firm.

The only Rochdale principle considered explicitly in the Helmberger and Hoos conception of a cooperative is operation at cost. The impacts of member ownership, member control, and limited returns to capital are not considered. These cooperative principles are in apparent conflict with the assumptions defining the property rights governing ownership and control of resources in the TOF. The implication is that models which directly employ the TOF may inadequately address a number of important attributes that follow directly from the cooperative principles and that have potential for affecting performance both in static and dynamic contexts. Such attributes include:

- separation of ownership functions from control functions,
- restriction of membership to a specific class of member patrons, such as agricultural producers, and the tying of membership rights to patronage,
- restrictions on transfer of ownership rights, and
- limited returns to invested capital.

Separation of ownership from control occurs in any large institution

---

<sup>20</sup> De Alessi, Louis, "Property Rights, Transaction Costs and X-Efficiency: An Essay in Economic Theory," American Economic Review 73(1983): p. 65.

where absolute numbers make direct management by owners impractical. In cooperatives, members delegate most monitoring and policy functions to a board of directors and management functions to a professional manager or management team. Membership in an agricultural cooperative is usually restricted to "bona fide" agricultural producers or other agricultural cooperatives by state incorporating statute.<sup>21</sup> Six states require members to patronize their organizations in order to remain active.<sup>22</sup> Even if patronage is not required by law, the principal way to derive economic benefit from the cooperative is through patronage, as will be shown.

Most states severely restrict the transferability or alienability of cooperative ownership rights.<sup>23</sup> Since membership is tied to patronage, ownership rights in a cooperative are not perpetual. The horizon of membership is limited to the producer's expected term of active participation in agricultural activity.

Finally, most states limit the returns that may be paid to invested capital in cooperatives.<sup>24</sup> This rule is imposed to ensure that these organizations are operated in the interests of members, not of returns to invested capital.

---

<sup>21</sup> Baarda, James, State Incorporation Statutes for Farmer Cooperatives, Agricultural Cooperative Service, United States Department of Agriculture, Cooperative Information Report 30, 1982. p. 85.

<sup>22</sup> Ibid., p.70

<sup>23</sup> Ibid., p.393-398

<sup>24</sup> Ibid., p.112

### 1.3 SPECIFIC PROBLEM STATEMENT.

In any type of firm organization, property rights determine who can make decisions over how resources are to be used and who is to bear the risk of gain or loss as a result of those decisions. The above-mentioned restrictions inherent to cooperative enterprise do not describe a set privately held and fully allocated property rights. The problem this research seeks to address can now be summarized as follows:

The existing theory of cooperatives, which is primarily an adaptation of the neoclassical theory of the firm, is incapable of capturing the impact of the unique set of property rights that distinguishes these firms from other forms of economic organization. Specifically, there is reason to believe that the restricted nature of ownership rights in the organization may impede the investment process and lower the survival value of cooperatives relative to firms with unrestricted property rights to ownership and control such as the investor owned-corporation.

The salient issue this research seeks to explore is the impact resulting from the explicit inclusion of the property structure implied by the Rochdale Principles into a firm-level, neoclassical model of cooperatives. The research is intended as a partial contribution towards the goal of establishing a comprehensive theory of cooperative business. As such, focus will be narrowed to a particular aspect of cooperative behavior: the investment process.

## 1.4 OBJECTIVES AND PROCEDURES.

### 1.4.1 Objectives.

1. To justify and provide a framework for the incorporation of a realistic set of assumptions reflecting the nature of property rights to ownership and control of resources into neoclassical theories of firm-level behavior.
2. To expand on the explanatory and predictive power of the neoclassical theory of cooperatives by developing a formal theory of cooperative investment behavior that explicitly incorporates assumptions reflecting the attenuated structure of property rights to ownership and control of resources inherent in these organizations.
3. To determine the impact of the attenuated set of property rights that defines a cooperative on the investment behavior of these firms relative to their most commonly identified rival organizational form, the investor-owned corporation.

### 1.4.2 Summary of Procedures.

Objective 1, motivating the incorporation of a realistic set of property right assumptions into neoclassical theories of firm-level behavior, raises a controversial and unsettled debate among students of the methodology of economics. The focus of controversy is the degree of factual realism required of the assumptions that comprise the building blocks of economic theory. Arguments range from insistence that all economic statements must be operational in the sense that they be capable of being empirically tested, to the other extreme which holds that the more unrealistic the assumption, the more powerful the

theory.<sup>25</sup> Chapter 2.0 will provide a detailed historical and methodological argument demonstrating that for an identifiable category of assumptions, increased factual realism increases the explanatory and predictive power of the theory. It will also be shown that assumptions reflecting the nature of property rights to ownership and control of resources in a firm fall into this category. Chapter 2.0 will also begin a process of establishing a conceptual framework for examining the attributes and characteristics of property right structures in any economic organization, including cooperatives.

In Chapter 3.0, a model of cooperative investment behavior that reflects the nature of the property rights to ownership and control in the enterprise will be developed. The theory must be based on the decisions of individual members to invest in their cooperative in order to reflect the cooperative principles of member-patron ownership and control. Therefore, the model will assume utility maximization on the part of all agents in the cooperative.

There exist two fundamental schools of thought with respect to existing neoclassical investment theory. The first school represented by Fischer and Hirshleifer envisions the objective of investment as consumption ("work to live" ethic).<sup>26</sup> The second school of thought maintains that investment is an objective in itself ("live to work"

---

<sup>25</sup> See Chapter 2.0 for details and references relating to this debate.

<sup>26</sup> Hirshleifer, Jack "On the Theory of Optimal Investment Decision," Journal of Political Economy 66(1958): 329.

ethic). The former school lends itself to an investment theory based on the utility maximizing decisions of the individuals that under proper circumstances can be aggregated to the firm level. For this reason, the Hirshleifer approach will serve as the starting point for an investment theory that accounts for the property rights structure of a cooperative. The latter school of thought lends itself to investment models that use the firm as the basic decision unit and therefore would suffer from many of the limitations mentioned above in the context of the TOF.

The model developed above will be used to develop an exhaustive set of refutable hypotheses that will explain and/or predict the impact of the property rights structure of cooperatives on their investment behavior. To be addressed are the specific conditions under which cooperative property rights will adversely constrain the investment process of cooperatives relative to alternative economic organization, and under what specific conditions the adverse effects of an attenuated set of property rights can be ameliorated or entirely negated.

Objective 3 will be addressed in Chapters 4.0 through 8.0. The purpose of this part of the study will be to conceptualize, in detail, the impact of cooperative property rights on the investment behavior of cooperatives relative to investor-owned firms (IOF). A formal model of the cooperative investment process will be constructed. The model will incorporate the attenuated property right constraints identified as a result of the theoretical analysis in Chapter Three. Two firms, a cooperative and an IOF, will consider an identical investment project.

The firms will be constructed so as to be identical in every respect, that is, technology, scale, market conditions, etc., except organizational structure. The point of the exercise will be to examine the sensitivity of the cooperative to those parameters identified as being affected by property rights to ownership and control of resources available to the firm. Such parameters will include investment horizons, member-investor discount rates and attitudes toward risk.

Conclusions will be drawn in Chapter 9 as to the impacts of this research in two areas: the process of policy formation with respect to cooperatively organized firms in agriculture, and the role economists may play in providing managerial and organizational assistance to the members, directors, and management of cooperatives. Finally, recommendations will be made as to the orientation of future research into the nature and behavior of cooperatives. Particular attention will be paid to recommendations for further empirical examination of the constraints imposed by property rights on the performance of cooperatives.

## CHAPTER 2.0 THE ROLE OF PROPERTY RIGHT ASSUMPTIONS IN ECONOMIC THEORY

METHODOLOGY: n. 1. 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.<sup>27</sup>

### 2.1 INTRODUCTION

Because the primary objective of this study is to incorporate property rights into a theory of cooperatives and to examine their impact, 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.<sup>28</sup> Because the property rights to ownership and control in a firm define the limits of choice over resource use in that firm, it will

---

<sup>27</sup> G & C Merriam Co.. Webster's Seventh New Collegiate Dictionary, p. 533. Springfield Ma: G & C Merriam Co.: 1969.

<sup>28</sup> See, for example: Friedman, Milton, "The Methodology of Positive Economics," in William Breit and Harold Hochman, eds., Readings in Microeconomics, New York, Holt, Rinehart, and Winston: 1968.

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

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

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

be shown that property rights fall into a category of economic assumptions that must be empirically verifiable. Fritz Machlup calls such assumptions "assumed conditions".<sup>29</sup>

The need for realism and verification of assumptions in economic theory has been subject to considerable debate over the years. Much of the disagreement has arisen due to a lack of recognition that a number of levels of assumptions exist, each with a specific role in the construction of theory.

The other major purpose of this chapter is to demonstrate that certain classes of assumptions need to incorporate some degree of realism in order to give the theory meaningful content. That the assumptions reflecting the relevant set of property rights governing a firm fall into this category will be shown.

---

<sup>29</sup> Machlup, Fritz, op. cit., p.148

## 2.2 A BRIEF HISTORY OF THE METHODOLOGY OF ECONOMIC ARGUMENT

Most economists wish to believe 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. As such, we need not carefully analyze each and every piece of research in order 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 in order to conduct sound research and to read and review the quality of his or her colleagues' work.<sup>30</sup>

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

---

<sup>30</sup> If there are methodologists who disagree on what is or ought to be proper scientific reasoning, there are those who dispute that there ought to be any proper method at all. P.K. Feyerabend in his book, Against Reason, offers the ultra-positive viewpoint that any existing rules of scientific reasoning have been violated with impunity and the result has been valid and important scientific discovery (p. 23). He maintains that only through research unconstrained by scientific method can true science take place; that is, "...anything goes".

property rights belong. A brief examination of the historical evolution of the method of economic argument will be useful in accomplishing this task.

### 2.2.1 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 in contrast to the methodology espoused by nineteenth century classical or political economists. Classical economic arguments were made with what Mark Blaug and others call the method "a priori". As is evidenced by the following quote from Senior, a few 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.<sup>31</sup>

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

---

<sup>31</sup> Senior, Nassau, quoted in M. Bowley, Nassau Senior and Classical Economics, New York, A.M. Kelly: 1948, p.43.

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.<sup>32</sup>

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.<sup>33</sup>

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 because the conclusions are as true as one aspect of human behavior by virtue of these assumptions, which in turn are true by virtue of being based on self-evident facts of human experience.<sup>34</sup>

---

<sup>32</sup> Mill, James, quoted in Mark Blaug, The Methodology of Economics, Cambridge, Cambridge University Press: 1980, p. 59.

<sup>33</sup> Cairnes, J.E., quoted in Mark Blaug, The Methodology of Economics, Cambridge, Cambridge University Press: 1980, p. 81.

<sup>34</sup> Blaug, Mark, The Methodology of Economics, Cambridge, Cambridge University Press: 1980. p. 77.

Predictions of economic behavior were derived based on the general principles outlined above. 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 were always said to be subject to "disturbing causes".<sup>35</sup> 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 validity of the theory, but rather attributed the discrepancy to the influence of uncontrollable 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.

#### 2.2.2 The Structure of Economic Argument According to Neoclassical Economists

Most twentieth century economic reasoning and theory revolves around

---

<sup>35</sup> Blaug, Mark, op. cit., p. 59, p. 64, p. 65.

Karl 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.<sup>36</sup> No matter how many times the sun rises in the morning, we cannot prove conclusively the proposition that it will always 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 which, 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 as non-science those propositions that cannot be falsified.<sup>37</sup>

In Popper's view, science is a never-ending process of testing theory with intent to refute it. Strong warnings are issued against the use of

---

<sup>36</sup> Ibid., p.12.

<sup>37</sup> Popper, Karl, Objective Knowledge. An Evolutionary Approach, London, Oxford University Press: 1972, p.3.

what are called "immunizing stratagems"; these insulate a theory from falsifying tests.<sup>38</sup> Such stratagems include unspecified or loosely constructed "ceteris paribus" conditions that, 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 naive 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, experimenting with humans is frowned upon, a test of theory necessarily includes a test of predictions conditional on auxiliary assumptions.<sup>39</sup> 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 theory but rather its appropriate application. Remember, verificationists presume the theory to be true. "Falsificationists"

---

<sup>38</sup> Ibid., 3.

<sup>39</sup> Blaug, Mark, op. cit., p.17.

view empirical tests of predictions as tests of theoretical validity.

### 2.2.3 The Testing of Assumptions in Economic Theory

Popper leaves unclear the role of the assumptions that comprise the building blocks of theory. He does not specify whether the criteria of "falsification" apply only to the hypotheses generated from assumptions or also to the assumptions themselves.

Terence Hutcheson<sup>40</sup> 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 which 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 fundamental assumption rationality 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.<sup>41</sup>

---

<sup>40</sup> Hutcheson, Terrence, The Significance and Basic Postulates of Economic Theory, New York, A.M. Kelly: 1938 (reprinted in 1965).

<sup>41</sup> Hutcheson, Terrence, "Professor Machlup on Verification in Economics," Southern Economic Journal, 22(1956): 481.

Hutcheson is saying that equally valid tests of a theory may be obtained either from direct empirical examination of the predictions or through 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 theory, such as Bridgeman, Samuelson, and Gorden, argued in support of Hutcheson by insisting that all economic statements must be operationally meaningful, that is, an economic proposition must imply an "hypothesis about empirical data which could be refuted, if only under ideal conditions."<sup>42</sup> Samuelson concluded that using the criteria of "operationalism", the modern theory of consumer behavior and welfare theory did not represent valid economic constructs.<sup>43</sup>

Gorden suggested that operational criteria could and should be applied to mental constructs as well as physical. Therefore, introspection becomes 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 in order 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

---

<sup>42</sup> Samuelson, Paul, Foundations of Economic Analysis, Cambridge: Harvard University Press: 1948, p. 4.

<sup>43</sup> Blaug, Mark op. cit., p. 100.

economic theories.<sup>44</sup>

Gorden maintains that an operational statement implies the existence of stable functional relationships among specified economic variables. By stable he 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 concept of 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, ...<sup>45</sup>

This 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. The demand curve is not a stable construct if it can account for either contradictory occurrence. This statement could be made operational only if the relevant "ceteris paribus" conditions are explicitly stated and checked for validity.

---

<sup>44</sup> Gorden, Donald, "Operational Propositions in Economic Theory," in William Breit, and Harold Hochman eds. Readings in Microeconomics, New York: Holt, Rinehart, and Winston, 1968, p. 49.

<sup>45</sup> Ibid., p. 50.

The other side of the debate has been argued most vocally by Milton Friedman<sup>46</sup> and Fritz Machlup.<sup>47</sup> 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, that is, not truistic predictions about phenomena not yet observed."<sup>48</sup> Positive theories must have certain attributes. A theory should be simple; it should require as little knowledge as possible to predict events. A theory should be precise in prediction and yet address as wide a field of phenomena as possible. Theories must also be logically consistent<sup>49</sup>

A theory or hypothesis is valuable only in so far as its predictions coincide with observation.<sup>50</sup> For Friedman, theories are black boxes for generating predictions, and as such, their basic assumptions need not be realistic (read "operational"). In fact, it is desirable if assumptions are unrealistic if they are more simple as a result. In Friedman's view, theories can and should be unrealistic, because it is logical folly to interpret an empirical test of assumptions as a direct test of the validity of the theory.

---

<sup>46</sup> Friedman, Milton, op. cit.

<sup>47</sup> Machlup, Fritz, op.cit. and Essays on Economic Semantics, Englewood Cliffs: Prentice Hall, 1963.

<sup>48</sup> Friedman, Milton, op. cit., p. 26.

<sup>49</sup> Friedman, Milton, op. cit., p. 27.

<sup>50</sup> Friedman, Milton, op. cit. p. 26.

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 treats assumptions as homogeneous elements, apparently without 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 major 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."<sup>51</sup> The maximization of opportunity is an 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 usage of the term unrealistic does not seem to intend that assumptions should be patently false, but rather that assumptions should

---

<sup>51</sup> Blaug, Mark, op. cit., p. 105.

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.<sup>52</sup>

However, he is not consistent within the essay, and sometimes leaves the impression that even 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.<sup>53</sup>

Machlup, an opponent of operationalism, interprets the 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' ".<sup>54</sup> 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

---

<sup>52</sup> Friedman, Milton, op. cit., p. 31.

<sup>53</sup> Friedman, Milton, op. cit., p. 30.

<sup>54</sup> Machlup, Fritz, 1978, op. cit., p. 192.

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.<sup>55</sup>

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."<sup>56</sup>

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. Donald McClosky<sup>57</sup> argues that the practice of "modernism", which he calls a curious mixture of positive science and operationalism, is impossible and not followed by economists no matter what they profess.

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.<sup>58</sup>

McClosky offers two examples of the failure of modernism in modern

<sup>55</sup> Machlup, Fritz, 1978, op. cit. p. 197. After having made this definitive statement, Machlup goes on to demonstrate that some assumptions of theory need to be operational. This will be demonstrated below.

<sup>56</sup> Machlup, Fritz, 1978, op. cit., p. 201.

<sup>57</sup> McClosky, Donald, "The Rhetoric of Economics," Journal of Economic Literature 21(1983):481-517.

<sup>58</sup> Ibid., p.488.

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.

Consider also, the typical path taken to publication of a journal article. Hypotheses are specified and data are fitted and tested by some econometric procedure. If the results meet expectations, the paper is sent to a journal. If the results do not meet expectations, the economist will generally alter the hypotheses or specifications of the model until reasonable results emerge. In such a case the research may have value, but the procedure violates our stated methodology flagrantly.<sup>59</sup>

McClosky recommends that we examine closely how economics has actually progressed, instead of artificially dictating how we think it ought to progress. Above and beyond the application of falsification, economists employ a host of other tools to convince each other that a hypothesis has merit.

McClosky invites us to examine and become aware of what he calls the rhetoric of economics, which includes all the techniques we use to argue our science. Two often used, but little understood, techniques that economists often employ are standards of comparison and metaphor.

Economists usually employ a statistical criterion to decide whether a

---

<sup>59</sup> Ibid., p. 494.

set of data supports the predictions made by a hypothesis. McClosky argues that statistical criteria are often arbitrary and do not reflect economic standards of judgement. Consider an attempt to discover whether or not international prices move directly with U.S. internal prices.<sup>60</sup> If prices in the U.S. are regressed against similar prices abroad and the slope coefficient is found to be 1.00, then the hypothesis of purchasing power parity is confirmed. If we discover (with proper "ceteris paribus") a slope of .9999 significantly different from 1.00, have we refuted the hypothesis?

One often overlooked economic standard of comparison is the consequences of being wrong. When we make predictions based on statistical criteria, we should know what the 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.<sup>61</sup>

A second argumentative and communicative technique often overlooked is the power of the literary metaphors economists use to convince. All economic theory, hypotheses and models are, by virtue of their abstraction, metaphors. We are telling "stories" in order to instill a higher degree of understanding about how the the infinitely more complex

---

<sup>60</sup> Ibid., p. 496.

<sup>61</sup> Ibid., p. 496-497.

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 word 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."<sup>62</sup> 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, 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 revenues? 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.<sup>63</sup>

McClosky's realization that there are a number of ways to make economic arguments may be inconsistent with the positive economist's view of science, but it does not really challenge the positive structure of economic theories. Most economists will still 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

---

<sup>62</sup> Ibid p.496.

<sup>63</sup> Ibid., p.502-509.

maximization. They would agree with Friedman and Machlup that any such test would have little bearing on the validity of an economic theory because these statements are perceived to be introspective and intended to impart ideals.<sup>64</sup> However, as Machlup (but not Friedman) and others argue, 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.

---

<sup>64</sup> Blaug, Mark, op. cit., p. 127.

### 2.3 COMPONENTS OF ECONOMIC THEORY

Providing a framework for the analysis, understanding, and prediction of economic behavior is the general purpose of any economic theory. Theory gives meaning to the events economists observe. From theory we derive hypotheses, that, 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 Thomas Kuhn<sup>65</sup> refers to as the research paradigm, which includes not only assumptions and hypotheses, but also the appropriate tools of analysis and argument, and even a world view that defines what are the interesting questions for economists to address.

Much, though not all, of the confusion which 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 its 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.

---

<sup>65</sup> Kuhn, Thomas, The Structure of Scientific Revolutions, Chicago: University of Chicago Press, 1970

One of the most straight-forward and informative descriptions of the components of economic theory is found in Silberberg.<sup>66</sup> Because of its simplicity, Silberberg's discussion is a good starting point from which to examine the structure of modern microeconomic theory.

For Silberberg, 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, for example, consumers, firms, prices, and quantities, 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".<sup>67</sup> 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 to the nature of the "laboratory" in which economists must work. Since 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

---

<sup>66</sup> Silberberg, Eugene, op. cit.

<sup>67</sup> Ibid., p. 7.

of bread posted at xyz supermarket on such-and-such date"<sup>68</sup>(sic) or "ceteris paribus" conditions, such as "all other prices, incomes and tastes constant." Silberberg maintains properly that assumptions defined in this way must be operational with respect to the "essential aspects of the theoretical constructs"<sup>69</sup> in order to give the theory relevance. 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 directly or indirectly is of little practical value. More importantly, hypotheses cannot be tested if data are required that are unobservable, either directly or by adequate proxy. For example, suppose a generated hypothesis that predicts that the property rights structure of cooperatives constrains member-patron investment horizons relative to certain other modes of organizing business. Such a theory is of little value if a curtailed investment horizon cannot be measured or an observable causal link between the property rights structure and the firm's investment behavior cannot be established. In either case, the theory would be empty of content. Care must be taken that hypotheses

---

<sup>68</sup> Ibid., p. 7.

<sup>69</sup> Ibid., p. 8.

are not generated that seem to explain a great deal, but that are not operational and therefore cannot be tested or refuted.

Silberberg's decomposition of economic theory differs from Friedman's view because he recognizes that not all assumptions should be evaluated by the same criteria. Those assumptions that establish the link between ideal statements of economic behavior and actual conditions must be realistic to the extent that the important variables that affect a particular economic phenomenon are taken into account. Extending this logic, if a certain class of assumptions should exhibit a degree of realism in order for the theory to have relevance, then these assumptions should also be subject to some kind of empirical examination to determine their validity.

Melitz<sup>70</sup> provides a most convincing argument for this kind of realism, that is, 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.<sup>71</sup> 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

---

<sup>70</sup> Melitz, J., op. cit.

<sup>71</sup> Friedman, Milton, op. cit., p. 36.

assumptions to deduce operational predictions. Melitz maintains that auxiliary assumptions, and quite possibly generative assumptions, benefit from operational validity. The argument, in the case of auxiliary assumptions, deserves further discussion.

An economic hypothesis, H, can be stated in the following fashion: If a vector of conditions, C, are realized, then an event, E, will occur. If the event E is observed, then the hypothesis will not be rejected. The hypothesis, H, cannot yield predictions by itself but only with a set of statements, A, that define the environment in which the condition vector C must function. Then, the set, A, is a vector of auxiliary assumptions.

The hypothesis, H, and the set, A, can be used to make a statement about a specific "spatio-temporal" event, O. The event, O, is not the predicted outcome of the hypothesis, but rather an event that affirms the validity of the assumption set, A. Note that there is no required relationship between the event E, and the event O.

Inductive reasoning demonstrates that: if O is true, then the assumption set, A, has been confirmed and also the hypothesis, H, has received some measure of confirmation. Any evidence that disputes the validity of the assumption set, A, increases the chances that observations on the hypothesis fall outside the boundary conditions for testing H. In other words, the hypothesis may be consistent with false results. Two related conclusions can be drawn. As the employed auxiliary assumptions diverge from observed behavior, the power of any

hypothesis test is lessened. Lack of attention to realism in the use of auxiliary assumptions leads to ambiguity in the test results. These results do not necessarily mean such a hypothesis test is faulty. Through the use of syllogisms it can be shown that true conclusions can be reached from partially false premises. However, the probability of a false conclusion is increased.

Melitz's argument for factual realism in generative or fundamental assumptions is less convincing. His principal point of argument relies on an attack on Machlup's logic, as opposed to an advance of his own logic. Machlup maintains that, in addition to serving no purpose, the testing of fundamental assumptions is impossible. Such assumptions are based on abstract, ideal constructs that have no real world counterpart. Machlup drew his examples from physics, where such concepts as Newton's laws of mechanics are postulated, but have no known operational correspondence to an observable quantity. For example, there is currently no way to generate a perfect vacuum. Such generative assumptions are based on ideal, abstract constructs that are not intended to have real world counterparts. Melitz responds that, while this logic might have merit in physics, vastly different principles of behavior exist in the social sciences, and in particular, economics.<sup>72</sup> There is no reason to believe that economics must conform to the methodological rules of physics. Melitz concludes that Machlup's analogy is wrong, and therefore, so must be his argument that the

---

<sup>72</sup> Melitz, J., op. cit., P. 52.

generative assumptions of economics are not testable. The conclusion is strengthened by recent developments in physics. The abstract construct of an atom now appears quite operational as a result of recent advances in observational technology.

The problem with Melitz's argument is that it violates his syllogistic logic so carefully applied in reference to auxiliary assumptions. True conclusions can be reached from partially false premises. To infer that generative assumptions can be realistic and empirically testable based on the fact that Machlup's conclusion is poorly argued is insufficient.

Melitz makes a strong argument for operational attributes in auxiliary assumptions, but leaves a rather vague notion of the nature and theoretical role of operational assumptions. Are all nonfundamental assumptions to be tested? If so, how rigorously? Assumptions are observed in economic theory that are clearly not fundamental statements of human economic behavior, but that are so generally defined that definitive empirical verification would be difficult if not impossible. Are such assumptions valid? To answer these questions, a conceptual framework is needed of theoretical structure that is more detailed than those offered thus far.

Machlup<sup>73</sup> offers the most comprehensive classification of the components of economic theory currently existing. As do most other authors, he initially divides assumptions into two general categories,

---

<sup>73</sup> Machlup, Fritz, op. cit., pp. 148-152

fundamental and specific. He further categorized specific assumptions by application, frequency of change, and the need for rigor in testing. Figure 2 reproduces his classification scheme.

Two additional components are proposed, assumed changes and deduced changes. The assumed change in 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 must usually be operational to have relevance.<sup>74</sup> Machlup mentions some cases where this may be problematical because data are unavailable. The effects of

---

<sup>74</sup> Ibid., pp. 148-149

ASSUMPTIONS ON OBSERVABLE DEPENDENT AND INDEPENDENT VARIABLES

THE "MACHINE" OF PURE THEORY

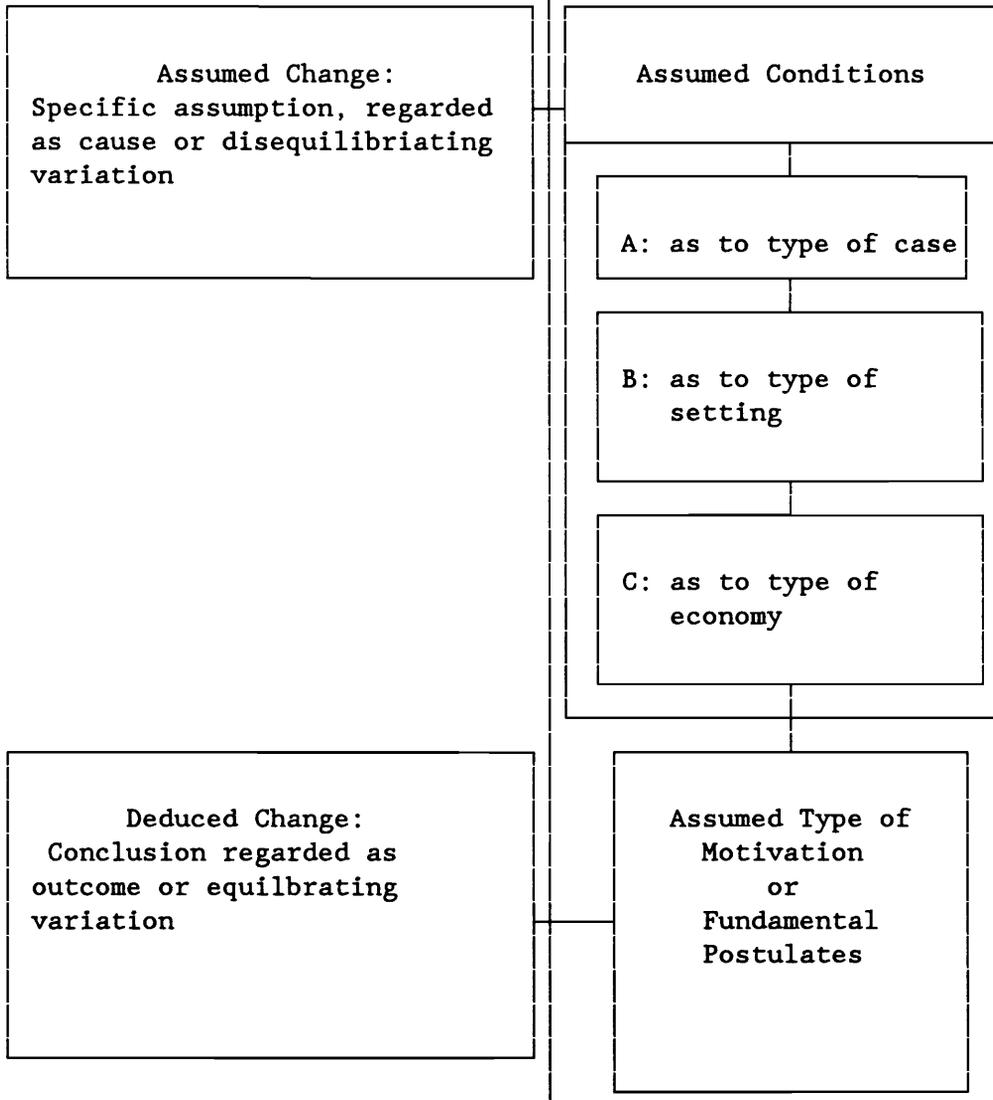


Figure 2. Machlup's Model of the Components of Economic Theory

Source: Machlup, 1978.

technological change or changes in tastes and preferences are offered as examples. The deduced change is the predicted result of the theory or hypothesis that must be put to empirical test. By definition, this component must be operational in order to know if the theory is of value. The deduced change exactly corresponds 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 observation of 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 above, fundamental postulates are not generally subject to direct empirical verification because of their "a priori", ideal, or abstract nature. Machlup does require that these statements meet a requirement of realism in a different sense. The behavior specified by a postulate, though ideal and/or abstract in nature, must be realistic in the sense that it suggests behavior that humans find understandable.<sup>75</sup> Where Machlup makes the largest contribution to understanding the structure of economic theory is in his exhibition of the various classes of specific assumptions or assumed conditions. These statements define the personal characteristics, technological or organizational circumstances, market

---

<sup>75</sup> Ibid., p. 153.

forms, and institutions affecting the economic problem under study. Assumed conditions are subdivided into three classes according to the type of circumstance defined and the frequency with which the condition might be expected to change. The three cases include conditions which describe (1) type of case, (2) type of setting, and (3) type of economy.

Because assumed conditions form the link between what are accepted as ideal 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, 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.<sup>76</sup>

In summary, a number of students of the methodology of economic inquiry have provided a 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

---

<sup>76</sup> Ibid., p. 151

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. In the next section, it will be shown that assumptions reflecting property rights to ownership and control of a firms' resources properly fall into the class of assumptions in economic theory that must be operational.

## 2.4 THE STRUCTURAL AND FUNCTIONAL ROLES OF PROPERTY RIGHTS IN ECONOMIC THEORY

The ultimate purpose of this chapter is to argue that assumptions reflecting the property rights to ownership and control of resources in any kind of economic organization should be factually realistic. 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 presented above. The determination as to whether property right assumptions need to be factually realistic can then be made.

From a methodological perspective, the determination that a theory will benefit from explicit and operational representation of the existing property rights structure will provide the foundation for pursuing the other principal objectives of this study; that is, to develop the beginnings of a property-rights based theory of cooperatives and to apply this theory to the task of constructing a model of the investment process of these organizations.

### 2.4.1 A Definition of Property Rights

Considering the relative wealth of property rights literature in economic journals, surprisingly few examples exist that seek to define precisely 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. Cursory definitions are often not very useful in contributing to the understanding of complex social institutions such as property rights, but 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.<sup>77</sup>

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.<sup>78</sup>

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.<sup>79</sup>

All of the above 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

---

<sup>77</sup> Randall, Alan, Resource Economics, Columbus: Grid Publishing, 1981.

<sup>78</sup> Alchian, Armen, "Some Implications of Recognizing Property Right Transactions Costs," in Karl Brunner, ed. Economics and Social Institutions, Boston, Martinus Nijhoff Publishing, 1979, p. 237.

<sup>79</sup> Schmid, Allan, Property, Power, and Public Choice, New York: Praeger, 1978, p.5.

evolve. What is the economic incentive for instituting a particular set of property rights? With respect to the theory of the firm the question might well be put: What determines the organizational structure actually adopted by a firm? The answer to this question is crucial to understanding the role of cooperatives, and the question will be examined in depth in the following chapter.

A key to understanding how a particular set of rights comes about is to recognize that they are social institutions, that is, rules 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 which govern resource use.<sup>80</sup>

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 is synthesized in the following definition.

Property rights are social institutions, expressed as legal restrictions, that are devised in order to place constraints on how the resources available to an economy may be used. Property rights specifically address: who may make decisions over a particular resource's use, who will bear the risk of gain or loss as a result of employing the resource in some productive activity, the length of time, the right may be considered valid, the circumstances under which the right can be transferred, and the penalties to be incurred for violations of the privileges inherent in the rights.

#### 2.4.2 The Nature and Function of Property Rights to the Resources of a Firm

---

<sup>80</sup> Hite, James, Room and Situation, Chicago: Nelson Hall, 1979, p. 78.

A neoclassical economic firm is usually 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 goods and services 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.<sup>81</sup>

As was mentioned in Chapter 1, the property-rights structure implicit in the above statement implies that the resources available to a neoclassical firm are individually and privately held and fully allocated. The single agent, an entrepreneur, responsible for making decisions determines how the available resources will be combined and 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 above, represents only a subset of the economic organizations we can observe in an economy that produce goods

---

<sup>81</sup> Henderson, James and Richard Quandt, Microeconomic Theory, New York: McGraw-Hill, 1971. p. 52.

and services. A more comprehensive list of such organizations would include:

- Sole proprietorships,
- Partnerships,
- Investor-owned firms,
- Nonprofit organizations,
- Mutuals,
- Labor-managed firms,
- Cooperatives.

The sole proprietorship is characterized by a single owner-manager as described above. This manager assumes 100 percent of the risk generated by the organization.

A partnership occurs when two or more individuals each share 100 percent of the liabilities generated by an organization. Each individual shares any gains the organization generates according to a prespecified contractual agreement. Limited partnerships occur when the loss suffered by any individual partner is limited to his/her investment in the organization. Limited partners may not have full decision rights in the firm.

The investor-owned firm, more commonly known as a corporation, is an entity "owned" by one or more persons on the basis of the amount of capital invested, expressed in shares of capital stock. Corporations are classified according to restrictions on who may own stock and the relative marketability of that stock. For example, in an open or public corporation there is no restriction on who may purchase stock; whereas, in a closed corporation, stock is held in a fixed and identifiable group

and is not publicly offered for sale.

A nonprofit is an interesting organizational form because capital is invested without the expectation of a personal monetary return.

Moreover, there are no true owners in the sense of having a claim to the net proceeds of the organization. Included in this category are educational, religious, and charitable institutions.

A mutual is a specialized kind of cooperative usually found in the insurance or financial sectors. The "owners" are those who purchase the company's services. Net proceeds are distributed on the basis of patronage. Unlike a traditional cooperative, the members of a mutual company do not have a direct role in selecting directors or management.

A labor-managed firm is characterized by some degree of direct control over management by those who supply labor to the entity. The degree of control may be complete as in the case of a production cooperative or limited as in the case of an Employee Stock Ownership Plan (ESOP). In an ESOP, employees own at least the majority of the outstanding shares of stock of a corporation, but their power of control over directors and management may be limited by contractual agreement.

As defined in Chapter 1, a marketing, supply, or consumer cooperative are organizations that operate in conformance with the modern Rochdale Principles. Members share the net proceeds generated by the entity in accordance with the amount of patronage. Members have ultimate control over the operations of the organization through the election of a board of directors who, in turn, hire, fire, and set the remuneration of high-

level management. Control over the firm is exercised in accordance with the one person - one vote principle rather than through stock shares.

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 TOF, with its implicit assumption of a single owner-manager, would appear to describe only a single element of the economic organizations observed. Therefore, there are two alternatives: (1) to develop an individual model of behavior for each of the alternative modes for organizing economic activity, or (2) to seek a more general theory of economic organization within which the TOF would represent a valid subset.

Fortunately, the ground work for a property-rights-based theory of economic organizations has been established in the research of Fama,<sup>82</sup> Jensen and Meckling,<sup>83</sup> Jensen,<sup>84</sup> and Fama and Jensen.<sup>85</sup> In this

---

<sup>82</sup> Fama, Eugene, "Agency Problems and the Theory of the Firm," Journal of Political Economy 88(1980):288-307

<sup>83</sup> Jensen, Michael and William Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure," in K. Brunner ed., Economic of Social Institutions, Boston: Martinus Nijhoff Publishing, 1979a; and "Rights and Production Functions: An Application to Labor-managed Firms and Codetermination," Journal of Business 52(1979b):460-506.

<sup>84</sup> Jensen, Michael, "Organization Theory and Methodology," The Accounting Review 58(1983):319-339.

research, an economic organization is viewed not as a technical entity but rather 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.<sup>85</sup>

Considering the working definition of property rights established above, 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 which 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.<sup>87</sup>

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

---

<sup>85</sup> Fama, Eugene, and Michael Jensen "Separation of Ownership and Control," Journal of Law and Economics, 26(1983a):301-325; and "Agency Problems and Residual Claims," Journal of Law and Economics 26(1983b):325-349.

<sup>86</sup> Jensen and Meckling, 1979a op. cit., p.170-172.

<sup>87</sup> Fama and Jensen, 1983a, op. cit., p.302-304.

is the right to the net cash flows of the organization after all fixed obligations have been met. Residual claimants are the riskbearer's of the organization.<sup>88</sup>

The residual claims of any organization have four identifiable characteristics, (1) ownership, (2) alienability, (3) redeemability and (4) ownership horizon.<sup>89</sup> Any restrictions on the ownership of a residual claim means that the role of riskbearing in the organization is tied to some other agent's role. For example, partners must usually assume both decision-management and decision-control rights in order to hold the residual claim.

Alienability refers to the ease in 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<sup>90</sup> 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 is generally liquid.

---

<sup>88</sup> Fama and Jensen, 1983b, op. cit., p. 328

<sup>89</sup> Fama and Jensen, 1983b, op.cit., p. 328.

<sup>90</sup> For example it may be necessary for the residual claimant to also become a partner.

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 features of restricted ownership residual claims. For example, the residual claim of a labor production cooperative is valid only so long as an 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.<sup>91</sup> 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.<sup>92</sup>

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 they call 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

---

<sup>91</sup> Fama and Jensen, 1983a, op. cit., p.304

<sup>92</sup> Fama and Jensen, 1983a, op. cit., p. 303-304

a contract may exceed its benefits.<sup>93</sup>

Separation of residual rights and decision rights occurs in many types of organization because of economies to be gained from specialization of the riskbearing functions and decision functions. However, an agency cost is created because those who make decisions are not necessarily residual claimants; therefore, they may not bear the full consequences of their decisions. The case of the investor-owned firm serves to illustrate this process. In the IOF residual rights and decision-making 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 as a result of management decisions fall on the residual claimants, that is, the stockholders. Managers could be in a position to make decisions which furthered their own interests<sup>94</sup> at the expense of stockholder wealth. Fama and Jensen maintain that in the IOF, the separation of decision-control rights from decision-management rights is observed in order 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 that must

---

<sup>93</sup> Jensen and Meckling, 1979a, op. cit., p. 168.

<sup>94</sup> For example, better working conditions, prestige, or an enhanced perception of worth in the market for managers.

presumably 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."<sup>95</sup> 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 authority to enforce them. With respect to economic organizations, property rights assign and define the limits of the roles of the residual riskbearers, the decision managers and the decision controllers. 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 observed. In the following section, what has been learned about the nature and function of property rights in the context of economic

---

<sup>95</sup> Fama and Jensen, 1983a, op. cit., p. 301.

organization will be applied to the methodological task of classifying the role of property right assumptions in economic theory.

#### 2.4.4 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 which 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 cooperatives.

The appropriate criteria of judgement must be whether property right assumptions fulfill the requirements of assumed conditions as defined above by Machlup in section 2.3. In the preceding section the function of property rights to a firm's resources was established as defining the roles and limits of riskbearing, 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 frequency of change and purpose. Property right assumptions fit into conditions describing type of economy because this category includes "legal and social institutions; private property; freedom of contract;...and enforcement of contracts"<sup>96</sup> which is fairly complete list of the attributes of property rights as described in the last section. However, Machlup also maintains that conditions 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".<sup>97</sup> Conditions describing type of setting are said to be able to change over brief periods of time.<sup>98</sup>

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 homogeneous across all organizations. Models attempting to describe or predict firm level behavior must incorporate a

---

<sup>96</sup> Machlup, Fritz, 1978, op. cit., p. 151.

<sup>97</sup> Ibid., p. 151.

<sup>98</sup> Ibid., p. 150.

realistic and verifiable set of assumptions reflecting the appropriate rights structure governing that particular firm type.

## 2.5 CHAPTER SUMMARY

The purpose of this chapter 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 cooperatives. 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, amongst 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 principle, 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: (1) Fundamental assertions establish ideal and often abstract statements of human economic behavior, and (2) assumptions that define the socio-economic environment

under which a hypothesis will be tested. Operational realism in this latter 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. This manipulation of property rights within economic organizations 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 cooperatives.

The final task of this chapter was to employ 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 demonstrated above, this category of assumptions must exhibit some degree of operational realism if the resultant theory is to have relevance.

## CHAPTER 3.0 A PROPERTY-RIGHTS-BASED THEORY OF COOPERATIVE INVESTMENT BEHAVIOR

### 3.1 INTRODUCTION

In Chapter 2, the argument was made that theories of firm-level behavior would benefit from explicit inclusion of the property right structure that defines and constrains the roles of residual risk-bearing and the decision process in an economic organization. Also shown was that such an inclusion is methodologically appropriate in the context of neoclassical economic theory. The objective of the current chapter is to accomplish the task of identifying the nature of and incorporating the impact of the restricted set of property rights that defines cooperatives into a model of the cooperative investment process.

The first part of this chapter will establish the fundamentals of a general theory of cooperatives based on the nexus of contracts and property rights framework laid out in the latter part of Chapter 2. A most effective approach to documenting the nature and impacts of the property right structure inherent in cooperatives will be to contrast this structure with that of alternative firm organizations, in particular, the sole proprietorship form and the investor-owned firm (IOF). The sole proprietorship is used because it represents the closest organizational form to that implied by the neoclassical theory of the firm. The IOF is used as a standard of comparison because, in the minds of many, the IOF represents the most viable alternative

organizational form for agricultural producers to vertically integrate economic activity. As will become clear, the nature of the property rights structure that governs the IOF may actually act as a disincentive to producers in choosing this option. However, the IOF does represent the most common organizational form with which cooperatives must compete for survival and market share in agricultural markets.

## 3.2 FUNDAMENTALS OF A PROPERTY-RIGHTS-BASED THEORY OF COOPERATIVES

### 3.2.1 The Cooperative as an Economic Organization

To begin the process of analyzing the agricultural cooperative in the context of a nexus of contracts, it is necessary to identify some basic characteristics of these firms. As discussed in Chapter 2.0, a key to understanding why a firm adopts a particular organizational or property rights structure is the control of agency costs in order to enhance its competitive position for organizational survival. In order to understand the source and control of agency costs within cooperatives, (1) who the agents are that comprise a cooperative and (2) the degree of organizational complexity required by the kinds of economic activity in which cooperatives are involved, must be established. Organizational complexity means the degree of required diffusion across agents of the specialized decision-related information necessary to operate and manage the firm. Fama and Jensen maintain that complex organization occurs when the specific information relevant to firm decisions is optimally diffused across many agents. Noncomplex organization is observed when specific decision information is best located with one or a few agents.<sup>99</sup> Specific decision information is defined as firm-related technical and business knowledge that is costly to transfer among agents due to training or experience requirements.<sup>100</sup>

---

<sup>99</sup> Fama and Jensen, op. cit., p. 301.

<sup>100</sup> Fama and Jensen, op. cit., p. 302.

### 3.2.1.1 Agent roles in a cooperative

The agents bound together by contract in a firm are those who hold some kind of fixed or residual claim on the cash flows of the organization in exchange for factors of production. In addition, those who transact with the firm to supply inputs or purchase finished products are agents of the firm in the sense of holding a contract through a market transaction. The agent groups bound by the nexus of contracts pertinent to cooperatives include:

- member-patrons,
- management,
- directors,
- labor,
- holders of debt instruments in the cooperative (bankers, etc.),
- outside purchasers of finished products, and
- outside suppliers of production inputs.

Fama and Jensen maintain that it is the property rights to the decision process and residual claim that have the greatest impact in determining the organizational structure of firms. The member-patrons of the cooperative are its residual claimants and the ultimate holders of the rights to decision control. However, much of the actual exercise of decision control is delegated to a board of directors. A professional management team holds the right to decision management.

### 3.2.1.2 Organizational complexity in cooperatives

The degree of organizational complexity required by the kinds of economic activity in which agricultural cooperatives are involved varies significantly. Agricultural cooperatives are involved in a variety of activities including: marketing, input supply, processing, manufacturing, leasing, bargaining, finance, political lobbying, education and the provision of various agriculturally-related services. Agricultural cooperatives may range in size from individual local supply stores that are easily managed by one or a few people to Fortune 500-size interregional giants involved in a number of activities that require significant degrees of technical and business specialization.

Size is not the only valid measure of organizational complexity. For example, large agricultural bargaining associations, measured in terms of numbers of members or volume of business, exist that require relatively few agent-specific talents. Such cooperatives do not employ any production processes or complex distribution systems. They exist only to negotiate with suppliers or purchasers over price.

In the most important sense, all cooperatives can be classified as organizationally complex. In most cases, the activities in which cooperatives are involved are foreign to the specific talents of its members, who are presumably experts only in the production of agricultural commodities and the management of farm-level business. While farmer-members may be able to bring varying degrees of technical,

organizational, and risk-bearing skill to the cooperative, there is no reason to believe that the agricultural producers will have all the required skills to effectively manage a distinct business enterprise. Further, it would be logistically inefficient for the members of a cooperative to jointly manage a separate business activity. Given such circumstances, there are economies to be gained in the assignment of the management agent role to those who are experts in the field. Separation of the cooperative management role from the cooperative "ownership",<sup>101</sup> control of the resultant agency costs, and the resultant implications for the performance of cooperatives is the subject of the rest of this section.

### 3.2.2 Characteristics of the Decision Process in Cooperatives

As mentioned above, cooperatives are viewed properly as complex firms because of the economies to be gained from specialization of management as a result of both the kinds of activities in which cooperatives are involved and the logistics of managing a firm with many residual claimants. The separation of residual risk-bearing from the decision process creates a source of agency cost because the economic interests of managers need not coincide exactly with those of the

---

<sup>101</sup> "Ownership" of a firm is an imprecise term when used in the nexus of contracts framework. Agents own factors of production, but the firm is not owned in the commonly understood sense. A firm is presumed to be operated in the interests of those who own the residual claim. Hence, through out the remainder of this dissertation, the more precise term of residual claimant or residual riskbearer will be used in place of ownership.

member-patrons. The opportunity exists for managers to expropriate a portion of member wealth because the positive costs associated with writing and enforcing contracts that completely ensure management behavior will often exceed the benefits. Such monitoring and enforcement should only be undertaken until the marginal revenue realized from the effort equals its marginal cost.<sup>102</sup> The separation of the right to the residual from decision management led Fama and Jensen to the following hypothesis reflecting the structuring of property rights in complex organizations.

Separation of residual risk bearing from decision management leads to decision systems that separate decision management from decision control.<sup>103</sup>

The rights to the decision process of cooperatives are divided as suggested by the above hypothesis. The right to initiate and implement decisions, decision management, is assigned to the professional management team in order to capture the economies of role specialization. To control the resultant agency costs, the rights to ratify and monitor the decisions taken by top-level management, decision control, are assigned only to member-patrons. Members delegate much of the power of decision control to a board of directors for the same qualification and logistical reasons that justify a separate and independent professional management team.

---

<sup>102</sup> Alchian and Demsetz; Fama and Jensen.

<sup>103</sup> Fama and Jensen, op. cit., p. 306.

The summary of the assignment of rights to the decision process inherent in the cooperative, IOF, and proprietorship presented in Table 3 indicates that, thus far, the described process of separation of residual risk bearing from the decision process and the separation of decision control from decision management is indistinguishable from that describing the IOF. But, there is an important feature of the cooperative decision process that distinguishes it from the IOF and all other forms of economic organization. The board of directors in an IOF is composed of a combination of inside directors, who are

Table 3. Attributes of Cooperative, IOF, and Proprietorship Property Rights to the Decision Process.

PROPERTY RIGHT	COOPERATIVE	IOF	NEOCLASSICAL PROPRIETORSHIP
	HOLDER OF PROPERTY RIGHT		
DECISION CONTROL	MEMBERS - DIRECTORS  BASED ON ONE PERSON ONE VOTE	STOCKHOLDERS - DIRECTORS  BASED ON CAPITAL SHARE	ENTREPRENEUR
DECISION MANAGEMENT	PROFESSIONAL MANAGER	PROFESSIONAL MANAGER	ENTREPRENEUR

usually selected from top-level management who have the necessary organization-specific knowledge of the firm, and outside directors, who are experts in their field but who hold no other agent role in the IOF.<sup>104</sup> Effective decision control is accomplished in the IOF in three ways. First, manager-directors generally do not ratify the same decisions they implement.<sup>105</sup> Second, outside directors have incentives to effectively monitor management behavior on behalf of the long-run interests of the firm and its stockholders, because the value of their human capital as directors depends on the quality and integrity of their performance as decision monitors.<sup>106</sup> Finally the existence of a market for trade of the residual claims of an IOF, the common stock market, supplies both easily accessible information as to the quality of management performance and the means to wrest control of a firm from existing management. The threat of outside takeover by other residual claimants or IOFs through purchase of stock or a proxy fight tends to act as a constraining force on the behavior of management. Since the decision control function provided by this "market for takeovers" supplants some of the control responsibilities of a board of directors, an additional benefit exists because IOF boards may include some members who are representatives of management whose expertise and contribution lies in their intimate knowledge of the organization, not their ability

---

<sup>104</sup> For example, as residual claimants.

<sup>105</sup> Fama and Jensen, op. cit., p. 315.

<sup>106</sup> Fama and Jensen, op. cit., p. 315.

to control the organization in the interests of residual claimants.<sup>107</sup>

As will be discussed in detail below, there is no market for the trade of residual claims of cooperatives. To replace the loss of this important control feature, cooperative boards of directors are made up almost entirely of elected member-patrons of the organization<sup>108</sup> in order to ensure to the degree rational, that management operates the cooperative in the interests of members. While this innovation increases control over the agency cost of separation of risk-bearing from decision management, the lack of expert decision-agents on the board of directors who have organization-specific knowledge of the organization and its business activities may create another source of agency cost and penalize the efficiency of the decision process of cooperatives relative to IOF firms in the competition for organizational survival.

### 3.2.3 Characteristics of Residual Claims in Cooperatives

In Chapter 2, the four principal characteristics of the residual claims of an economic organization were presented as

- the degree of separation of residual risk bearing from other

---

<sup>107</sup> Fama and Jensen, op. cit., p. 316.

<sup>108</sup> The following exceptions should be noted. Some states provide for the appointment of an outside expert to the board of directors of a cooperative. In the case of federated, interregional cooperatives many directors are representatives of top-level management from the member associations.

- roles in the organization,
- the degree of alienability of residual claims,
  - the degree of redeemability of residual claims, and
  - the time horizon of residual claims.

Table 4 presents a comparison of these characteristics for the cooperative, the IOF, and the neoclassical proprietorship.

### 3.2.3.1 Separation of the ownership of residual claims from other roles in the firm

Owners of common stock are not required to perform any other function in the organization.<sup>109</sup> The unrestricted nature of ownership of residual claims in an IOF permits specialization of risk-bearing. The many prospective owners of residual claims are free to assume the degree of risk they desire and diversify among the claims of many IOFs. Arrow<sup>110</sup> demonstrates that unrestricted residual claims and the resultant ability to diversify, optimally lowers the cost of risk-bearing and results in an optimal allocation of the residual claimant's resources. Unrestricted ownership also increases the pool of potential residual claimants and therefore the potential pool of equity capital. The large number of potential investors increases the probability of raising funds to purchase organization-specific assets.

---

<sup>109</sup> Note that this separation does not preclude any other role for residual claimants. However, such a role is not a prerequisite for risk-bearing. The managers and directors of an IOF often hold shares of common stock.

<sup>110</sup> Arrow, Kenneth, "The Role of Securities in the Optimal Allocation of Risk Bearing," Review of Economic Studies 31(1964)

Table 4. Attributes of Cooperative, IOF and Neoclassical Proprietorship property Rights to Residual Claims.

RESIDUAL CLAIM ATTRIBUTE	COOP	IOF	NEOCLASSICAL PROPRIETORSHIP
OWNERSHIP	MEMBER/PATRONS ONLY	OWNERSHIP NOT RESTRICTED	OWNERSHIP NOT RESTRICTED
HORIZON	VALID ONLY WHILE PATRON	VALID FOR LIFE OF FIRM	VALID FOR LIFE OF FIRM
ALIEN-ABILITY	CAN'T BE BOUGHT OR SOLD	FREELY TRANSFERABLE	FREELY TRANSFERABLE
VALUATION	NO SECONDARY MARKET TO VALUE CLAIMS	CLAIMS VALUED IN COMMON STOCK MARKET	NO SECONDARY MARKET TO VALUE CLAIMS
REDEEM-ABILITY	PARTLY REDEEMABLE	NOT REDEEMABLE	NOT APPLICABLE

In contrast, the role of residual risk bearing in a proprietorship is tied to the roles of decision management and decision control. This restriction means that residual claimants cannot be chosen for their talents as riskbearers alone. Diversification opportunities are limited because entrepreneurs are chosen for their joint abilities as sole riskbearer and decision maker in a single organization. Fama and Jensen maintain that proprietorships will tend to be observed only in activities where specific decision information is optimally located in a single agent and where demands for wealth to purchase organization-specific assets and bond the performance of other agents<sup>111</sup> are not constraining.<sup>112</sup> In such a case, the net agency benefits of separation of residual risk-bearing do not exceed the agency-cost savings that occur when residual rights and decision rights are vested in the same agent. In such cases, the proprietorship minimizes agency costs.

The cooperative exhibits a unique form of restriction on ownership of residual claims. Only active agricultural producers may hold the residual claims of an agricultural cooperative. To be precise, the role of residual claimant in a cooperative is directly tied to the role of patron or customer of the organization's goods and services. From the

---

<sup>111</sup> That is, agents such as the suppliers of debt capital who may require the bonded wealth of residual claimants to assure that fixed claims can be repaid.

<sup>112</sup> Fama and Jensen op. cit., p. 330.

perspective of the cooperative as a competitor with IOFs, this restriction limits the pool of potential residual claimants. In the absence of perfect finance markets,<sup>113</sup> such a restriction may retard the ability of the organization to raise capital for the purchase of organization-specific assets. From the member perspective, the tying of the residual role to the patron role, eliminates the agency cost that arises when an organization can successfully exploit market power and extract rent from its customers. However, the combining of the residual and patron roles limits the member-patron's opportunity for risk diversification and therefore raises the cost of risk-bearing. In addition, the restriction on who may own the residual claims of a cooperative may combine with other restrictions on cooperative claims to cause more serious impacts on the behavior of these firms. These impacts are discussed below.

### 3.2.3.2 Alienability of Residual Claims

Alienability refers to the degree of freedom involved in the transfer residual claims to others. In the IOF, residual claims are freely transferable to anyone with the means to purchase them. The unrestricted alienability of IOF claims, coupled with their unrestricted ownership permits the existence of secondary markets to transfer these claims. The secondary market has the advantage of using all available

---

<sup>113</sup> By perfect finance markets is meant the cost of debt financing does not increase with the quantity of debt employed.

information about the performance of an IOF to evaluate the present value its residual claims. If the market functions efficiently, the present value of current and future net income streams generated by the investment decisions taken by an IOF are evaluated by the market and reflected in the current price of its residual claims. Holders of these claims can capitalize the present value of future income streams at any time by selling the claim or by borrowing on its market established value.

The residual claims of a proprietorship are also freely alienable. However, due to the restriction that the residual claimant must also be the sole decision agent, there can be no secondary market to value and trade the claims alone. Therefore, the management control function provided by a secondary market is absent in proprietorships, because the agency costs of separation of risk-bearing from decision roles is not a feature of individual owner-manager proprietorships.

The residual claims of a cooperative are for almost all purposes completely inalienable. In an incorporated cooperative, possession of common voting stock is merely a symbol of the right to vote and bear residual risk. In 1976, common stock represented only 16.3 percent of total agricultural cooperative sector equity capital. By far the largest source of equity capital (50.1 percent) was held in certificates of equity that are accumulated through member patronage.<sup>114</sup> These certificates do not entitle the holder to any further control power. In

---

<sup>114</sup> U.S.D.A. Agricultural Cooperative Service data.

a cooperative, the value of residual claims is not earned as a return to capital, but rather as a return to patronage. The effective restriction on transfer of claims is accomplished in two ways. Through state statutes, articles of incorporation or cooperative bylaws, ownership of common voting stock in a cooperative is limited to agricultural producers.<sup>115</sup> Regardless of the amount of stock owned, most states explicitly limit the member of a cooperative to a single vote in the entity's affairs. Ownership of more stock than is necessary to qualify to vote affects the individual member's ability to capture residuals only indirectly by increasing capital investment costs without increasing returns. Members earn residual returns based on their patronage with the cooperative, not their invested capital.

As in the case of the proprietorship, the restriction on the alienability of cooperative residual claims prevents the existence of a secondary market to trade and value these claims, with a resultant loss of an important control feature on management behavior. Unlike the proprietorship, the potential for creation of agency costs due to separation of risk-bearing from the decision management is of concern. Cooperatives address the need to control separation-related agency costs by requiring that the board of directors be comprised almost entirely of

---

<sup>115</sup> Though not prohibited, many states stipulate internally that transfer of stock may only occur with approval of the board of directors or management. See: Baarda, James, State Incorporation Statutes for Farmer Cooperatives, U.S.D.A. Agricultural Cooperative Service, Cooperative Information Report No. 30, 1982, p. 69. and U.S.D.A. Agricultural Cooperative Service, Legal Phases of Farmer Cooperatives, Information Report 100, 1976, pp.82-87.

member-patrons, the residual claimants.

### 3.2.3.3 The degree of redeemability

Redeemability of an organization's residual claims is an unusual but important source of control that residual claimants can exercise over decision agents. Complete redeemability is the authority to exchange with the firm, at an agreed price, the right to a residual claim for the accrued value of the claim to that date. Once redeemed, the claim passes out of existence. Note that this is in contrast to the sale of a claim to another agent for whatever the market will bear. Presumably, the purchaser of a claim takes into account not only the claim's accrued value to date, but also its earning potential in the future. Exercising the redemption of equity capital has the effect of removing assets from the control of managers, thus effecting a kind of partial takeover.

The residual claims of an IOF are redeemable only in unusual circumstances such as when a public corporation goes private. The control feature of redeemable residual claims is unnecessary in an IOF due to the management discipline imposed by the existence of the market for takeovers described above. The concept of redeemable claims in the context of a proprietorship is not applicable since there is only a single agent who holds the property rights to the residual and the decision process.

The residual claims of a cooperative are redeemable to a limited degree. The nominal value of capital stock plus accrued interest is

redeemable on demand if a member leaves the organization. However, allocated equity, invested in the cooperative via patronage is generally returned to members only after some indefinite period of revolvment.

The cooperative member-patron can force redemption in a number of ways. If individual members feel that the decisions taken by management are lowering the value of their residual claim, they may exit the organization and force redemption of their claim after some indefinite period of time. If the majority of members are in agreement that management is acting to lower the value of their residual claims, they may vote to formally dissolve the organization and distribute its assets. Members may also vote to merge or federate their organization with another cooperative that exhibits lower separation-related agency costs.

The redemption of cooperative claims is an imperfect process because members as individuals or as a group face an "all or nothing" redemption decision and an undefined period between the demand for redemption and return of effective control over the assets at issue. Partial redemption of the residual claim is not possible. The control feature of redemption can still be effective. If enough members choose to, or threaten to, exit an organization, management will be compelled either directly or by board insistence to improve their performance or face termination.

### 3.2.3.5 The effective horizon of residual claims

The horizon or term of validity of the residual claims of an IOF is the life of the firm itself. This unrestricted horizon coupled with unrestricted alienability and the existence of a perfectly functioning secondary market for residual claims permits application of the market value rule for evaluating firm-level investment decisions. The market value rule stipulates that given perfectly functioning capital markets, managers can maximize stockholder's welfare, with out knowledge of stockholder's consumption preference functions, by choosing a portfolio of investments and business activity that maximizes the current market or present value of residual payment streams to be paid to claimants. Individual residual claimants may borrow or lend in the capital market on the present value of the stream of current and future residual cash payments in order to adjust their consumption streams according to their current and future preference functions.

The residual claims of a proprietorship are also valid for the life of the firm. Fama and Jensen argue that proprietorships, in general, cannot be expected to follow the market value rule for evaluating and adopting investment projects.<sup>116</sup> Their argument is based on a rather narrow and overly restrictive definition of a proprietorship in the context of a perfect capital market. In a perfect and certain capital market, residual claims are indistinguishable from fixed claims or debt. Fama and Jensen interpret this as meaning that all claims are residual

---

<sup>116</sup> Fama, Eugene and Michael Jensen, "Organizational Forms and Investment Decisions," Working Paper No. MERC 83-03, University of Rochester Managerial Economics Research Center, June 1983, pp. 5-8.

claims. Under such a definition, the owner of a proprietorship cannot borrow on its future net income stream without selling and transferring some portion of the firm's residual rights and by definition, ceasing to be a proprietorship. Such a proprietorship would not invest according to the market value rule if to do so required borrowing to meet current period consumption preferences. By relaxing these strict definitions of a perfect capital market and proprietorship, it can be shown that such firms can follow the market value rule for selecting investments.

The cooperative member-patron faces a serious restriction on the effective horizon of residual claims. Because the residual of a cooperative is earned as a result of and in proportion to patronage, once the member ceases to be an active patron, he/she can no longer capture, in subsequent periods, returns from existing investments. Since there is no market to value the claims of a cooperative and since the claim is inalienable, the member-patron cannot sell the claim and capitalize the present value of future income streams generated by existing investments. That portion of the cooperative's future income stream that falls beyond a member-patron's expected horizon of patronage are discounted to zero when the member evaluates the cooperative's investment portfolio.

#### 3.2.4 Summary of the Potential Advantages of Cooperative Property Right Structure

The structure of property rights that govern resource use in cooperatives has two distinct purposes: (1) to create economic

incentives for potential patrons to form or join cooperative activity and (2) to contribute to the position of cooperatives in the competition for survival with alternative types of economic organization by lowering the agency costs inherent in cooperatives. The following discussion summarizes the ways in which the cooperative property rights structure accomplishes these goals. The section will also summarize the ways in which the structure of cooperative property rights may present obstacles to the attainment of these goals.

#### 3.2.4.1 Control of agency costs between patron and residual claimant

When patron and residual roles are separated, the fundamental assumption of agent utility maximization implies that the interests of residual claimants will often conflict with the interests of an organization's customers. This conflict of interests can manifest itself in a number of ways.

Residual claimants, seeking maximum returns to their investment, have an incentive to extract rents from the organization's customers or suppliers when conditions permit the exploitation of market power. Unless competitive conditions dictate otherwise, there is no incentive to pass on any cost savings realized as a result of economies of scale. A climate for the potential exploitation of market power has historically existed in production agriculture, where relatively many, geographically isolated producers with large investments in specific-use assets have faced relatively few providers of input supply and marketing

services.

The property rights to residual risk-bearing and the decision process in a cooperative are structured so as to reduce this adversarial and costly agency relationship. The structuring of cooperative property rights so as to combine the roles of residual claimant and patron into a single agent, eliminates many of the conflicts of interest between these agent roles, and in doing so, constitutes a major incentive for participating in cooperatives. Member-patrons of a cooperative are entitled to the entire available surplus generated by the organization. Legal restrictions on the alienability of agricultural cooperative residual claims has the advantage of ensuring that these claims will remain in the hands of producers who have, if not identical, at least similar interests. Note that this feature of cooperative structure does not affect the potential agency costs arising from conflicts of interest between "large" and "small" members caused by democratic control.

#### 3.2.4.2 Control of agency costs between residual claimants and management

As discussed previously, the rights to the residual claim and the rights to decision management are separated in a cooperative in order to take advantage of the expertise of a professional management team. This almost universal feature of complex organizations results in the need to control management behavior so as to ensure the organization is operated in the interests of member-patrons. If cooperatives are to survive the competition for market share with alternative organizational forms, they

must adopt structures to reduce this source of agency cost. Management incentive contracts can and are written to tie top level management incomes to performance indicators that are of value to members, but this is a costly and imperfect process, especially in cooperatives where financial information reflecting such indicators is difficult to generate and is easily manipulated.<sup>117</sup> Cooperatives structure the rights to the decision process in a unique way in order to control this agency problem.

As in the case of the IOF, the rights to ratify and monitor decisions are vested in a different set of agents than the rights to initiate and implement decisions in order to maintain a check on management behavior. However, because of the inalienability of cooperative claims and the resultant lack of a secondary market to provide easily accessible information on the quality of management performance, the separation of decision control from decision management is more extreme in the case of cooperatives. Unlike the IOF, cooperative management may hold no other agent role, such as residual claimant or director. Directors, who exercise most of power inherent in the decision control right, are elected almost exclusively from the ranks of member-patrons. To increase member-patron control over management, the residual claims of cooperatives are partially

---

<sup>117</sup> Consider, for example, incentive provisions that are tied to a measure of cooperative net savings. Astute managers could easily manipulate short-term savings to the detriment of the longer-term interests of the cooperative.

redeemable. Member-patrons who feel the organization is not being operated in their interests can remove, or threaten to remove, assets from management control by redeeming the accrued value of their residual claim and exiting the organization. The possibility of a significant number of members opting for this alternative will act as a disciplining force on management behavior. The effectiveness of exercising redemption of residual claims will depend on the existence of viable institutional or market alternatives to replace the goods or services provided by the cooperative. If the cooperative is the only viable alternative in a given geographic region, the threat of redemption will be ineffective as a decision control mechanism.

### 3.2.5 Summary of the Potential Disadvantages of the Cooperative Property Rights Structure

This section summarizes those characteristics of cooperative property rights that would seem to create agency problems not observed in alternative forms of economic organization with which the cooperative must compete. The actual existence of one or more of these agency problems in a cooperative does not necessarily mean that the firm is placed at a competitive disadvantage. The structuring of certain decision and residual property rights to correct a particular agency problem will inevitably create others. It is the net cost position of a particular organization relative to its competitors that determines its ability to compete and ultimately its survival potential.

### 3.2.5.1 The decision-control problem

In the last section the advantages of structuring cooperative property rights so as to exert additional control over management behavior were presented. Under certain circumstances, these same control rights may lower the survival value of a cooperative.

The assignment of the decision control right exclusively to residual claimants means that the board of directors in agricultural cooperatives is composed primarily of agents who may have only limited experience in the business activities of the organization. In the absence of an education process that trains directors how to effectively determine the interests of the organization over time and how to evaluate its progress, the lack of an expert board may actually result in reduced control of management behavior. Directors who feel they have insufficient expertise to properly ratify and monitor management performance may effectively relinquish this role to management and "rubber stamp" their decisions.

If restricting the decision control rights of cooperatives to residual claimants with limited expertise may result in too little effective decision control, it may also result in too much. Because the rights to decision control are assigned to agents whose residual claims are valid only for the period of active patronage, and because of the potential impact on management of residual claims that are partially redeemable, residual claimants may be in a position to force management

into making decisions that maximize the short-term interests of existing member-patrons to the detriment of the long-term survivability of the cooperative and its future residual claimants.

### 3.2.5.2 The investment portfolio problem

The combining of the agent roles of residual claimant and patron roles presents potential problems as well as advantages for cooperatives. The mandatory linking of agent roles limits the pool of potential residual claimants and therefore the amount of equity wealth that can be attracted by a cooperative for the purchase of organization-specific assets and the bonding of contracts to other agents, such as labor and fixed-claim holders. Cooperatives seeking to compete in activities that require large quantities of equity capital may find themselves at a disadvantage relative to organizations such as IOFs who have access to an unlimited pool of residual claimants.

From the member-patron's perspective, the combination of the role of residual claimant and patron removes a degree of freedom with respect to choosing the desired level of investment in the organization. The investment decision in cooperatives is largely inseparable from the patronage decision. Since management generally initiates capital investment decisions and determines the level of equity capital to be withheld from the value of member patronage, members cannot freely select the level of risk they would choose to bear without affecting other variables, in particular the quantity of business they are to

transact with the cooperative. Arrow<sup>118</sup> demonstrates that an optimal allocation of resources and risk-bearing services can be guaranteed only by the existence of competitive securities markets that allow free choice with respect to the level of risk to bear and the mix of securities to hold. Members who are forced to accept more risk than they would otherwise prefer will pressure the cooperative to rearrange its investment portfolio to reduce risk even if the new portfolio implied lower expected returns. The details of this argument and the implications for cooperative investment performance will be presented later in the following two sections in the context of the cooperative investment model to be developed.

### 3.2.5.3 The common-property problem

The tied nature of the roles of the right to be a patron and the right to the residual claim in a cooperative and the lack of a market to establish a price for residual claims that reflects both their accrued and the present equivalent of their future earning potential combine to form what may be called the common-property problem in associations that maintain open membership policies. Newly entering producers who obtain patronage and residual rights in a cooperative are entitled to the same payment per unit of patronage as existing members. The gross return paid by a cooperative, including patronage refunds, if any, represents payment for the product supplied and a return to patronage-generated

---

<sup>118</sup> Arrow, Kenneth, op. cit.

investment from previous periods.

When new members receive the same return as existing members they are receiving, in part, a return to an investment for which they did not contribute equity. If the residual claims were marketable, their price in the market would increase with their value reflecting a cost of obtaining the residual benefits of past investments.

In the absence of active compensation by new member's to existing members, the common-property problem will result in a dilution of the rate of return existing members expect they will receive for their investment in the cooperative. If the common-property problem is anticipated by existing members, a clear disincentive is created for investing equity in the cooperative at levels that will result in a payment high enough to attract new members. Analysis of the model to be developed in the following section will reveal how this threshold level of investment can be determined, and the nature of the impact of new members on the price received in open-membership cooperatives.

#### 3.2.5.4 The residual-horizon problem

The same property right restrictions that are responsible for forming the common-property problem, combine to create what Fama and Jensen have called the residual-horizon problem. This problem results from the restriction on the right to the residuals of a cooperative to

active member-patrons and the lack of a market to transfer residual rights to others. Each cooperative member must evaluate the net income streams generated by investments based on the term of his or her horizon not the term of the income stream itself. An investment will be opposed if it does not generate an adequate return over the member's horizon, even if the investment would be deemed desirable by those who are able to capture the entire stream of returns. If a sufficient number of cooperative members face active horizon problems, the cooperative can be expected to exhibit an investment portfolio that is skewed towards shorter term projects and projects that tend to return higher rates of return in the near term. This relation will hold true even at the expense of investment projects that would return at higher rates over their entire lifespan.

## CHAPTER 4.0 A MODEL OF COOPERATIVE INVESTMENT BEHAVIOR

### 4.1 INTRODUCTION

In this chapter, a model of investment behavior will be developed. The model seeks to incorporate many of the restrictions imposed by the structure of property rights that defines cooperatives. Accounting for all the implications of cooperative property rights on the short-run and long-run behavior of these firms is not possible, as some of these issues are bound to problems of collective choice that are not well suited to a neoclassical maximizing framework. Emphasis is placed on those issues identified in sections 3.2.4 and 3.2.5 that directly affect the incentive structure facing member-patrons for attracting investment into cooperatives. Specifically, a detailed theoretical framework will be developed and used to analyze the impact of the common property, investment portfolio, and residual horizon problems that may constrain the cooperative in its struggle for organizational survival with other forms of economic organization.

### 4.2 BASIC ASSUMPTIONS

The objective of the individual member of an agricultural cooperative is to maximize the satisfaction derived both from a

pecuniary income stream and nonpecuniary benefit stream over a defined planning horizon of  $s$  periods. Member income is generated from the sale of a farm-produced product ( $m$ ) to the cooperative<sup>119</sup>. In any one period, the member has three options with respect to disposing of income generated as a result of patronizing the cooperative. The member may (1) consume the income, (2) invest some portion in the activities of the cooperative in the expectation of an increased return in future periods, or (3) invest some portion of the resources in the individual's own commodity production business with the expectation of an increased return in future periods. Investment in the cooperative will result in an increased average price received per unit of ( $m$ ) delivered at some future time. Investment in on-farm activities will result in increased productivity that may be manifested either as increased production for a given amount of resources or decreased costs per unit of output, or both.

The cooperative generates resources through the assembly, processing and sale of the member-supplied input. In each period, any remaining surplus after all input and fixed-claim costs have been paid is distributed to members on the basis of patronage shares as payment for their input plus a return to patronage-generated investment.

---

<sup>119</sup> This discussion is cloaked in terms of an individual agricultural producer selling product to a single marketing type cooperative. Other, more realistic possibilities exist, for example, membership in multiple marketing cooperatives or membership in an input supply cooperative. Clarity is served by the use of the simpler case without loss of generality. The individual producer's decision rule will not change.

#### 4.2.1 Individual Member Behavior.

Each of the member's of a cooperative seeks to maximize the following preference function.

$$V(c_{1i}, c_{2i}, \dots, c_{Si}) = U_i(c_{1i}) + EU_i(c_{2i}) + \dots + EU_i(c_{Si}), \quad (4.1)$$

where:  $c_{ti}$  = resources available for consumption by the  $i$ th individual in each of  $S$  periods,  $i = 1, 2, \dots, N$ ; the number of members in the cooperative at time  $t$ ,  $t = 1, 2, \dots, S, \dots, T$ ; where  $S$  represents the planning horizon of the members of the cooperative at  $t=1$ , and  $T$  represents the ultimate number of periods the cooperative will exist given that members may join the organization at some period subsequent to  $t=1$  who have planning horizons greater than  $S$ ;  $S \leq T$ , and

$E$  = the expectation operator.

The preference functions of individuals are assumed to be concave in the consumption of resources; i.e.,  $V'_i > 0$ ,  $V''_i < 0$ , implying diminishing marginal utility.

In each period, the surplus resources generated by the cooperative and distributed to each member must be disposed of in accordance with the following cash-flow equations.

$$\begin{aligned} c_{ti} &= y_{ti} - i_{ti} - o_{ti}, \quad t = 1, 2, \dots, S-1, \\ c_{Si} &= y_{Si} + l_{Si}, \end{aligned} \quad (4.2)$$

where:  $y_{ti}$  = income available from cooperative in period  $t$ ,  
 $c_{ti}$  = resources consumed in period  $t$ ,  
 $i_{ti}$  = resources invested in cooperative in period  $t$ ,  
 $o_{ti}$  = resources invested in on-farm commodity production,  
 $l_{Si}$  =  $i$ th member's share of the liquidated value of the cooperative in period  $S$ .

In each of the first  $S-1$  periods, resources available for consumption in period  $t$  ( $c_{ti}$ ) are a function of the impact of investments made in previous periods in the cooperative on current income ( $y_{ti}$ ), current investment in the cooperative ( $i_{ti}$ ), and current investment in the member's privately owned production unit ( $o_{ti}$ ). In the last period of the planning horizon ( $S$ ), the individual member's equity contribution to the cooperative as a result of investment over all previous periods ( $l_{Si}$ ) is returned. This liquidated share of equity capital will be the sum of investment ( $i$ ) in previous periods.

Below, a two-period version of the individual member's preference model presented in equations (4.1) and (4.2) is analyzed in order to facilitate ease and clarity of exhibition without loss of generality. The member makes an investment decision in period one and liquidates in period two. The following first-order conditions and decision rule for each individual in the two period case can be found by taking derivatives of the preference function  $V$  for changes in investment in the cooperative ( $i$ ) and the private unit ( $o$ ) taking into account the cash-flow equations as defined.

$$\frac{\partial V_i}{\partial i_{1i}} = \frac{\partial U_i(c_{1i})}{\partial c_{1i}} \frac{\partial c_{1i}}{\partial i_{1i}} + \frac{\partial EU_i(c_{2i})}{\partial c_{2i}} \left[ \frac{\partial c_{2i}}{\partial y_{2i}} \frac{\partial y_{2i}}{\partial i_{2i}} + \frac{\partial c_{2i}}{\partial l_{2i}} \frac{\partial l_{2i}}{\partial i_{2i}} \right] = 0 \quad (4.3)$$

$$\frac{\partial V_i}{\partial o_{1i}} = \frac{\partial U_i(c_{1i})}{\partial c_{1i}} \frac{\partial c_{1i}}{\partial o_{1i}} + \frac{\partial EU_i(c_{2i})}{\partial c_{2i}} \left[ \frac{\partial c_{2i}}{\partial y_{2i}} \frac{\partial y_{2i}}{\partial o_{2i}} \right] = 0$$

Note that:

$$\frac{\partial c_{2i}}{\partial y_{2i}} - \frac{\partial c_{2i}}{\partial l_{2i}} = 1, \quad \frac{\partial c_{1i}}{\partial i_{1i}} - \frac{\partial c_{1i}}{\partial o_{1i}} = -1,$$

The decision rule for member investment is found by setting the equations of (4.3) equal to each other and simplifying.

$$\frac{\partial y_{2i}}{\partial i_{1i}} + \frac{\partial l_{2i}}{\partial i_{2i}} = \frac{\partial y_{2i}}{\partial o_{1i}} \quad (4.4)$$

The decision rule for members is to invest in the cooperative and their own production activities until the marginal return from investment in the cooperative is equal to the marginal return from investment in own activities. This relationship holds between any two periods and can be generalized to the full  $S$  periods of the member's planning horizon.

#### 4.2.2 Cooperative Behavior.

The individual member of a cooperative must decide how to allocate net income each period among consumption, investment in other activities, and investment in the cooperative. The decisions over how much of a period's resources to consume and how much to invest in noncooperative activities are completely private and independent of the decisions of other individuals. However, the investment decision in cooperative activities is only partly a private decision. The amount of investment the cooperative initiates in any one period is a collective-choice process typically is initiated at the level of cooperative

management, subject to approval by the cooperative's board of directors, and under special circumstances, subject to direct approval of members.<sup>120</sup> In addition, the direct linkage between the patron and decision-agent roles in cooperatives makes it impossible to completely separate the decision to invest and the decision over the level of patronage.

In order to make the impact of restricted property rights on the investment process in cooperatives more clear, it will be initially assumed that the cooperative makes investment decisions regarding investment plans as if members did not have alternative investment opportunities. That is, the cooperative has no knowledge of the individual member's decision variable  $o_t$ . Once such a model has been presented, the implications of cooperative property rights in the competition for member investment resources will be investigated.

The individual members of cooperatives are assumed to form and join such organizations in search of maximum returns, pecuniary and nonpecuniary, in accordance with their expressed preference functions. A basic assumption of the following model of cooperative investment behavior is the existence of a single valued aggregate member preference function for consumption opportunities over time. Challenges to the existence of aggregate preference functions usually refer to the Arrow Possibility Theorem. This theorem states that in order for an aggregate

---

<sup>120</sup> A member vote is usually required to approve mergers and a referendum may be demanded on any issue over which the board of directors has domain. See: Baarda, J., op. cit., p.80.

preference function to exist, it must satisfy all of the five axioms of complete ordering, responsiveness to individual preferences, nonimposition, nondictatorship, and the independence of irrelevant alternatives.<sup>121</sup> The theorem goes on to maintain that, in general, it is not possible to meet all five criteria simultaneously.

Gordon Tullock<sup>122</sup> has argued that the implications of the Possibility Theorem are trivially restrictive under real world conditions. Tullock sees the voting paradox as Arrow's principal objection to the existence of aggregate preference functions. The voting paradox occurs when majority voting rules do not result in a decision acceptable to the majority. For example, consider the case where a majority of individuals prefer outcome C to B which, in turn, is preferred to outcome A. A paradox occurs if individuals vote on each outcome separately and the eventual acceptance of outcome C depends on the order in which the three alternatives are considered.

Tullock maintains that, given well-defined individual preferences, real world voting paradoxes will occur only under very unusual circumstances and majority voting procedures will generally result in determinant outcomes which, though not perfect under Arrow's criteria, are sufficiently accurate for decision-making purposes.<sup>123</sup>

---

<sup>121</sup> J. Henderson and R. Quandt, Microeconomic Theory, New York: McGraw-Hill, 1971, pp. 284-286.

<sup>122</sup> Tullock, G., "The General Irrelevance of the General Impossibility Theorem." Quarterly Journal of Economics 81(1967): 256-270.

<sup>123</sup> Ibid., p. 270.

The use of a single-valued aggregate member-preference function as the criteria for making decisions in a cooperative is clearly an abstraction from reality that ignores important aspects of the collective choice dynamic that influences decision making in these organizations. For example, understanding how cooperatives deal with the apparently conflicting interests of small-, medium-, and large-volume members would be of great value in determining the cooperatives' survival value in the current economic environment where the distribution of farm size is becoming increasingly bimodal. Large volume members of a cooperative may feel that the cooperative principle of democratic control gives smaller volume members a disproportionate share of decision power. They may prefer that control of the organization be based on capital contributed or some other measure that reflects the size and impact of larger members.

The simplifying assumption of an aggregate member-preference function allows the examination of certain property right issues pertaining to the investment process in isolation of the inevitable complications of explicit representation of the collective choice problem of cooperatives.<sup>124</sup> The ultimate criterion for adoption of this simplifying assumption is whether or not useful and accurate insights can be gained without full representation of the complex, and possibly

---

<sup>124</sup> See: Staats, John, "A Theoretical Perspective on the Behavior of Farmers' Cooperatives." Ph.D Dissertation, Michigan State University, 1984, for a detailed examination of the collective choice issues of cooperatives from a game theory perspective.

nonmaximizing, decision process of cooperatives.

For an aggregate preference function to exist, the majority of members at any time  $t$  will solve the problems of determining an appropriate planning horizon and apportioning the consumption of resources over time. The resulting concave aggregate preference function in member consumption streams can be written as:

$$\sum_{i=1}^N V_i(c_{ti}) = V_t = U_t(C_1, C_2, \dots, C_s) \quad (4.5)$$

where:  $C_t = \sum_{i=1}^N c_{ti}$ .

Note that the aggregate preference function is indexed on  $t$ . Thus, the function reflects the fact that investment decisions are based on the expressed interests of those who are members of the cooperative at some period  $t$ . However, as a result of current investment's impact on the amount the cooperative is able to return to members in subsequent periods, new members may be attracted into the organization if allowed or existing members may exit. Investment decisions made in later periods may reflect the interests of the expanded or contracted group and thus a new preference function is required.

In each period, the cooperative takes delivery of the member-supplied product ( $M_t$ ), processes it, and sells the output ( $Q_t$ ) in competitive markets. The cooperative faces the following technical production and cost relationships.

$$Q_t = f_t(K_t, m_t, N_t), \quad (4.6)$$

where:  $Q_t$  = the quantity of output produced by the cooperative

in period  $t$ ,

- $K_t$  - the quantity of capital stock employed by the cooperative in period  $t$ ,
- $m_t$  - the average quantity of member supplied input to the cooperative per individual member firm in period  $t$ ,
- $N_t$  - the number of individual member firms in the cooperative at period  $t$  ( $m_t N_t = M_t$ ).

Other variable inputs used by the cooperative are assumed for simplicity of exposition to be used in proportion to the amount of  $M$  supplied by members; that is:

$$x_t = g_t(M_t).$$

where:  $x_t$  - the level of all variable inputs used by the cooperative.

The cost function for the cooperative may be written as:

$$Z_t = Z_t(K_t, m_t, N_t). \quad (4.7)$$

Variable costs associated with inputs other than  $M_t$  are not explicitly represented in either the production or cost functions as they vary proportionately with  $M_t$  in each period. The variable  $K_t$  is entered as an explicit argument in the cost function in order to account for periodic expenses, such as depreciation associated with maintaining or replacing the existing capital stock in period  $t$ .

The cooperative distributes all revenues net of costs<sup>125</sup> to members on the basis of patronage shares, preserving the cooperative principle of operation at cost. The cooperative net surplus equation can be written as:

$$NS_t = P_{Qt} [ f_t(K_t, m_t, N_t) ] - Z_t(K_t, m_t, N_t), \quad (4.8)$$

where:  $NS_t$  -  $P_{mt} * m_t * N_t$ , payments to members for their input to the cooperative,  
 $P_{mt}$  - the price paid by the cooperative per average unit of input supplied by members,  $P_{mt} = NS_t / (m_t N_t)$ ,  
 $P_{Qt}$  - the parametric price per unit of output sold by the cooperative in competitive markets.

Surplus is allocated to members in two forms: (1) A portion ( $\alpha_t$ )  $NS_t$  is paid to members in cash, where  $\alpha_t$  is  $\leq 1$ , and (2) a portion  $(1-\alpha_t) NS_t$  is allocated to individual member equity accounts, but withheld by the cooperative as investment in future productive capacity. The nominal or par value of this equity capital is revolved back to members dollar for dollar after some usually unspecified number of periods. Many cooperatives pay a legally limited nominal interest rate on retained capital, but this feature is not required for this analysis. This provision is omitted from the model for simplicity without loss of generality. Economic returns generated by this capital are paid to members on the basis of patronage and are realized as an augmented price

---

<sup>125</sup> Except those costs associated with the member-supplied input and the value of member equity.

$P_{mt}$  per average unit of patronage supplied.

Investment in the cooperative amounts to a decision as to the magnitude of  $\alpha_t$ , the proportion of cooperative net surplus to be paid as cash to members. The smaller the value of  $\alpha_t$  chosen, the larger the amount withheld as investment. When the initial position of the cooperative is established by fixing values for  $K_0$  (the initial level of capital),  $m_1$ , and  $N_1$ , a level of investment is determined that will vary with desired levels of  $C_1$  and  $O_1$  that compete for available resources generated by the cooperative. The investment relationship for period one may be written as:

$$I_1 = (1 - \alpha_1)NS_1 - P_{Q1} [f_1(K_0, m_1, N_1)] - Z_1(K_0, m_1, N_1) - C_1. \quad (4.9)$$

Investment has consequences for the firm's capital stock in succeeding periods. If  $I_1$  dollars are allocated to investment in period one, and  $P_{k1}$  is the price per unit of capital equipment, then  $I_1/P_{k1}$  units of capital equipment will be added to the cooperative's capital stock in the next and succeeding periods.<sup>126</sup>

An additional adjustment must be made to each investment equation subsequent to period one. New investment implies potentially increased surpluses in later periods. Higher surpluses will be manifested to members as a rise in  $P_{mt}$ . A rise in  $P_{mt}$  will elicit a positive supply response both from existing members and as a result of new members being

---

<sup>126</sup> Remember, capital goods are assumed to be maintained through the planning horizon by including the term  $Kt$  in the cost function of the cooperative.

attracted to the cooperative's new price, if permitted. Since the objective planning function (V) was constructed to reflect the interests of the original group of members, the consumption variable  $C_t$  must be adjusted by a factor  $N_1/N_t$  in each period to determine the amount of consumption resources made available to this original group. The preference function V was constructed in period one to map out the preferences for all periods to the original majority's planning horizon  $\underline{S}$ . In subsequent periods, the cooperative may adopt a new preference function to reflect the interests of the changing mix of members. Investment in period two becomes:

$$\begin{aligned}
 I_2 = & (1-\alpha_2)NS_2 - P_{Q2} \left[ f_2 \left( K_0 + \frac{I_1}{P_{k1}}, m_2, N_2 \right) \right] \\
 & - Z_2 \left( K_0 + \frac{I_1}{P_{k1}}, m_2, N_2 \right) - \frac{N_1}{N_2} C_2.
 \end{aligned} \tag{4.10}$$

An investment equation can be constructed for each of the periods one through S that the set of decision makers face in period one. The entire system of S equations will appear as:

$$I_1 = (1-\alpha_1)NS_1 - P_{Q1} [f_1(K_0, m_1, N_1)] - Z_1(K_0, m_1, N_1) - C_1. \tag{4.11}$$

$$I_2 = (1-\alpha_2)NS_2 - P_{Q2} \left[ f_2 \left( K_0 + \frac{I_1}{P_{k1}}, m_2, N_1 \right) \right]$$

$$- Z_2(K_0 + \frac{I_1}{P_{k1}}, m_2, N_2) - \frac{N_1}{N_2} C_2.$$

$$\vdots$$

$$I_S = (1-\alpha_S)NS_S - P_{QS} \left[ f_S(K_0 + \sum_{t=1}^{S-1} \frac{I_t}{P_{kt}}, m_S, N_S \right]$$

$$- Z_S(K_0 + \sum_{t=1}^{S-1} \frac{I_t}{P_{kt}}, m_S, N_S) - \frac{N_1}{N_S} C_S.$$

From the perspective of those designing an investment plan in period one, there is no purpose to positive investment in period S. The limited-horizon nature of cooperative residual claims indicates that members can realize no return to investment in periods after S, because they will not patronize the cooperative in any period beyond S.

In period S, the cooperative will be at least partially liquidated in order to revolve the original value of the equity capital contributed by those whose decisions are represented in  $V_1$ ; that is, those who have reached their planning horizon. The liquidation does not necessarily have to be complete as presumably others have joined the cooperative since period one, whose horizons are longer and whose interests are represented in preference functions occurring after period one. The liquidation equation can be written as:

$$L_S = K_0 + \sum_{t=1}^{S-1} \frac{N_1}{N_t} I_t. \quad (4.12)$$

The model developed in equations (4.5) through (4.12) can now be expressed as a quasi-concave Lagrangian problem.

The Lagrangian may be written as maximize:

$$\begin{aligned}
 & - U(C_1, C_2, \dots, C_S) + \lambda_1 [P_{Q1} Q_1 - Z_1(Q_1) - I_1] & (4.13) \\
 & + \lambda_2 \frac{N_1}{N_2} \left[ P_{Q2} f_2(K_0 + \frac{I_1}{P_{k1}}, m_2, N_2) - Z_2(K_0 + \frac{I_1}{P_{k1}}, m_2, N_2) - I_2 \right] \\
 & \quad \vdots \\
 & + \lambda_S \frac{N_1}{N_S} \left[ P_{QS} f_S(K_0 + \sum_{t=1}^{S-1} \frac{I_t}{P_{kt}}, m_S, N_S) + L_S \right. \\
 & \quad \left. - Z_S(K_0 + \sum_{t=1}^{S-1} \frac{I_t}{P_{kt}}, m_S, N_S) - I_S \right]
 \end{aligned}$$

The following Kuhn-Tucker conditions must hold to ensure a solution:

$$\begin{aligned}
 (1) \quad \frac{\partial U}{\partial I_t} &\leq 0, & (2) \quad \frac{\partial U}{\partial I_t} I_t &= 0, & (3) \quad I_t &\geq 0. \\
 (4) \quad \frac{\partial U}{\partial \lambda_t} &\leq 0, & (5) \quad \frac{\partial U}{\partial \lambda_t} \lambda_t &= 0, & (6) \quad \lambda_t &\geq 0.
 \end{aligned}$$

The Lagrangian and Kuhn-Tucker terms are formulated to ensure that certain nonnegativity and border conditions are maintained in order to ensure a solution. Condition (1) ensures that the investment solution found in the problem represents an interior maximum solution for net surplus or at least a valid local border solution if  $I = 0$ . Condition (2) requires that either the marginal utility of investment equal 0, indicating an interior maximum solution, or investment equal 0, indicating a border solution. Conditions (4) and (5) have similar interpretations for  $\lambda$  the Lagrange multiplier. Conditions (3) and (6)

require nonnegative solutions only; that is, total investment must be nonnegative in each case. The sum of resources used for member reinvestment or consumption must not exceed the available net surplus in any period. This condition is imposed to satisfy the initial assumption that all financing of investment and consumption activities must derive from member equity. For the present, no cooperative-level debt financing is permitted. The ability of debt to relieve some of the property-rights-generated investment problems that cooperatives face will be investigated in a later chapter.

With the model thus specified, a general solution could be found using a nonlinear programming technique that would identify optimal values for the decision variable  $I$  in each period and consequently optimal values for consumption  $C$ , cooperative production  $Q$ , cost  $Z$ , and levels of capital stock  $K$ , average input per member  $m$ , and number of members  $N$ . To obtain such a solution, detailed knowledge of the functional relationships would be necessary. We would need to know how members seek to trade-off current for future consumption resources over time;  $U(C_t)$ , as well as the technical production and cost relationships facing the cooperative,  $f_t(K_t, m_t, N_t)$ ,  $Z_t(K_t, m_t, N_t)$ ,  $g_t(M_t)$ , and the member supply-response functions;  $m_t(P_{mt})$ ,  $N_t(P_{mt})$ . While the solution obtained with such knowledge would be extremely useful, it would also be highly dependent on the peculiarities of the individual case examined. The model can generate more broadly applicable information in its general form by suggesting hypotheses that have general impact on the

investment behavior of all cooperatives.

Instead of attempting an exhaustive comparative statics analysis of the impact of the decision variable (I) on all of the parameters of the model, it will be more pertinent given the objectives of this study to individually examine what can be gleaned from the model with respect to the three major property rights-related cooperative investment obstacles mentioned in Chapter 3.0: the common-property problem, the investment portfolio problem, and the residual horizon problem.

## CHAPTER 5.0 THE COMMON-PROPERTY PROBLEM.

To illustrate the common-property problem, it will be sufficient to compare the difference in additional benefits received in terms of the price offered by the cooperative ( $P_{mt}$ ) to its members from a marginal increase in investment by members of open- and closed-membership cooperatives. In an open cooperative,  $N_t$  is allowed to vary freely in response to the price offered by the cooperative for member-supplied input. A closed cooperative is defined in terms of the current model as the fixing of  $N_t$ , the level of membership for all periods.

### 5.1 SUPPLY RESPONSE TO MEMBER PAYMENTS IN COOPERATIVES

The common-property is illustrated if the value  $\partial P_{mt}/\partial I_{t-1}$  for the two-period case demonstrates that returns to the investment of existing members are diluted by the supply response of new members.  $\partial P_{mt}/\partial I_{t-1}$  is the appropriate term because of how investment is specified to create capital and impact the net surplus function in equation (4.8). Investment in period  $t$  is assumed to impact the capital stock in succeeding years.

To find  $\partial P_{mt}/\partial I_{t-1}$  the quotient rule of differentiation is employed on equation 4.8, remembering that  $P_{mt}$  is defined as  $NS_t/(m_t N_t)$ .

$\partial P_{mt}/\partial I_{t-1}$ , the derivative can now be written as:

$$\frac{\partial P_{mt}}{\partial I_{t-1}} = \frac{\frac{\partial NS_t}{\partial I_{t-1}} (m_t N_t) - NS_t \frac{\partial (m_t N_t)}{\partial I_{t-1}}}{(m_t N_t)^2} \quad (5.1)$$

By expanding the terms  $\partial NS_t / \partial I_{t-1}$  and  $\partial (m_t N_t) / \partial I_{t-1}$  using the chain rule and consolidating the resulting term:

$$P_{Qt} (m_t N_t)^{-1} \frac{\partial K_t}{\partial I_{t-1}} \frac{\partial Q_t}{\partial K_t} = A$$

equation (5.1) can be written as:

$$\begin{aligned} \frac{\partial P_{mt}}{\partial I_{t-1}} = & A + P_{Qt} \frac{\partial Q_t}{\partial m_t} \frac{\partial m_t}{\partial I_{t-1}} (m_t N_t)^{-1} + P_{Qt} \frac{\partial Q_t}{\partial N_t} \frac{\partial N_t}{\partial I_{t-1}} (m_t N_t)^{-1} \quad (5.2) \\ & - \frac{\partial Z_t}{\partial K_t} \frac{\partial K_t}{\partial I_{t-1}} (m_t N_t)^{-1} - \frac{\partial Z_t}{\partial m_t} \frac{\partial m_t}{\partial I_{t-1}} (m_t N_t)^{-1} \\ & - \frac{\partial Z_t}{\partial N_t} \frac{\partial N_t}{\partial I_{t-1}} (m_t N_t)^{-1} - NS_t m_t \frac{\partial N_t}{\partial I_{t-1}} (m_t N_t)^2 \\ & - NS_t N_t \frac{\partial m_t}{\partial I_{t-1}} (m_t N_t)^2 \end{aligned}$$

Note that by the definition of  $P_{mt}$  from equation (4.8),  $(m_t N_t)^{-1}$  can be written as  $P_{mt} / NS_t$ . Again for ease of computation, redefine the term A as:

$$A = \frac{P_{mt}}{NS_t} \frac{\partial K_t}{\partial I_{t-1}} \left( P_{Qt} \frac{\partial Q_t}{\partial K_t} - \frac{\partial Z_t}{\partial K_t} \right).$$

Combining terms and rearranging common factors (5.2) becomes:

$$\begin{aligned} \frac{\partial P_{mt}}{\partial I_{t-1}} = A + \frac{P_{mt}}{NS_t} & \left[ \left( \frac{\partial Q_t}{\partial m_t} \frac{\partial m_t}{\partial I_{t-1}} P_{Qt} \right) + \left( \frac{\partial Q_t}{\partial N_t} \frac{\partial N_t}{\partial I_{t-1}} P_{Qt} \right) \right. \\ & - \left( \frac{\partial Z_t}{\partial m_t} \frac{\partial m_t}{\partial I_{t-1}} \right) - \left( \frac{\partial Z_t}{\partial N_t} \frac{\partial N_t}{\partial I_{t-1}} \right) - \left( P_{mt} m_t \frac{\partial N_t}{\partial I_{t-1}} \right) \\ & \left. - \left( P_{mt} N_t \frac{\partial m_t}{\partial I_{t-1}} \right) \right] \end{aligned} \quad (5.3)$$

Note that  $\frac{\partial m_t}{\partial I_{t-1}} = \frac{\partial m_t}{\partial P_{mt}} * \frac{\partial P_{mt}}{\partial I_{t-1}}$  and  $\frac{\partial N_t}{\partial I_{t-1}} = \frac{\partial N_t}{\partial P_{mt}} * \frac{\partial P_{mt}}{\partial I_{t-1}}$  so that (5.3) becomes:

$$\begin{aligned} \frac{\partial P_{mt}}{\partial I_{t-1}} = A + \frac{\partial P_{mt}}{\partial I_{t-1}} \frac{\partial m_t}{\partial P_{mt}} \frac{P_{mt}}{NS_t} & \left[ P_{Qt} \frac{\partial Q_t}{\partial m_t} - \frac{\partial Z_t}{\partial m_t} - N_t P_{mt} \right] \\ + \frac{\partial P_{mt}}{\partial I_{t-1}} \frac{\partial N_t}{\partial P_{mt}} \frac{P_{mt}}{NS_t} & \left[ P_{Qt} \frac{\partial Q_t}{\partial N_t} - \frac{\partial Z_t}{\partial N_t} - m_t P_{mt} \right] \end{aligned} \quad (5.4)$$

Equation (5.4) must be solved for  $\frac{\partial P_{mt}}{\partial I_{t-1}}$ . The term  $(\frac{\partial m_t}{\partial P_{mt}} \frac{P_{mt}}{NS_t})$  can be written as  $s_{mt} (P_{mt} N_t)^{-1}$  by multiplying it by the factor  $m_t/m_t$ .  $s_{mt}$  is interpreted as the the elasticity of supply response on the part of existing members in the cooperative in response to a change in the price the cooperative can offer per unit of member- supplied product. An expression  $s_{Nt} (P_{mt} m_t)^{-1}$  is found in a similar manner to equation (5.4) where  $s_{Nt}$  represents the elasticity of supply response by

new members when they are attracted into the cooperative by an investment-induced increase in  $P_{mt}$ . Equation (5.4) becomes:

$$\frac{\partial P_{mt}}{\partial I_{t-1}} = \frac{\frac{P_{mt}}{NS_t} \frac{\partial K_t}{\partial I_{t-1}} (P_{Qt} \frac{\partial Q_t}{\partial K_t} - \frac{\partial Z_t}{\partial K_t})}{1 - [(s_{mt} (P_{mt} N_t)^{-1} (P_{Qt} \frac{\partial Q_t}{\partial m_t} - \frac{\partial Z_t}{\partial m_t}) - s_{mt}) + (s_{Nt} (P_{mt} m_t)^{-1} (P_{Qt} \frac{\partial Q_t}{\partial N_t} - \frac{\partial Z_t}{\partial N_t}) - s_{Nt})]} \quad (5.5)$$

The final step in determining the change in price paid to members with a change in member investment is to normalize the solution found in (5.5) to reflect the fact that the effects perceived by individual members, not the cooperative in aggregate is being examined. To reflect this level of change, the investment terms of (5.5) are multiplied by  $(m_{t-1}/N_{t-1})$  to reflect the size of the average member's investment at the time when investment decisions are made in period  $t-1$ . The impact of a change in investment on price paid to members becomes:

$$\frac{\partial P_{mt}}{\partial I_{t-1}} = (m_{t-1} N_{t-1}) \frac{\frac{P_{mt}}{NS_t} \frac{\partial K_t}{\partial I_{t-1}} (P_{Qt} \frac{\partial Q_t}{\partial K_t} - \frac{\partial Z_t}{\partial K_t})}{1 - [(s_{mt} (P_{mt} N_t)^{-1} (P_{Qt} \frac{\partial Q_t}{\partial m_t} - \frac{\partial Z_t}{\partial m_t}) - s_{mt}) + (s_{Nt} (P_{mt} m_t)^{-1} (P_{Qt} \frac{\partial Q_t}{\partial N_t} - \frac{\partial Z_t}{\partial N_t}) - s_{Nt})]} \quad (5.6)$$

Equation (5.6) indicates that the response of the price paid to members for their input to an increase in investment is equivalent to the marginal value of the increased productive capacity of the cooperative (numerator) discounted by the combined supply response of existing and new members to the initial increase in price (denominator).

The direction and limits of change in  $P_{mt}$  in response to increased investment can be determined by discovering the sign of equation (5.6). The denominator of equation (5.6) will always be positive in sign. The elasticities of existing- and new-member supply response to changes in the offered price ( $s_{mt}$  and  $s_{Nt}$ ) will be positive if members are themselves profit maximizers. The sign of the terms  $(P_{Qt} \partial Q_t / \partial m_t - \partial Z_t / \partial m_t)$  and  $(P_{Qt} \partial Q_t / \partial N_t - \partial Z_t / \partial N_t)$  can be seen to be negative through examination of the Helmlinger-type cooperative represented in Figure 3. The cooperative, which pays an average price  $P_{mt} = NS_t / M_t$ , can offer any price along the curve  $P_{mt}$ . Once a price is announced, members will respond by supplying an amount where their combined supply curve ( $M_t = m_t N_t$ ) intersects  $P_{mt}$  at a point like a. The term  $(P_{Qt} \partial Q_t / \partial m_t - \partial Z_t / \partial m_t)$  can be interpreted as the value of the marginal product of the input  $m$  minus the marginal factor cost of processing that level of  $m$ . As can be seen in Figure 3, for any combination of  $P_m$  and  $m$  the cooperative will generate, the marginal factor cost - mfc (point b in this case) will exceed the value of the marginal product - vmp (point c in this case) indicating that this term will be negative in sign.

Similar curves could be drawn to represent response of new members only and the conclusion of a negative sign would be the same for  $(P_{Qt} \partial Q_t / \partial N_t - \partial C_t / \partial N_t)$ . The denominator is a positive value minus two negative values, indicating it will always be positive. At the limit, the denominator of (5.6) will approach infinity as the supply responses become extremely large.

The numerator of (5.6) can also be signed as positive. The ratio  $P_{mt} / NS_t$  will always be positive for positive prices. The partial derivative  $\partial K_t / \partial I_{t-1}$  will also be positive for rational investments.

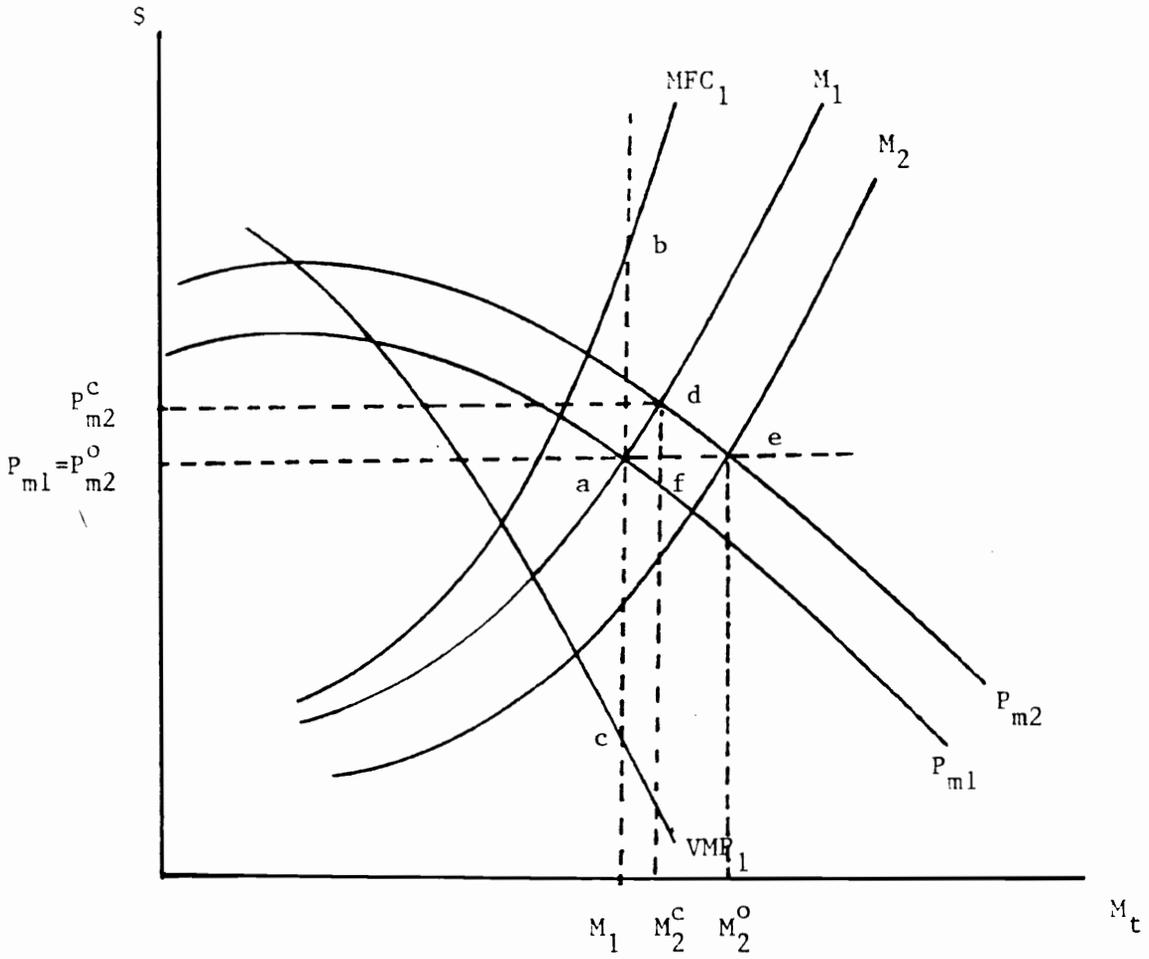


Figure 3. The Common-Property Problem in a Helmsberger Cooperative

The term  $(P_{Qt} \partial Q_t / \partial K_t - \partial Z_t / \partial K_t)$  represents the marginal value of increased investment in the cooperative minus the marginal increase incost associated with maintenance of the new level of capital stock. The term  $\partial Z_t / \partial K_t$  is not the entire cost of additional capital. The cost of capital in period  $t$  is usually considered to be its purchase price minus its discounted salvage value. In this model, the cost of capital in period  $t$  is its purchase price plus its discounted maintenance cost minus its discounted salvage value. Though a cooperative would not necessarily employ capital until its marginal benefit equaled its cost, it is unlikely that the portion  $\partial Z_t / \partial K_t$  would exceed  $P_{Qt} \partial Q_t / \partial K_t$ , indicating the numerator is most likely positive. In addition, since the numerator is the term that determines the amount of shift in the function  $P_{mt}$ , it is not rational that a cooperative would knowingly adopt an investment that would reduce net surplus and shift  $P_{mt}$  down.

The change in the average price paid to members, in response to an increase in the level of average investment, will be positive or at the limit zero. The limit of zero change is established as the supply response of existing and new members, that is, the denominator of (5.6) becomes extremely large, thus setting an effective limit on the amount of shift which will be observed to a point like  $e$  on the member supply curve  $M_2$  in Figure 3.

## 5.2 THE COMMON-PROPERTY PROBLEM IN OPEN- AND CLOSED-MEMBERSHIP COOPERATIVES

The case of the closed membership cooperative will be similar to the open case with the exception that a fixed level for  $N_t$  will result in the elimination of the second term in the denominator of equation (5.6) resulting in the following function.

$$\frac{\partial P_{mt}}{\partial I_{t-1}} = \frac{(m_{t-1} N_{t-1}) \frac{P_{mt}}{NS_t} \frac{\partial K_t}{\partial I_{t-1}} (P_{Qt} \frac{\partial Q_t}{\partial K_t} - \frac{\partial Z_t}{\partial K_t})}{1 - [(s_{mt} (P_{mt} N_t)^{-1} (P_{Qt} \frac{\partial Q_t}{\partial m_t} - \frac{\partial Z_t}{\partial m_t}) - s_{mt})]} \quad (5.7)$$

The common-property problem arises because an investment is made by cooperatives members of size  $N_{t-1}$  in some period  $t-1$ , but the resultant return, expressed as increased  $P_{mt}$ , is available to existing members plus all who would wish to join and patronize the open cooperative in some later period  $t$ . The supply response from increased members will result in a shift in the member supply curve to the right no further than represented by  $P_{m2}$  in Figure 3. The ultimate price the open cooperative is able to pay for the average unit of investment is correspondingly reduced over what the closed cooperative would pay by a factor of:

$$\frac{1}{1 - [(s_{Nt} (P_{mt} m_t)^{-1} (P_{Qt} \frac{\partial Q_t}{\partial N_t} - \frac{\partial Z_t}{\partial N_t}) - s_{NT})]}$$

In terms of Figure 3, the original membership would respond to a price increasing investment by expanding along their supply curve  $M_1$  to a point like d, supplying  $M_2^c$  to the cooperative. New members will join, attracted to the new price, supplying  $M_2^o$ . If the cooperative had remained closed to new members, current members would have received the price  $P_{m2}^c$  earning a revenue equivalent to the area  $OM_2^c d P_{m2}^c$ . With the supply response of new members, who are not required to compensate existing members for past investments, total input supply expands to  $M_2^o$ , reducing the average price to be received by all to  $P_{m2}^o$ . New members receive a revenue equivalent to the area  $M_2^c M_2^o e f$  while the revenue of existing members is reduced in comparison to the closed case by the area  $P_{m2}^o f d P_{m2}^c$ . The common-property problem exists unless existing members are compensated by new members. If the existing body of cooperative members are not compensated, and they recognize the common-property problem, they will evaluate investments based on their realizable returns after the anticipated supply response of new members, resulting in the rejection of some investments that would otherwise be adopted. Note that the existence of the common-property problem does not necessarily mean that existing members will choose to keep the membership closed. Existing members may still gain from investments as evidenced by the area  $M_1 M_2^c f a$  in Figure 3, but some portion of potential returns is lost to entering members.

## CHAPTER 6.0 THE INVESTMENT PORTFOLIO PROBLEM.

Thus far, individual members have been modeled as seeking to maximize the utility derived from the consumption of a bundled composite-good over time expressed as monetized consumption streams  $(c_1, c_2, \dots, c_S)$ , where  $c_t$  is equal to  $p_{1t} x_{1t} + \dots + p_{nt} x_{nt}$ . Demonstration of the investment portfolio problem will be more illustrative if the composite consumption goods are disaggregated back into individual commodities.

Following Arrow's work<sup>127</sup>, in a world of pure exchange of commodities,  $I$  individuals seek the consumption over time of some mix of  $x_c$  commodities  $(c=1, \dots, C)$  under  $S$  possible, but uncertain future states of nature. Individuals hold subjective probabilities  $\pi_{is}$  for the state  $s$  occurring. The quantity  $x_{isc}$  is the amount of commodity  $c$  claimed by individual  $i$ , if state  $s$  occurs. Individuals choose commodities so as to satisfy a quasi-concave preference function of the form:

$$V_i(x_{i11}, \dots, x_{i1C}, x_{i21}, \dots, x_{iSC}) \quad (6.1)$$

Claims on physical commodities are limited by available resources such that all such claims do not exceed available supplies:

---

<sup>127</sup> Arrow, Kenneth, "The Role of Securities in the Optimal Allocation of Risk Bearing", Review of Economic Studies 14(1964):92-96.

$$\sum_{i=1}^I x_{isc} = x_{sc}. \quad (6.2)$$

In addition, the sum of each individual's claims on commodities in state  $s$  cannot exceed the total available stock in that state. To optimally allocate resources and risk-bearing services, individuals choose  $x_{isc}$  subject to (6.2) such that no other choice would make every one better off, that is;

$$x_{isc}^*, \quad (i = 1, \dots, I), \quad (s = 1, \dots, S), \quad (c = 1, \dots, C). \quad (6.3)$$

The "\*" indicates that for each of the  $I$  individuals, the bundle of commodities taken is optimal given their preferences.

Assume there exist a set of incomes  $y_i$  and given prices for commodities  $P_{sc}$  for claims on  $x_c$  if state  $s$  occurs. Each individual now chooses levels of commodities subject to the budget constraint

$$\sum_{s=1}^S \sum_{c=1}^C P_{sc} x_{isc} = y_i. \quad (6.4)$$

Individuals, given a voluntary, competitive market, incomes, prices, and their expressed preferences, will choose a level of  $x_{isc}$  that is optimal; that is, the same bundle  $x_{isc}^*$ .

Translation of the above argument from a world of claims on commodities into a world where securities or claims on residuals exist is relatively simple. Individuals purchase claims on securities not physical commodities. These securities will return a monetary value that, in turn, may be used to purchase some mix of commodities. For any optimal allocation  $x_{isc}^*$  let commodity prices  $P_{sc}$  and income  $y_i$  be defined as before. Assume there are  $S$  securities available for purchase, each of which will pay one unit of money if state  $s$  occurs and nothing otherwise. Let  $q_s$  be the price of the  $s$ th security and  $p_{sc}$  the value of commodity  $c$  if state  $s$  occurs. Securities must be selected according to the rule:

$$q_s p_{sc} = P_{sc}. \quad (6.5)$$

If  $q_s p_{sc}$  is equivalent to the price of a claim on commodity  $c$  in state  $s$ , then an individual would purchase the following optimal mix of securities so as to eventually end up with the same optimal mix of commodities as was chosen in (6.3):

$$y_{is}^* = \sum_{c=1}^C P_{sc} x_{isc}^*, \quad (6.6)$$

$y_{is}^*$ , the value of purchased securities is subject to the following income constraint where the sum of securities purchased for all states cannot exceed the  $i$ th individual's income:

$$\sum_{s=1}^S q_s y_{is}^* = y_i.$$

The sum of all claims to be paid if state  $s$  occurs is

$$\sum_{i=1}^I y_{is} = y. \quad (6.7)$$

The value of a security for state  $s$  is found by substituting (6.6) into the expression for  $y_{is}$  in (6.7) and multiplying both sides by  $q_s/y$ , resulting in:

$$q_s = \frac{\sum_{i=1}^I \sum_{c=1}^C P_{sc} x_{isc}^*}{y}. \quad (6.8)$$

With the prices for securities ( $q_s$ ) and commodities ( $P_{sc}$ ) specified as before, security and commodity markets will operate so as to lead to a purchase of  $x_{isc}^*$  commodities. From (6.6), we see that the individual will demand  $y_{is}^*$  of security  $s$ . If state  $s$  occurs, the individual will receive  $y_{is}$  with which to purchase commodities that cost  $P_{sc}$ . It remains to show that the amount and mix of commodities purchased will be the set  $x_{isc}^*$  to complete the demonstration.

Suppose the individual who spent  $y_{is}^*$  on security  $s$ , received  $y_{is}$  when state  $s$  occurred, and faces commodity prices  $P_{sc}$  now has the certain utility function  $U_i(x_{is1}, \dots, x_{isc})$  subject to the constraint

$$\sum_{c=1}^C P_{sc} x_{isc} = y_{is}. \quad (6.9)$$

Suppose that the individual chooses the bundle  $x_{isc}^+$  ( $c=1, \dots, C$ ) where:

$$U_i(x_{i11}^+, \dots, x_{iSC}^+) \geq U_i(x_{i11}^*, \dots, x_{iSC}^*). \quad (6.10)$$

That is, the chosen bundle of commodities, given available income and the state of nature  $s$ , somehow brings greater utility than the optimal allocation identified under conditions of commodity exchange only.

Arrow shows that by the von Neuman-Morgenstern<sup>128</sup> theorem the function  $U_i$  can be written so that:

$$V_i(x_{i11}, \dots, x_{iSC}) \geq \sum_{s=1}^S \pi_{is} U_i(x_{is1}, \dots, x_{isC}). \quad (6.11)$$

If the strict inequality in (6.10) holds for the state  $s$  where  $\pi_s > 0$  then;

$$V_i(x_{i11}^+, \dots, x_{iSC}^+) > V_i(x_{i11}^*, \dots, x_{iSC}^*). \quad (6.12)$$

That is, the bundle  $x^+$  brings more utility than  $x^*$ , the optimal bundle in a world without a securities market. However, if the income constraint for the purchased bundle with income from securities, (6.9) is multiplied by  $q_s$ , the price of security  $s$ , then the purchase

---

<sup>128</sup> Ibid., p. 93

satisfies the original income constraint (6.4). By design, only the bundle  $(x_{i11}^*, \dots, x_{iSC}^*)$  satisfies this constraint; therefore, the strict inequality of (6.11) is an impossible contradiction. Only the equality portion of (6.11) may hold. The bundle  $(x_{i11}^*, \dots, x_{iSC}^*)$  maximizes the utility of the holder of securities, and this bundle will be chosen in all cases where the market for securities is voluntary and competitive.

Once the decision is made to join and patronize a cooperative, a member's decisions as to how to arrange the level and mix of securities is no longer independent or completely voluntary. There are no market determined prices for the securities, the residual claims of a cooperative. Members' investment decisions in the cooperative are the result of an indirect collective decision process usually initiated by management and the board of directors. The decision to invest is inseparable from patronage decisions, further constraining the voluntary nature of choosing a level and mix of securities. The unconstrained investor makes investment decisions and eventual consumption decisions based on equation (6.6) and his preference function. Instead of equation (6.6) the member of a cooperative would face the following rule for allocating income among securities.

$$y_{is} = p_{s1} x_{is1} + \sum_{c=2}^C p_{sc} x_{isc}. \quad (6.13)$$

Only if the level of investment allocated to the cooperative ( $p_{s1} x_{isc}$ ) happened to be equal to  $p_{s1} x_{isl}^*$  would the value of the two portfolios derive the same utility. The demonstration presented above indicates that if the level of investment required of a cooperative member differs from the level he would choose voluntarily, the resultant portfolio would not represent an optimal allocation of risk-bearing services. If risk-bearing services are more expensive than members would prefer (that is, the member must assume more risk than he would otherwise choose), pressure will be applied by members for the cooperative to adopt an investment portfolio that entails smaller levels of risk even if such a portfolio has lower expected returns.

## CHAPTER 7.0 THE RESIDUAL HORIZON PROBLEM

The right to residuals in a cooperative, that are generated as a result of investment but earned directly through patronage of the organization, is severely restricted relative to the corresponding right in an IOF. As previously mentioned, members cannot capture any portion of the net income stream generated by an investment that occurs after the member ceases to be an active patron. Because the cooperative claim is inalienable, members cannot sell it in order to capitalize its present value.

In the context of the present model of investment behavior in cooperatives, the residual horizon problem only has meaning when there exist alternative investment opportunities that will compete with the cooperative for the available resources of the member-patrons. Without such alternatives, the residual horizon problem would have no impact on the investment behavior of members because the reduced realizable return associated with horizon-shortened investments would be considered a cost of doing business with the "only game in town". Therefore, it is necessary to introduce such an alternative, if only in general terms. In the specification of the member-behavior model, two sources of investment opportunity were available to each individual. The variable  $i_t$  was specified as cash investment in the cooperative and  $o_t$  was specified as investment in other opportunities with potential for

increasing the member's income in future periods. The variable  $o_t$  can be considered as investment in either the individual's own production unit or perhaps some relatively riskless investment that returns a competitive rate; for example, a money market fund that returns an interest rate  $s_t$ .

When more than one investment opportunity exists for cooperative members, the interesting question becomes how will members' investable resources be allocated among the alternatives? The member-behavior model presented earlier indicates that members should invest their resources in the alternative with the greatest marginal return until the marginal return from each alternative is equal. As will be seen, the residual horizon problem occurs because members will follow the proper decision rule for allocating investment, but their perception of the realizable flow of returns on investments in the cooperative may differ from the actual flow of returns as a result of the restricted term of validity imposed on cooperative claims.

The S investment and consumption constraints of the cooperative model indicate that a infinite number of consumption streams can be formulated, but the level of consumption in any period depends on the investment and consumption decisions taken in past periods. Given past decisions, the maximum level of consumption possible in period  $t$  is clearly defined where  $I_t$  equals zero. As actual investment in  $t$  is increased from zero,  $C_t$  falls, but  $C_{t+1}$  will increase. This

relationship provides the basis for defining what Furubotn<sup>129</sup> calls an average rate of return on invested capital.

$$r^c = \frac{C_{t+1} - C_{t+1}^0}{C_t - C_t^0} = \frac{C_{t+1} - C_{t+1}^0}{I_t} \quad (7.1)$$

The average rate of return is found by dividing the difference between actual planned consumption in period t+1 and maximum possible consumption in t+1 by the amount of actual investment in t. The total return generated by the investment in period t is not limited to period t+1 because the inclusion of K in the cost function Z implies that capital will be maintained in perpetuity. The term  $C_{t+1} - C_{t+1}^0$  will appear in every period's expression to indicate the impact of the investment in period t, so the expression in equation (7.1) remains a valid average rate of return.

Since cooperative members do not have a perpetual claim on the flow of income deriving from an investment in the cooperative, and may claim such income only so long as they are active patrons, they must evaluate the rate of return based on a horizon that may be shorter than the length of the income stream generated by the investment. For example, a member may change the mix or level of commodities produced, seek out an alternative source of input or marketing services, or even retire. The effect may be somewhat mitigated, but not eliminated, by the unique way

---

<sup>129</sup> Furubotn, E., op. cit. p.115.

in which members invest in cooperatives. The equity portion of member investment in a cooperative is "guaranteed" to be returned to the member after some usually unspecified period of revolvment. Under conditions of uncertainty, return of the equity portion of member investment is subject only to the risk that the cooperative will survive and be liquid enough to repay the capital. Return of the equity portion is not fully dependent on the success of the investment itself. Though the two probability distributions would be correlated, the correlation would not be absolute. In this sense, the comparative risk of earning a return to investment that at least equals the initial outlay would probably be less in the case of a cooperative than in the case of an IOF, where the entire investment is subject to the risk of the investment's success. Under conditions of certainty, the full magnitude of the residual horizon problem will be realized because the income streams generated by an investment in either the cooperative or the IOF are known beforehand.

Call the average rate of return generated by a particular investment project  $r^c$ . If a member's planning horizon is shorter in length than the income stream generated by the investment, the member will judge an investment's worth according to a different average rate of return that is related to  $r^c$  by the following present value equation.

$$i_t = \sum_{s=t+1}^S \frac{(r i_t)_s}{(1+r^m)^s} \quad (7.2)$$

When equation (7.2) is solved for  $r^m$ , the member will have found the realizable rate of return from the investment in period  $t$  given the member's restricted horizon. If the members horizon is equal to or greater than the income stream generated by the investment, equation (7.2) reduces to an expression of the present value of the investment given the member's discount rate. Using even more general terms equation (7.2) can be written as:

$$r = r^c(i_t, S). \quad (7.3)$$

The perceived or realizable average rate of return for the cooperative member is a function of the investment chosen and the length of the planning horizon  $S$ . For a given investment in period  $t$ ,  $r^m I_t$  gives the total increase in consumption resources that can be obtained per period through the planning horizon. Note that if the member's planning horizon  $S$  is shorter than the term of existence of the cooperative,  $T$ , then some of the income stream is lost and  $r^m$  is also dependent on  $S$ . Therefore, a corrected marginal return to invested capital is given by:

$$\frac{\partial [r(i_t, S) I_t]}{\partial i_t} = r + I_t \frac{\partial r}{\partial i_t} + S \frac{\partial r}{\partial S} \quad (7.4)$$

The sign of equation (7.4) is clear for a given member's horizon. If there is a stage 3 segment in the cooperative's production function,  $r^m$  must eventually fall as the quantity of investment rises.

As described earlier, the relationships established in equations (7.1) through (7.4) will have an impact on the investment behavior of the cooperative only in the presence of viable alternatives for member's investment resources. Suppose that as a result of investment in other activities ( $o_t$ ), the member of a cooperative can receive a return  $d$ . In order for willing investment to take place in the cooperative, the realizable marginal rate of return from investment must at least equal the rate  $d$ . Aggregating over all members, the following constraint must be added to the investment behavior model.

$$r = I_t \frac{\partial r}{\partial I_t} + S \frac{\partial r}{\partial S} \geq d. \quad (7.5)$$

If unrestricted arbitrage exists with respect to the allocation of member's investable resources, the above rule must hold. Such arbitrage has already been shown to be somewhat restricted in the case of cooperative investment. The individual member's decision over how much to invest in the cooperative is not a completely independent one; the investment decision is a collective-choice problem. However, each member of a cooperative who's investment portfolio does not coincide with his horizon will put pressure on the association to adjust the

portfolio to meet his horizon. If the cooperative does not respond, these members will exit or threaten to exit. If the cooperative cannot replace such members with others who have horizons that permit full capture of the cooperative's investment-generated income streams, the end result will be an adjustment as if equation (7.5) were binding.

The constraint represented in equation (7.5) will result in three possible options with respect to the cooperative investment process. If the rate of return generated by investment in other activities is greater than the realizable rate generated by the cooperative throughout all possible ranges of member investment, then all affected members will exit or threaten to exit the cooperative, and they may choose to invest elsewhere. The second polar case will occur when the realizable rate of return generated by the cooperative exceeds that of other activities over all ranges of possible investment. In such a case members will willingly invest all available resources in the cooperative regardless of any horizon restriction. The final and most likely occurrence is that for some range of investment, the rate of return generated by the cooperative will exceed  $d$ , but due to eventual diminishing returns to investment, the marginal rate of return to cooperative investment will fall below  $d$ , and those members who are horizon-restricted will lose incentive to invest further.

The impact of the residual horizon problem is demonstrated graphically for the two-period case in Figure 4. Members who have preferences for consumption like those represented by the indifference

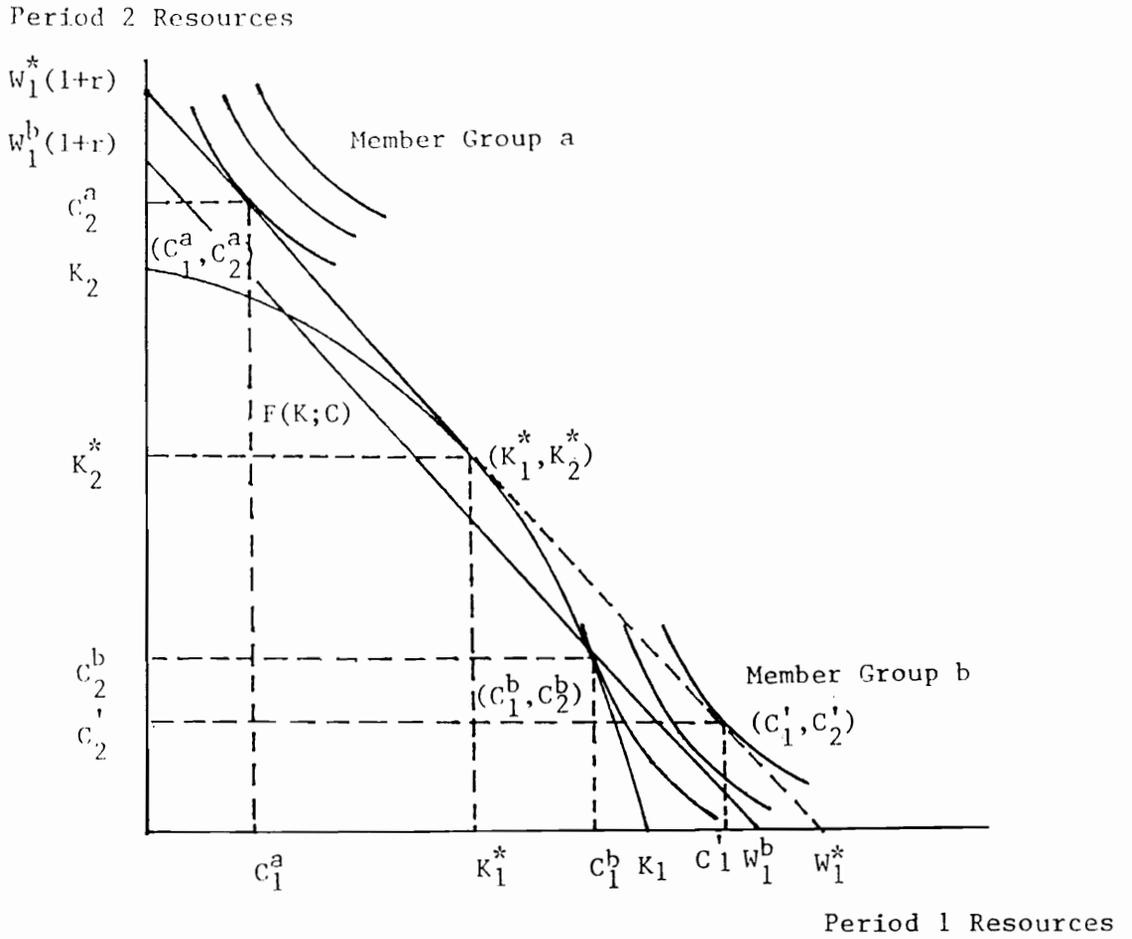


Figure 4. Member Investment Decision in Cooperative Organization.

sets a and b must make decisions as to the quantity of resources to invest in the cooperative plant in period 1, and conversely, what quantity of resources will be either invested in the member's private production or consumed.<sup>130</sup> Investment opportunities in the cooperative organization between the two periods are expressed by the transformation function  $F(K;C)$ .

Parallel lines such as  $W_1^*$   $W_1^*$  perform two related functions. In the first case, these lines represent the discounted present or market value through periods of the production process at the indicated interest rate. The slope of these lines is  $-(1+r)$ , where the interest rate is  $r$ . In Figure 4, the maximum possible current market value is indicated by  $W^*$ , where the market value line becomes tangent to the opportunities transformation function at  $(K_1^*, K_2^*)$ . The second function of the market value line is to indicate the constant borrowing and lending rate  $r$  at which fixed and residual claims may be traded over time. Note that the constant borrowing and lending rate presumes a perfectly functioning capital market. While the perfect market and certain market assumptions imply that there is no functional difference between fixed and residual claims, it is not assumed that all claims are residual in nature.

---

<sup>130</sup> Note that particular investment decisions are usually initiated by the cooperative management and ratified by the cooperative board of directors. The equity capital requirements are determined by management and raised as withholdings from patronage refunds. Therefore, the member decision as to the level of personal investment in the cooperative is often indistinguishable from the decision as to what level to patronize the cooperative.

Borrowing and lending by fixed-claim instruments is permitted.

A member whose preferences are characterized by the set of indifference curves  $a$  has the quantity  $K_1$  of resources available in period 1. This member would choose to patronize the cooperative until the quantity  $K_1 - K_1^*$  is invested in the organization. This member would then lend (or purchase a security)  $K_1^* - C_1^a$  in the market in order to receive  $K_2^* - C_2^a$  in period 2.

Members whose preferences are represented by the the set of indifference curves  $b$  face a different set of choices. If the residual claims of cooperatives were of full horizon, or if the planning of these members extended at least through the 2 periods represented in Figure 4<sup>131</sup>, then such members would also invest the quantity  $K_1 - K_1^*$  in the cooperative. Such members would then attempt to borrow on the value of their claims an amount equal to  $C_1' - K_1^*$  and repay an amount  $K_2^* - C_2'$  in period 2.

Rational investment choices are constrained when the planning horizon of members such as  $b$  does not extend the full time-span represented in Figure 4. Members who do not anticipate patronizing the cooperative throughout the full horizon of the investment, for reasons of retirement, can neither capture the value of future income flows nor capitalize their entire present value. A member like  $b$  could not borrow or sell a security on the value of future income streams he/she

---

<sup>131</sup> Note that the two periods represented in Figure 4 need not be consecutive.

cannot realize. A point like  $(C'_1, C'_2)$  is not attainable. A member like b would choose to patronize and invest in the cooperative, the smaller amount  $K_1 - C_1^b$  in order to consume  $C_2^b$  in the last period.

## CHAPTER 8.0 THE RESIDUAL HORIZON PROBLEM: AN EXAMPLE

The following simplified example is intended to demonstrate the impact of the residual horizon problem on the investment behavior of cooperatives. Two firms will face evaluation of an identical investment project, in this case the construction of a milk processing plant. The two firms will be considered to be initially identical with respect to existing capital stock, technology, production capacity, quality of management, with the only fundamental difference being that one firm is organized as an IOF while the other firm is cooperatively owned by its member dairy producers.

### 8.1 THE INVESTOR-OWNED-FIRM (IOF) CASE

A fundamental problem of measurement exists when comparing the returns to investment between an investor-owned firm and a cooperative. In the case of the IOF, the anticipated net surplus generated as a result of an investment in capital stock can be unambiguously measured as a return to invested capital because the only roles of the firm's residual claimants are to contribute capital and bear risk. These residual claimants will be quite satisfied with firm policies that seek to maximize the return to invested capital which will manifest itself in the stock price of the residual claim according to the following Fundamental Principle of

Valuation.<sup>132</sup>

$$P_1 = \sum_{t=1}^S \left[ \frac{E_t - I_t}{(1+r)^t} \right] + \frac{P_S}{(1+r)^{S-1}}, \quad (8.1)$$

where:  $P_t$  = Price of a share of common stock in period  $t$ ,  
 $r$  = Discount rate on invested funds required by stockholders,  
 $E_t$  = Earnings firm existing assets in period  $t$ ,  
 $I_t$  = Invested funds in period  $t$ ,  
 $t$  = (1, 2, ..., S, ..., T).

The price or value of a share in period  $t$  is equal to the sum of the discounted value of the share's earnings less investment, plus the value of the share in the last period.

The property rights structure of the cooperative dictates that control not be exercised as a function of capital share, but rather as a function of the individual's vote, or occasionally, patronage share. Therefore, members want returns to investment to be expressed as returns to patronage. The possibility exists for a cooperative to operate a physical plant to the point where the return to capital employed is nil, but the return to patronage expressed in the price received by members for their product is quite satisfactory. For example, it is not difficult to imagine a situation where a cooperative builds a milk plant even though the prevailing price of dairy products sold will mean little

---

<sup>132</sup> Mao, James, Quantitative Analysis of Financial Decisions, New York: MacMillian Publishing, 1969, pp.465-467. and

Fama, Eugene, The Theory of Finance, Hinsdale: Dryden Press, 1972, pp. 86-92.

or no positive return to the assets employed. Members who now have a market for additional capacity they would not have had otherwise will perceive a positive return to patronage and therefore, approve the investment.

The dilemma of measurement of the productivity of capital means that a way must be found to directly compare the investment made by IOF's and cooperatives. For the case of the IOF, the following assumptions will be used to directly compare the investment made by the two types of organizations.

1. The IOF operates in an environment of certainty, rationality, efficient capital markets, and zero transaction costs.
2. The effects of taxes and depreciation are ignored.
3. Only the earnings and costs associated with the current investment project under examination will be considered. All prior earnings and investments are netted out.
4. Since the last term of the valuation equation (8.1) is dependent only on subsequent investments and earnings, it need not be considered.
5. The IOF dairy marketing/processing firm contemplates an investment in additional plant capacity that will generate a gross income stream that is comprised of three years of net negative returns followed by eleven years of positive returns. At the end of the fourteen-year period, the plant will be completely exhausted and have no salvage value or cost.
6. A dairy producer holds 1,000 shares of stock in the IOF, and milks sixty cows that produce 7,200 cwt. of milk/year that is sold to the IOF at competitive prices.
7. The cost of the investment is calculated at \$1.44/share of stock in each of the first three

years. This cost is translated in terms of the milk sold by the producer and amounts to \$0.20/cwt in each of the first three years. The positive cash flow is similarly translated into terms of milk sold and amounts to \$0.10/cwt. of milk sold in each of the remaining eleven years of the investment's life.

8. An initial value of  $r = .06$  is chosen as the inflation-free rate of return (discount rate) required by this dairy farmer in order for the investment to be judged acceptable.
9. Initially, it is assumed that all finance must come from internal sources. No debt financing is permitted.

## 8.2 THE COOPERATIVE CASE

In a cooperative, returns from investments in the organization's activities can only be earned through patronage. The right to the residual cash flows of the cooperative cannot be bought, sold, or otherwise transferred. Once the member-patron no longer actively patronizes the firm, there is generally no mechanism for receiving subsequent benefits. Unlike the IOF, the restrictions on alienability preclude the existence of secondary markets to value and capitalize these claims by ordinary means. In the example to be presented, the following assumptions and simplifications are used to define the nature of investment evaluation in a cooperative.

1. The cooperative operates in an identical economic environment as the IOF firm, including conditions of certainty, rationality, efficient capital markets and zero transactions costs.
2. The effects of taxes and depreciation are ignored.
3. Only the earnings and costs generated by the investment under examination are considered. All other prior and future earnings and investments are netted out.
4. The cooperative firm contemplates the identical investment that is detailed above in the case of the IOF.
5. A cooperative member with identical production characteristics to the producer described above supplies 7,200 cwt. of milk to the cooperative annually. For this producer the cost of the investment will result in \$0.20/cwt. of forgone price and patronage refund for the first three years of the investment's life, and a \$0.10/cwt. increase in total price received thereafter for eleven years. Note that this income stream is assumed to be net of any supply response effects either from existing or

future members. As in the IOF case, the new plant is assumed to have no salvage value or cost at the end of its useful life.

6. Initially a value of  $r = .06$  is used as the cooperative member's required real discount rate.
7. In order to isolate the effect of the residual horizon problem, it is assumed that 100% of the patronage refund offered by the cooperative is returned as cash; that is, investment represents forgone cash, not allocated equity. Normally some type of revolving fund is employed to return retained equity capital to members dollar for dollar some years later. This simplification is used in order to avoid confusion between the similar impacts of restricted investment horizons and those of the revolving equity fund on the current realizable returns to investment.
8. Initially, it is assumed that finance of the investment must come entirely from internal sources. No debt financing is permitted.

### 8.3 COMPARISON OF COOPERATIVE AND IOF INVESTMENT

In Figure 5, the discounted income stream generated by the proposed investment in the IOF dairy plant is presented. From the perspective of the producer who holds stock in the IOF, there is no effective limit on the investment horizon because the stockholder may sell or borrow on the value of the residual claim at any time and capture the present value of the entire investment. By the present-value rule for evaluating investment projects, the stock holder will find acceptable any investment that produces a zero or positive net present value given the discount rate, and in the absence of capital rationing, the IOF should adopt all such investment projects. The present value of any investment project is found by the equation (8.1). In Figure 5, the present value of the proposed investment may be found by summing the area above the discounted income stream line and below the broken line indicating zero discounted income with the area below the discounted income line and above the zero line. In this case the net present value of the investment is \$0.14/cwt., and the stockholder of the dairy producer-stockholder of the IOF would find this investment project acceptable given a real discount rate of 0.06.

Along with Figure 5, Figures 6 through 8 present a range of situations the cooperative member-patron would perceive given the same investment and discount rates and varying lengths of effective residual horizon. Figure 6 shows an extreme case where the member anticipates only six further years of active patronage. This member is able to capture only a small portion of the income stream generated by the

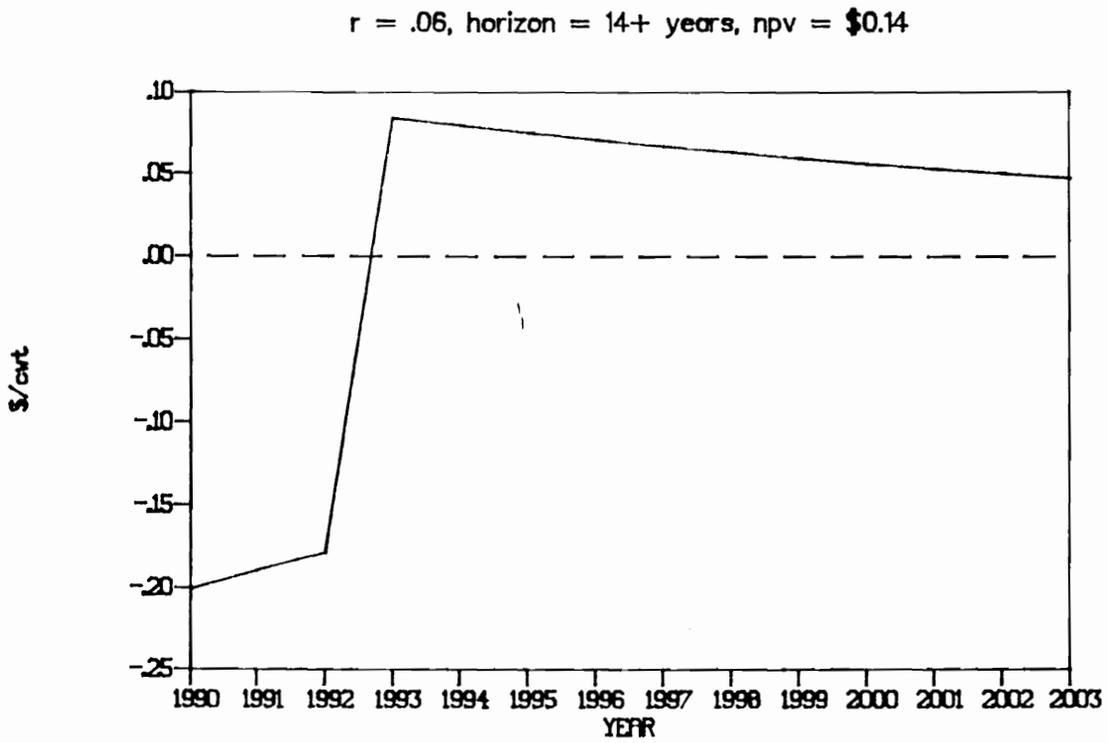


Figure 5. IOF Discounted Income Stream for Proposed Investment.

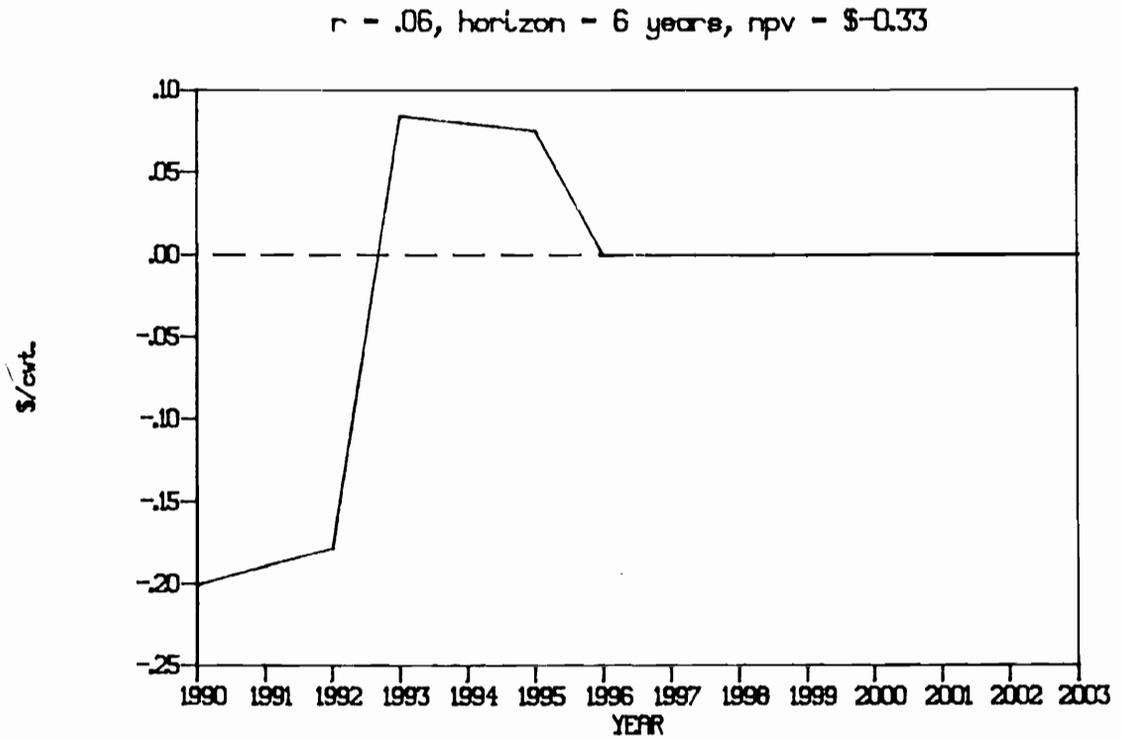


Figure 6. Coop Discounted Income Stream for Proposed Investment; Member Horizon = 6 Years

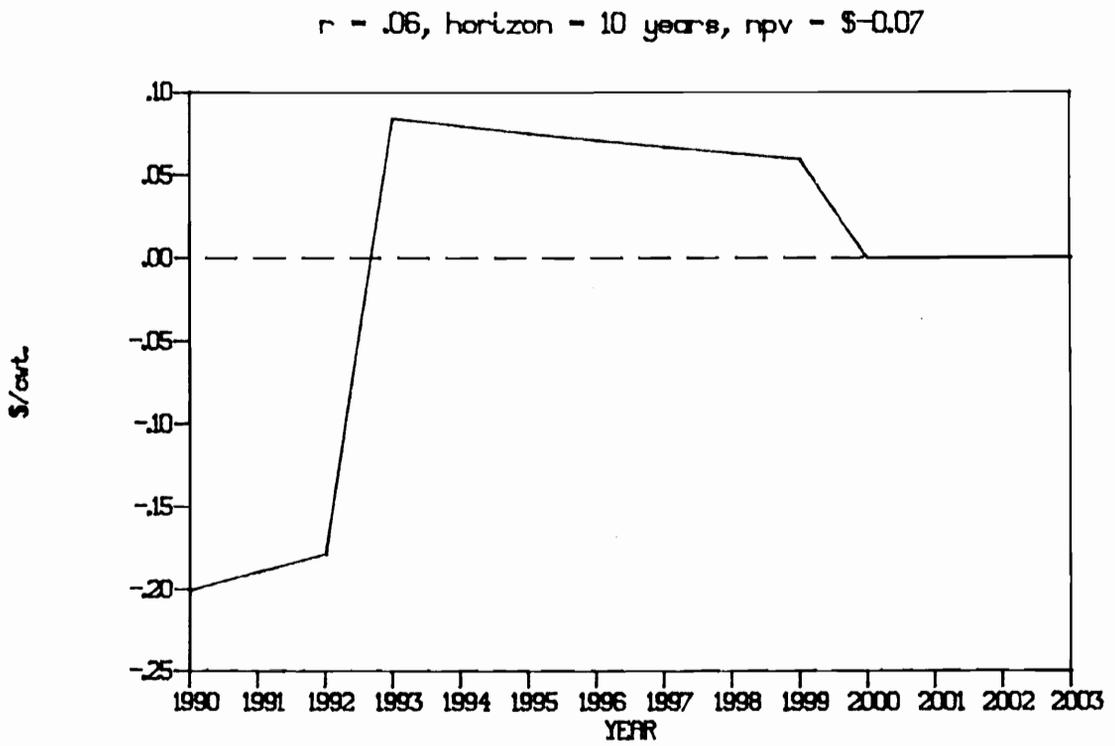


Figure 7. Coop Discounted Income Stream for Proposed Investment; Member Horizon = 10 Years

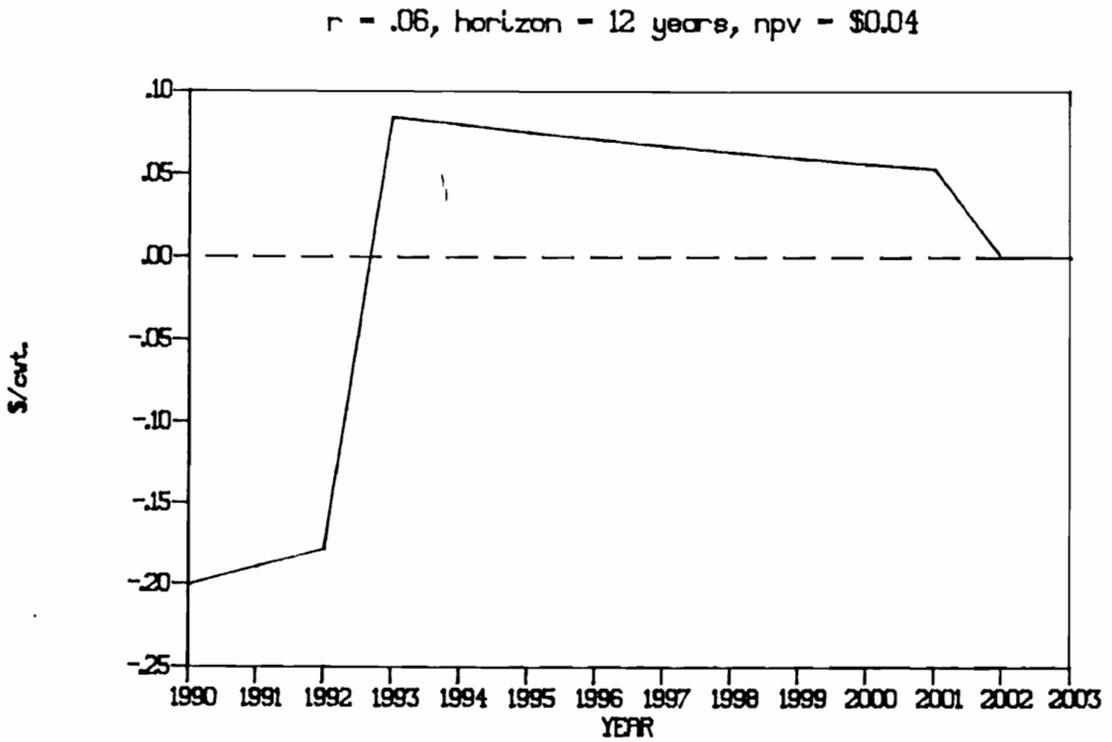


Figure 8. Coop Discounted Income Stream for Proposed Investment; Member Horizon = 12 Years

investment and will find that the realizable present value of the investment is negative (-0.33/cwt.) and therefore, unacceptable. Similarly, when the member's horizon is extended to ten years (Figure 7) the investment remains unattractive. For the intervals chosen, only when the horizon is extended to twelve years (Figure 8) will member-patrons of the type described find the investment acceptable. Figure 5 describes the realizable income stream for cooperative members whose investment horizon equals or exceeds the life of the investment. These members will be able to capture the entire investment stream, and thus, they would find it acceptable in the absence of other investments with more attractive rates of return.

The realizable net present value to the cooperative of our example investment project is plotted against discrete horizon periods between six and fourteen years in Figure 9. This figure indicates that for the simplified economic and technological relationships assumed for this example, only members who plan to patronize the cooperative in excess of ten years will find the proposed investment acceptable.

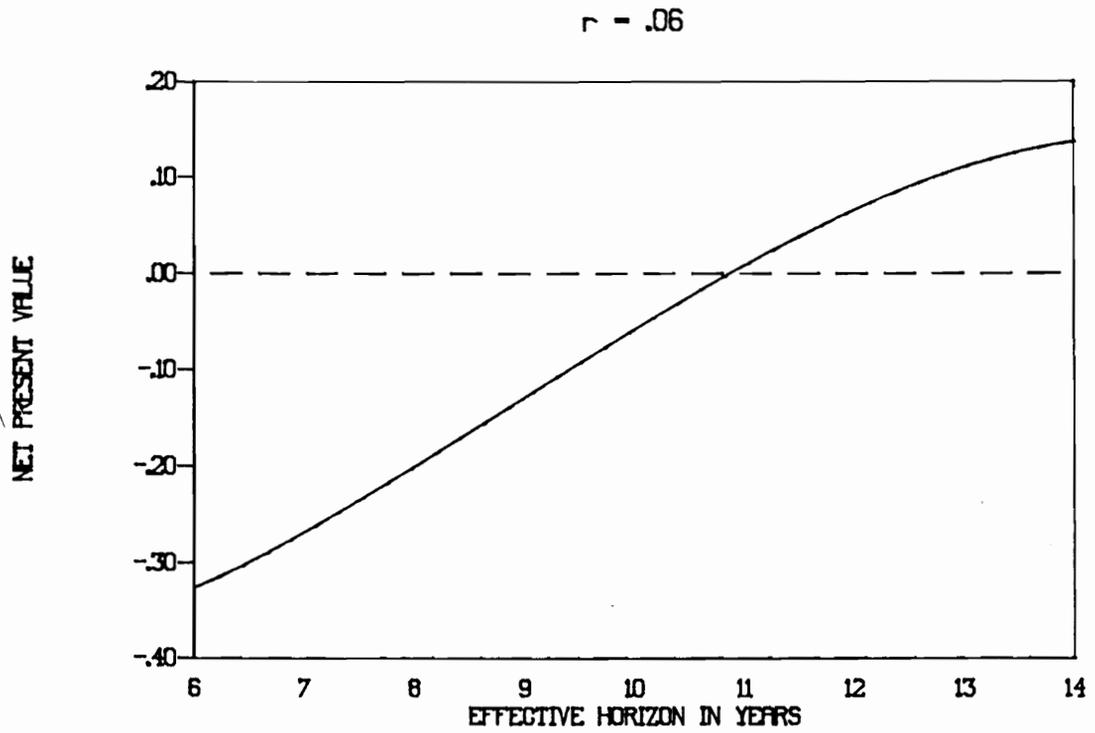


Figure 9. Effect of Residual Horizon on Net Present Value of Example Cooperative Investment

#### 8.4 IMPACT OF RISK ON THE RESIDUAL HORIZON PROBLEM

Thus far, the analysis of the impact of cooperative property rights has been carried out largely under assumptions of a certain world. This simplification has been adopted in order to facilitate the presentation of the theoretical considerations reflecting the restricted set of property rights without unduly complicating the analysis. No loss of generality of the implications of cooperative property rights would be anticipated, if risk behavior were introduced. One important impact of decision making under risk on the residual horizon problem can be examined without completely rewriting the model to reflect an uncertain investment environment.

Member-patrons of a cooperative and stockholders of an IOF who are risk averse will tend to discount more heavily those portions of an investment-generated income stream that occur in distant periods. Intuition would suggest that risk averse attitudes would tend to exacerbate the problem of producers perceiving a lower realizable return to horizon restricted investments, but careful analysis indicates that this is only partially true.

Figures 10 and 11 compare the income streams generated by the example investment for a stockholder of the IOF firm and a member-patron of the cooperative who faces a ten-year restricted horizon. Figure 10 is an overlay of the two income-streams shown in Figures 5 and 7 for a real discount rate of six percent. Figure 11 shows the same income stream with the discount rate increased to fifteen percent, simulating

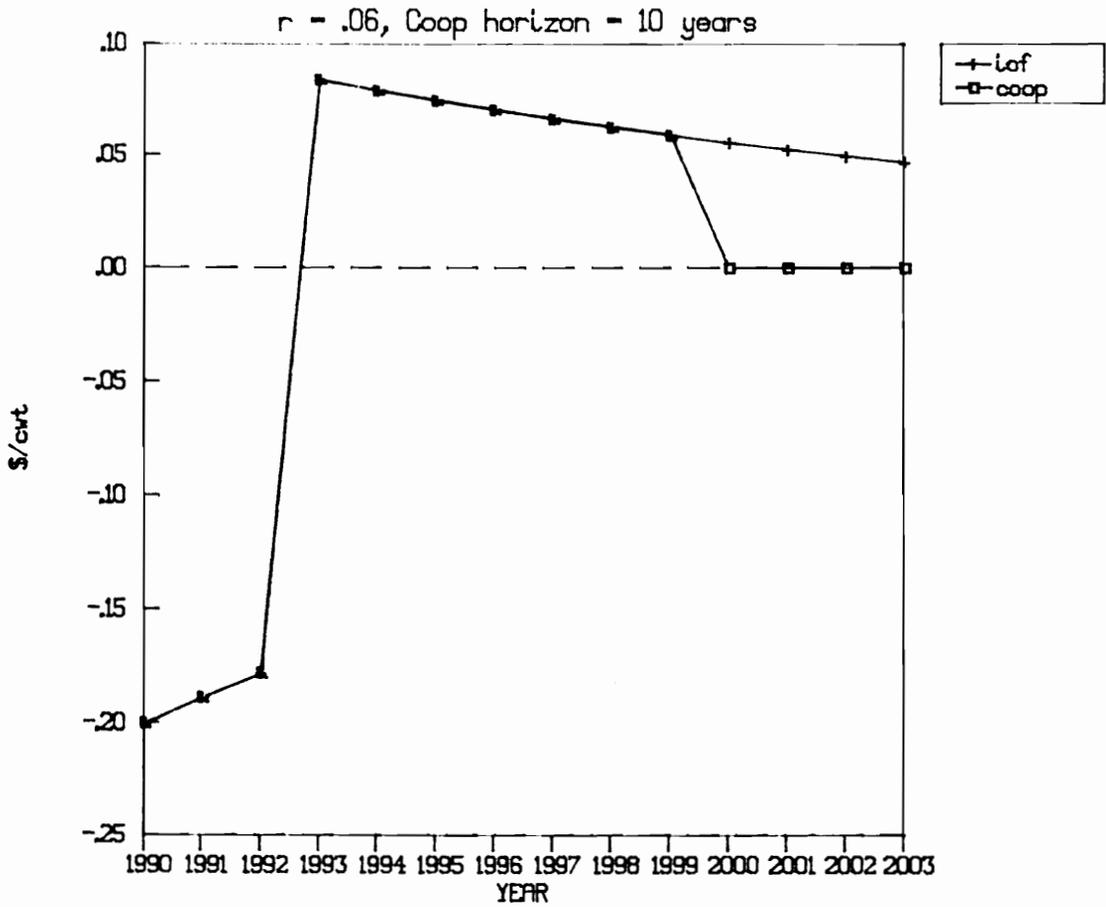


Figure 10. Cooperative and IOF Net Income Streams; Horizon = 10 years,  
Discount Rate = .06

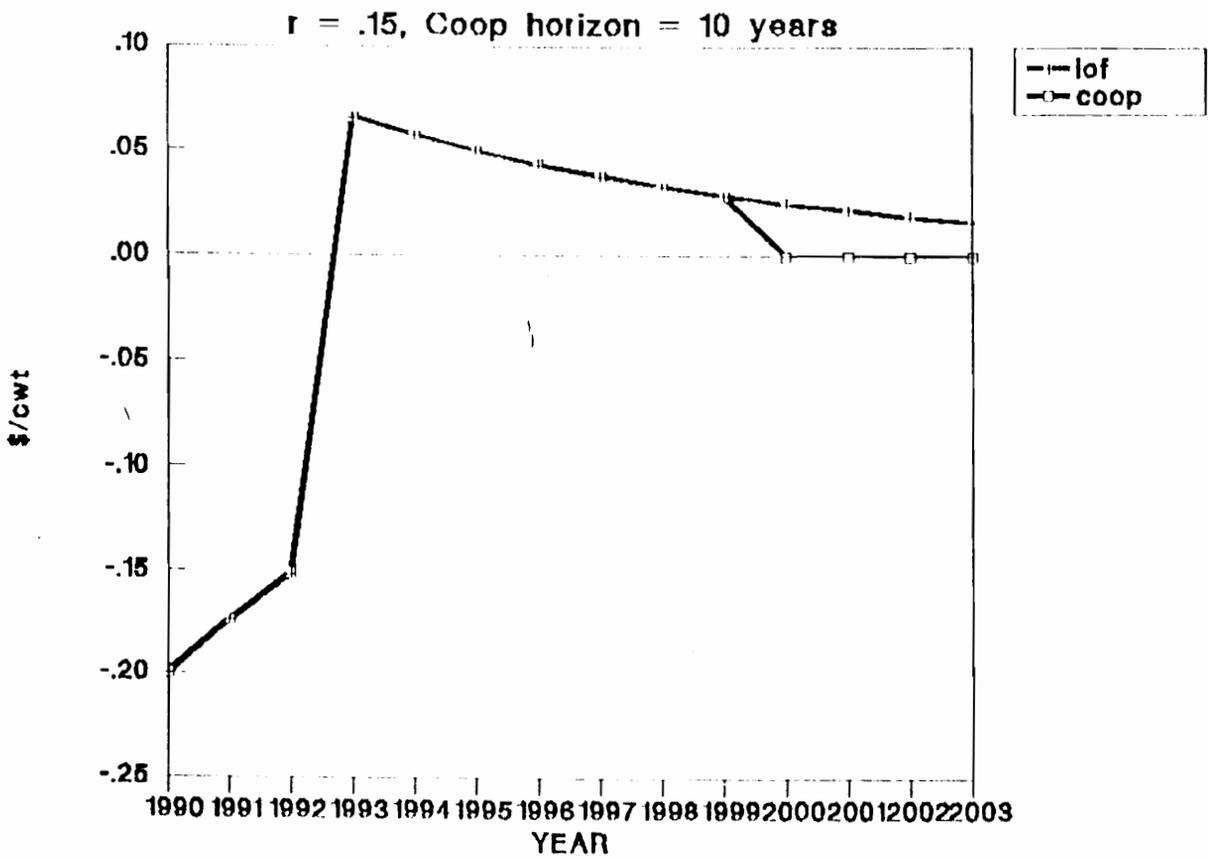


Figure 11. Cooperative and IOF Net Income Streams; Horizon = 10 years,  
Discount Rate = .15

the impact of a risk averse stockholder and member-patron.

Two major observations can be made. The increase in the applied discount rate caused by the identical risk averse attitude of the stockholder and member-patron have the effect of increasing the absolute impact of the horizon problem as indicated by the large reduction in the area under the positive portion of the income lines. The perceived net discounted present value of the investment falls from \$0.14/cwt. to -\$0.13/cwt. in the IOF case and from -\$0.07/cwt. to -\$0.21/cwt. in the case of the cooperative. This outcome is to be expected as the each individual incorporates a risk premium into the process of evaluation of the investment. Only in cases where the inclusion of a risk premium pushes the cooperative member from acceptance to rejection of an investment, that is, where the perceived net discounted present value goes from positive to negative, will the absolute impact of risk aversion make a difference in the investment behavior of the two firms.

The second observation that can be made from the two figures is that the relative impact of the horizon problem diminishes as the level of risk aversion increases for the two types of residual claimants. This phenomenon occurs because, for that portion of the income stream that is the same for the two kinds of residual claims, the impact of an additional risk premium is indistinguishable. However, that portion of the income stream that the member-patron of the cooperative cannot capture continues to be discounted heavily by the IOF residual claimant. As the level of risk aversion rises the two income-streams will become

nearly identical, and the horizon problem will cause no effective difference in the way in which the two claims are evaluated.

## 8.5 THE IMPACT OF DEBT FINANCE ON THE RESIDUAL HORIZON PROBLEM

To this point, the entire analysis of the impacts of cooperative property rights on these firm's investment behavior has assumed that all finance of investment projects would be internally generated. It is a reasonable question to ask, particularly with respect to the residual horizon problem, whether external sources of finance will render the restricted investment impact of the horizon problem a moot issue. The answer to this question is indefinite from a theoretical perspective and must ultimately be addressed empirically. However, it is possible to say from a theoretical basis that external finance will not necessarily ameliorate the horizon problem.

Figures 12 through 15 demonstrate the impact of external finance on evaluation of the example investment project for the same ranges of residual horizon examined earlier. The following assumptions are used to construct the finance example.

1. 100% of the cost of the investment is to be financed from external sources. The loan amount is calculated based on the cost assumed in the 100% equity example; that is  $\$0.20/\text{cwt.} \times 7,200 \text{ cwt./member} \times 3,500 \text{ members} \times 3 \text{ years} = \$15,120,000$ .
2. Because conditions of certainty and efficient capital markets are assumed, lending rates must equal borrowing rates. If the .06 discount rate employed by members is considered as a normal rate of return, then the borrowing rate must also be assumed to be .06 on the unpaid balance.
3. Repayment of the loan is to be amortized over a 15 year period resulting in equal payments of  $\$0.618/\text{cwt}$  per year for the member-patron in our example.

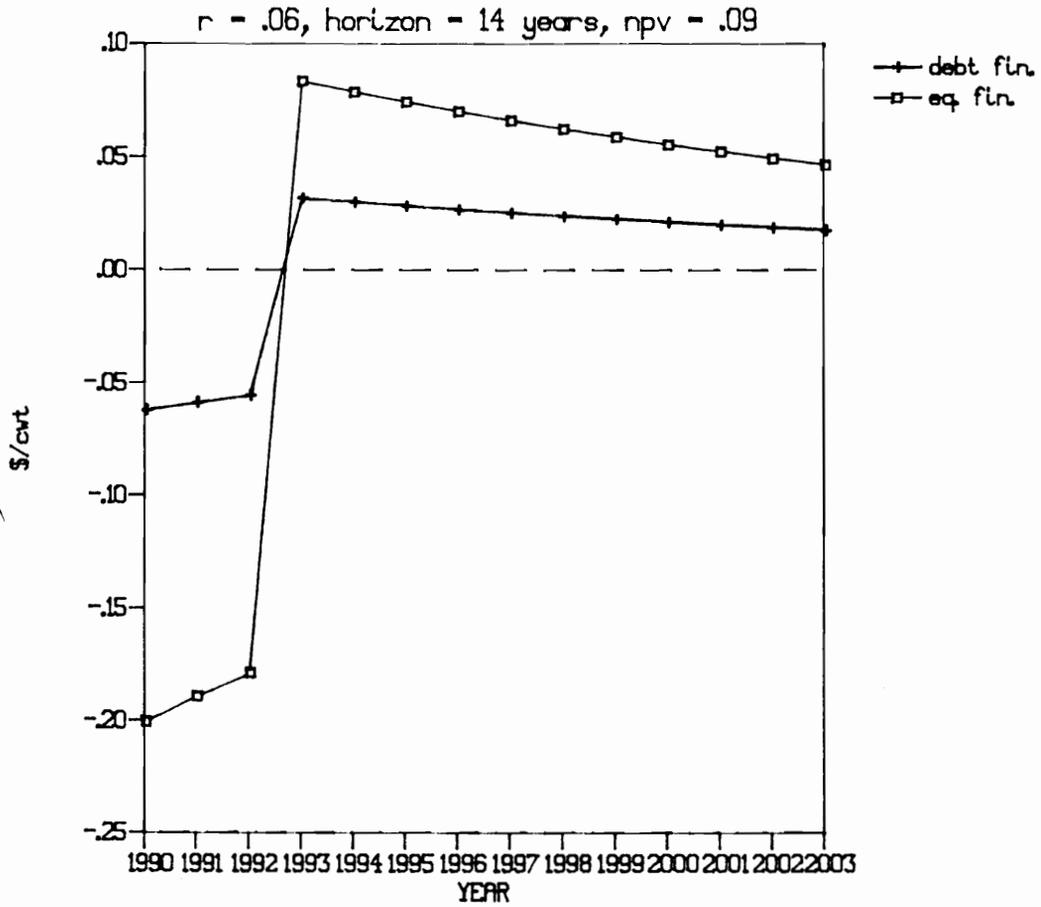


Figure 12. Coop Discounted Net Income Streams with Debt and Equity Financing; Horizon = 14 Years

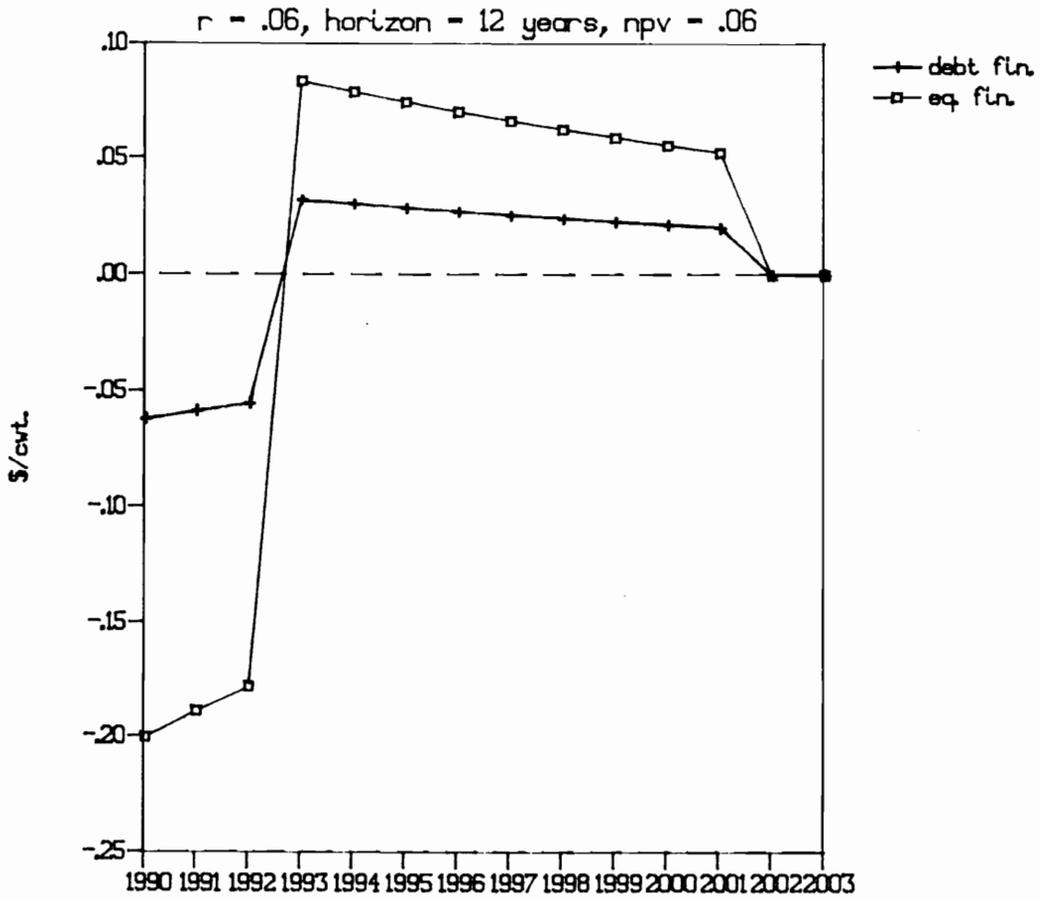


Figure 13. Coop Discounted Net Income Streams with Debt and Equity Financing; Horizon = 12 Years

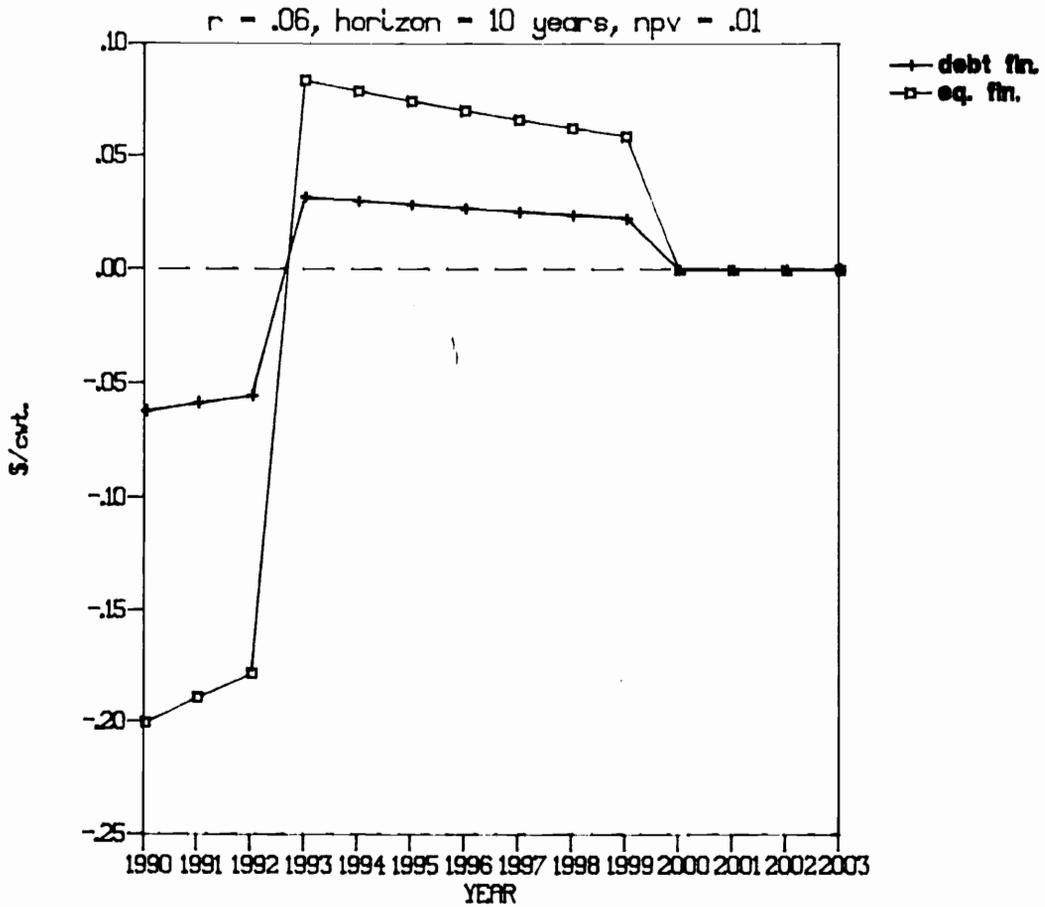


Figure 14. Coop Discounted Net Income Streams with Debt and Equity Financing; Horizon = 10 Years

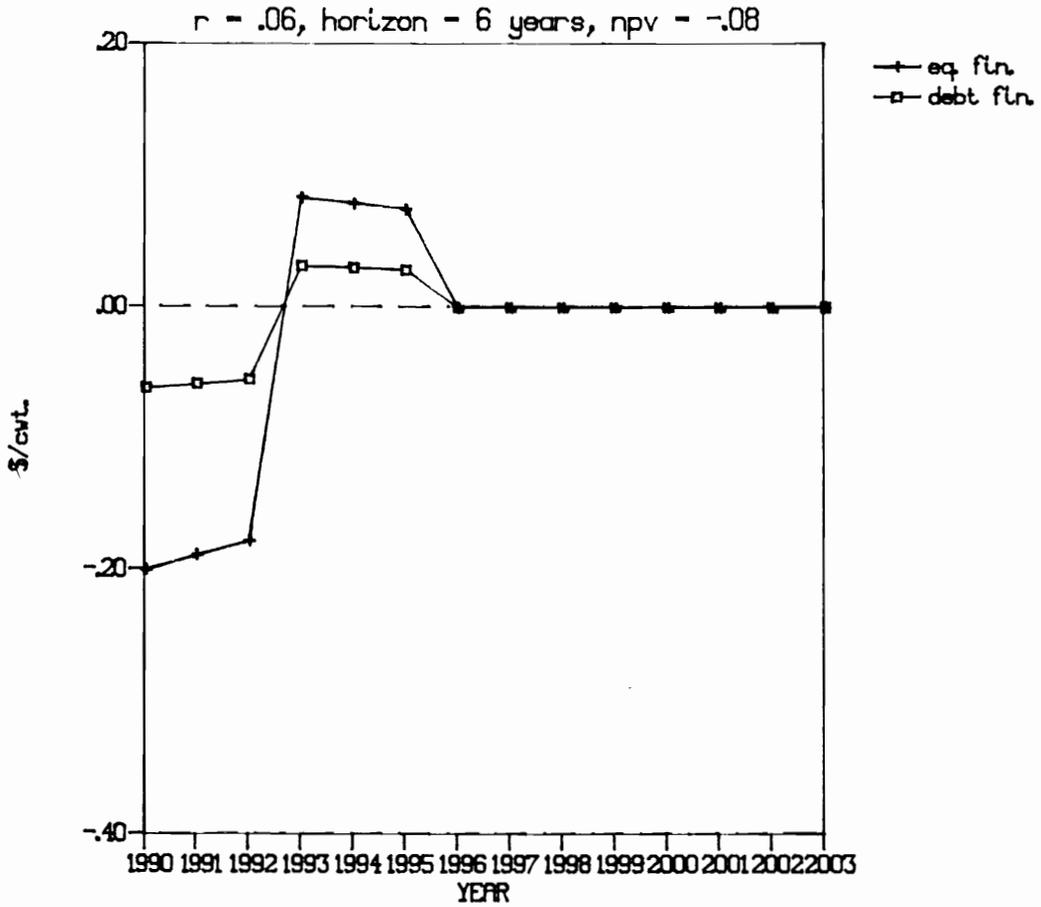


Figure 15. Coop Discounted Net Income Streams with Debt and Equity Financing; Horizon = 6 Years

Figure 12 compares the realizable income streams for the example investment under conditions of 100% member equity finance and 100% external finance when the member's effective residual horizon is not constraining. As would be expected, the additional cost of the debt reduces the discounted net present value of the investment from \$0.14/cwt. to \$0.09/cwt., but the investment would remain acceptable to the member. As the member's horizon is successively shortened in Figures 13 through 15, the effect of debt financing causes a new pattern to emerge. Formerly, it was shown that a member-patron with a residual horizon of ten years would find the example investment unacceptable. The effect of financing in this case is to place some of the burden of cost of the capital plant on subsequent members of the cooperative. Realizable discounted net present value increases from -\$0.07/cwt. to \$0.01/cwt. Though both costs and gross realizable returns are reduced, the member can now realize enough return over costs to find the investment acceptable.

In cases where residual horizons are extremely short, debt financing alone may not change how members evaluate a given investment project. Figure 15 indicates that a member who could not patronize the cooperative after six years would not find the example investment an acceptable use of resources under any circumstances. Figure 16 plots the effect of member horizon on the realizable discounted net present value of the example investment for the cases of 100% equity finance and 100% debt finance. Given the assumed conditions of the example, debt

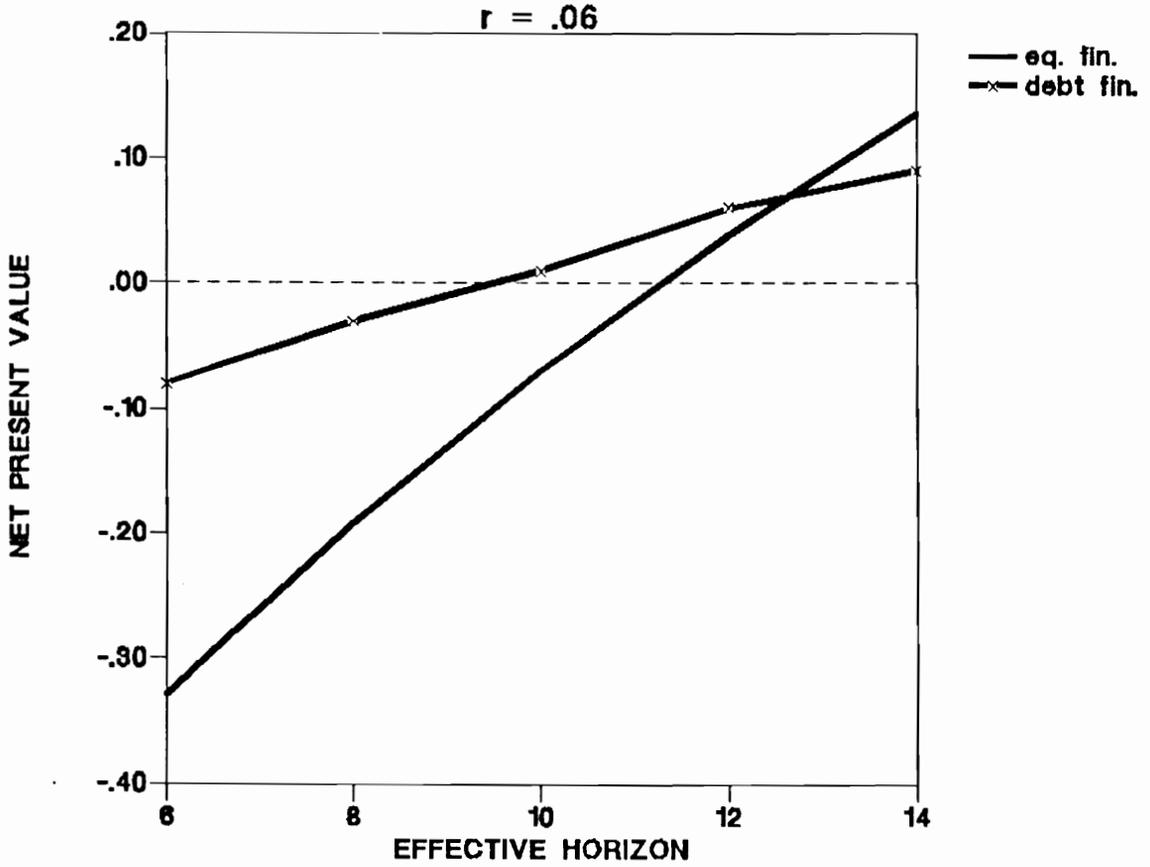


Figure 16: Impact of Horizon and Debt on Net Present Value of Example

Investment finance will allow more members to capture an acceptable return to their invested resources but it will not always eliminate the horizon problem.

## CHAPTER 9.0 SUMMARY OF DEVELOPED HYPOTHESES, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

In this chapter, each researchable hypothesis developed in this study will be summarized. In each case, a brief discussion of the hypothesis and suggestions as to the conditions and methods under which it may be tested will be discussed. At the end of the chapter the findings of this research study will be summarized along with recommendations for future research.

### 9.2 HYPOTHESES REFLECTING COOPERATIVE ORGANIZATION

Separation of the residual risk-bearing role from the decision making role in a cooperative increases the survivability of these vertically integrated institutions as well as the producer owned businesses at their foundation.

Separation of the "ownership" role from the decision making role in a cooperative allows each function to be performed most efficiently by the agent most qualified. A primary incentive force for the formation of cooperatives is the management of the risk entailed in operating a business with organization specific assets that have limited value outside of their current use. Farmers are interested in risk management because of the relative size and use specificity of the assets they employ.

However, farmers have no inherent talents or training in the daily operation of a input supply or product marketing business. By contracting the services of a qualified management team, this role

should be performed more efficiently, to the ultimate benefit of the farmer-riskbearer.

Upon testing, this hypothesis would be rejected if one or both of two sets of conditions were to be observed. If significant numbers of successful cooperatives were to be found that operated without an independent management team or that were primarily board managed, it would be grounds for rejecting this hypothesis. In this case "significant numbers" means enough firms to be a majority of or at least, a sizable minority which cannot be considered anomalies. Similarly, if an industry characterized by low levels of organization specific assets was found to contain a significant proportion of cooperatives, grounds would be present for rejecting this hypothesis.

Because riskbearing roles are separated from decision making roles in a cooperative, the right to decision control or ratification is separated from decision management and vested in producer-members and/or their elected representatives.

This organizational feature is similar to that found in an IOF. Because "ownership" is separated from control, structures are devised to ensure to the degree economically rational, that management operates in the interest of the owners of residual claims. Boards of directors are generally specified in the incorporation statutes of cooperatives and IOF's, therefore this hypothesis need not be tested.

Ceteris paribus, cooperatives are at a relative survival disadvantage to the IOF due to the requirement that cooperative director boards be constituted entirely of "inside" members.

The requirement that cooperative director boards be constituted

entirely of "inside" members is an additional and rational control response to the absence of a market to value and trade the residual claims of cooperatives. Such a market acts as a strong incentive to managers to act in the interests of residual claim holders or face takeover. The absence of outside directors may put cooperatives at a competitive disadvantage to the IOF due to the loss of potential specific knowledge expertise such board members might provide.

"Testing" of this hypothesis would require a case study approach which carefully sought to identify cooperative and IOF firms in similar sets of market circumstances, except for their organizational characteristics, and examine the strategic decisions taken by their respective boards. Caution must be exercised not to confuse the impact of decision quality stemming from differences between the training and experience of the two director-types with other forces at work due to the organizational differences in the two firm-types. If no detectable differences are found in the quality of strategic decisions taken by coops and IOF's, the hypothesis would be rejected, supporting the conclusion that an expert management team can overcome the lack of experience related-problems of a "inside" member board of directors.

### 9.3 HYPOTHESES REFLECTING COOPERATIVE RESIDUAL CLAIMS

Ceteris Paribus, the restricted ownership and alienability of cooperative residual claims and the resultant lack of a market to value and trade these claims will cause cooperatives to "under invest" relative to IOF firms which do not face other unique constraints on investment. Further, mitigating circumstances such as risk discounting and debt financing will ameliorate but not eliminate this disadvantage.

Cooperatives are at a potential competitive disadvantage to IOF firms for the following reasons. (1) Restricting ownership of residual claims limits the potential pool of amassed equity relative to firms without such restrictions. In addition, cooperative members' ability to match their attitudes towards risk with their attainable portfolio mix is limited. This is called the investment portfolio problem. (2) In open membership cooperatives the inability to value in a market and to trade residual claims in a market means future members may enjoy economic benefits generated by the cooperative at existing members' expense. This phenomenon is known as the common-property problem. (3) Because ownership and derivation of economic benefit from residual claims is tied to patronage, and because members cannot value and trade their claims in a market, members are forced to evaluate investments based on horizons that may be shorter than the benefit stream generated by the investment. This condition is called the residual horizon problem.

Testing this hypothesis will be difficult because of the necessity of a case study approach that seeks to examine cooperative and IOF firms which have faced similar sets of economic circumstances. The process will be further complicated by the fact that cooperatives have no reporting requirements to the government or public other than tax

reporting. The specific factors which must be comparatively examined would include the following:

- a measure of total firm investment over given periods of time (perhaps measured in per capita/stockholder terms);
- the portfolio mix of investments measured both as to type and level of risk;
- examination of any investment rules of thumb adopted by the board or management that would indicate perceived shortened investment horizons relative to IOF's (e.g. a required level of ROI in a given length of time);
- a measure of the effective investment horizon in a given cooperative firm (measured as average, median or majority effective planning horizon of members);
- examination of any management or financial policies undertaken to explicitly combat horizon related problems, for example, specific kinds of debt financing;
- a history of any member defections in response to investment decisions taken by the board or management;
- examination of the competitive structure of the market in which the cooperative exists to determine if effective organizational competition exists.

#### 9.4 SUMMARY OF STUDY

This study designed and employed a modified neoclassical framework for understanding and predicting the behavior and competitive potential of business firms organized on the Rochdale Principles of cooperation. The impetus for this research has been the arguably universal frustration, among interested applied economists, that the available models for understanding cooperatives do not describe the institutions and behaviors that have been observed. Coupled with the lack of understanding of these unique institutions is the policy direction the nation appears to be adopting which places more emphasis on market generated solutions to the age old problems of surplus agricultural commodities and chronically low and risky incomes. Without commenting on the wisdom of such policies, it is clear that supply and marketing cooperative's will face an uncertain, complex and possibly more competitive economic environment. An understanding of the ability of these institutions to perform in such an environment is crucial so that the legitimate interests of farmer-producers, agribusiness, and consumers alike may be best served.

There is certainly no requirement that a theory attempt to fully encompass the complexity of the economy. In fact, overly complex theoretic models lose their value in helping understand the world. However, a theoretical model must be able to cope with the "truly important" components of the economic problems put to it. Chapters 1.0 and 2.0 motivate the need to better understand the cooperative and

justify, from a theoretical perspective, the need for a model that can address crucial questions about the unique organizational and ownership structure of these firms and how these structures will affect their ability to compete in an unfettered economic environment.

Specifically, Chapter 2.0 focuses on the methodological issues that establish the need, justification and mechanics of making explicit the property rights assumptions reflecting ownership and control of cooperatives. It is argued that explicit incorporation of these property rights into the neoclassical theory of the firm is essential because they uniquely define cooperatives.

In chapter 3.0, the property rights approach is used to establish the core of a theory of cooperatives. This theory is used to suggest an initial set of hypotheses about cooperative behavior, particularly with respect to investment behavior and the relative competitive position of cooperatives and competing forms of business organization. The approach lends insight into the economic incentives for forming cooperatives and the reasons why cooperative corporation ownership and control structures are unique from those observed in investor owned corporations. In addition, the property rights approach suggests a number of inherent problem areas with which cooperatives must cope if they are to remain a competitive form of business organization. The concepts of the decision control problem, the investment portfolio problem, the common-property problem, and the residual horizon problem are introduced.

Chapter 4.0 begins the process of using the theoretical structure developed in Chapter 3.0 to construct a model to analyze the impacts of the ownership structure on the relative investment performance of cooperatives. Such an analysis will help determine under what economic circumstances cooperatives will or will not be able to compete with investor-owned firms.

A Lagrangian model is constructed that is conceptually capable of determining optimal levels of investment, cooperative production output, member-supplied input volume, and capital stock. Solutions to the model would be entirely dependent on the particular circumstances of individual firms and are therefore difficult to generalize. However, the comparative statics of the model with respect to investment variables reveal a great deal about the survival value of cooperatives.

Chapter 5.0 demonstrates that in open-membership cooperatives, the new member supply response in future periods generated by successful investment in past and current periods will erode some of the stream of economic benefits due the existing members. Unless new members explicitly compensate existing members for economic benefit gained from prior investment, the existing membership will anticipate this common-property problem and evaluate investment projects based on realizable rates of return that are lower than actual rates of return. Existing cooperative member-patrons, using perfectly rational decision rules, will reject some investments that competing firm types, like an IOF

would otherwise profitably make. The existence of the common-property problem argues for implementation of base capital equity plans which are designed to keep new member investment in line with current patronage, and also take into account the economic surplus available to new members which was generated as a result of past investment in the organization. Failure to cope explicitly with common-property issues provides all rational current members of a cooperative an incentive to invest at less than otherwise optimal levels.

Chapter 6.0 takes the property-rights based model of the cooperative and examines investment portfolio issues. Investment in a cooperative is unavoidably tied to patronage of the organization and cooperative investment decisions necessarily entail a group decision making process. The individual cooperative member loses a measure of freedom in choosing a mix of investment options and consumption which are consistent with his/her preferences and resources. Many have shown that when options are restricted, the perceived cost of bearing risk is increased relative to those whose portfolio choices are unrestrained. If so, pressure will be applied by cooperative members to adopt a portfolio of cooperative investments which entails less risk, even if such a portfolio has lower expected returns. Competitive survival is endangered if cooperatives are consistently forced to invest at suboptimal levels compared to IOF'S.

Chapter 7.0 discusses the concept of the residual horizon problem. Since capture of economic benefit in a cooperative is tied to patronage,

and since ownership claims to residuals cannot be valued and sold in a market, each member will judge the value of any investment only in terms of the income stream he or she can capture. This income stream is limited to the member's intended term of patronage of the organization. If the planning horizon of the member is shorter than the total anticipated income stream generated by an investment project, the member will perceive a smaller return to investment and act accordingly. If sufficient numbers of members perceive residual horizon problems, pressure will be placed on the organization to adjust its investments to meet the needs of these members. The pressure will be perceived either as political pressure inside the organization or as member defections, a form of partial redemption, from the cooperative. The cooperative will face pressure to adopt investments with closer-term payoff streams even if such investments have lower expected values. Failure of the management and directors to adjust to member wishes means loss of position or loss of control over resources. In the absence of "mitigating circumstances", cooperatives are placed at a competitive disadvantage to organizations, such as the IOF, that do not face restricted investment horizons.

Chapter 8.0 explores the circumstances that determine if the investment horizon problem will be binding on cooperative behavior. A simplified example of the residual horizon problem is presented in the context of a cooperative and IOF milk marketing / processing plant. In this example, the cooperative would be placed at a competitive

disadvantage to the IOF under the assumptions of perfect information, zero transaction costs, no debt financing, and the investment horizon and income stream chosen.

When the assumption of perfect and costless information is relaxed, the impact of the residual horizon problem becomes case specific. In a world of uncertainty and risk averse residual riskbearers, the absolute nature of the residual horizon problem is increased with perceived risk as residual claimholders heavily discount future portions of the income stream. However, even as the absolute nature of the residual horizon problem increases, the relative nature of the problem will decrease between cooperatives and IOFs. Each discounts future income streams; the cooperative due to horizon restrictions and risk, and the IOF due to risk alone. The more future income streams are discounted due to risk, the more alike each firm type residual claimholder perceives the expected value of the investment.

This phenomenon has particular significance in today's investment climate where some argue that the growth in large institutional investments in both debt and equity markets is forcing a more risk averse, short-term focus on IOF managers and directors. Research into the horizon problem must account for this possibility.

Debt financing has the effect of relieving some of the current burden of an investment's cost and distributing that burden on future time-periods to members with presumably longer investment horizons. Chapter 8.0 shows that prudent use of debt may remove the effective

horizon limit for some, but not all members. The competitive impact of debt on the residual horizon problem must be situation specific. However, the analysis suggests that when making debt financing decisions, specific consideration of the residual horizon problem may be particularly useful for cooperatives.

## 9.5 RECOMMENDATIONS FOR FUTURE RESEARCH

Since the 1940's one common aspect of the economic literature examining cooperatives has been the surprisingly few empirical studies attempting to explore those hypotheses which theory has suggested. Ironically, this study is no exception. The reason for this phenomenon has been the inability of this historical body of theory to suggest to applied economists and other interested parties, productive lines of research relevant to the real problems faced by patron - owners, management and policy makers interested in cooperatives. Since the HelMBERGER cooperative model is an almost trivial adaptation of the neoclassical theory of the entrepreneurial firm, applied economists have been content to let the ongoing research suggested by the TOF guide how economists think about cooperatives.

This current effort to reexamine the unique characteristics of cooperatives, along with other, hopefully complementary efforts<sup>133</sup>, clearly suggest new lines of inquiry that are of direct and immediate value to both the competitive future of cooperatives and to consumers alike. These lines of inquiry should concentrate on three related foci: issues that may guide management and directors of cooperatives towards more efficient paths of growth; issues that address the fundamental reasons why individuals would participate in cooperative activity; and issues that affect the ability of cooperatives to compete for

---

<sup>133</sup> see: Royer, J. ed. Cooperative Theory: New Approaches, USDA ACS Service Report # 18, July 1987.

organizational survival in a more competitive market environment.

Cooperative managers and directors need to understand the kinds of investment opportunities that make sense for cooperatives and those for which they have competitive disadvantages. This research suggests that there is reason for concern. We need to undertake a body of historical case studies whose purpose is to identify investment patterns<sup>134</sup> that have consistently led to success or failure.

This study maintains that cooperatives are formed (and not some other type of business organization) in order to protect the specialized capital assets of members, when these assets have limited value in alternative uses. The unique mechanisms of decision making and residual ownership in a cooperative are designed to ensure, to the degree possible, that the value of member assets will be maintained. Recently, many cooperative managers and directors have sought innovative organizational arrangements to provide more flexibility in the operations of cooperatives. For example, some organizations have formed non-cooperatively operated subsidiary companies which operate essentially as management owned IOF's. Another common example is joint ventures, such as refinery operations for a group of agricultural supply cooperatives, operated as separate cooperatives where the joint operation director-board is composed of management representatives from the constituent cooperatives.

While such arrangements have the potential for increasing investment

---

<sup>134</sup>Defined by size, horizon, type, risk, etc.

flexibility by overcoming horizon and portfolio related restrictions, they may detract from the risk management goals this study maintains as primary to the foundation of cooperatives. If members perceive that a substantial portion of the cooperative's activities are no longer under their control, they may conclude the agency costs of cooperative membership exceed the risk management benefits they sought from the cooperative. The implications of innovative organizational arrangements to the long term stability of cooperatives needs further analysis.

Finally, policy makers interested in promoting the role of cooperatives as an organizational form to assist and protect the interests of entrepreneurs such as farmers and at the same time provide an orderly and efficient flow of goods and services to consumers, need to understand the precise conditions of competitive environment, economic sector type, and investment requirements in which cooperatives will be able to fulfill these dual roles and those in which they cannot. Empirical research into these areas will require both case study and traditional quantitative approaches which permit in depth analysis of the hypotheses generated by this study which seek to explain and predict cooperative business organization behavior.

## BIBLIOGRAPHY

- Abrahamsen, Martin, Cooperative Business Enterprise, McGraw-Hill, New York, 1976.
- Agricultural Cooperative Service, Farmer Cooperative Statistics, USDA Cooperative Information Report 21, Section 27, March, 1984.
- Aizsilnieks, A., "Farmer Cooperatives and Economic Welfare: A Reply," Journal of Farm Economics, 37(1955):140-144.
- Alchian, A. and H. Demsetz, Production, Information Costs and Economic Organization," American Economic Review, ( ):777-795.
- Alchian, Armen, "Some Implications of Recognizing Property Right Transactions Costs," in Karl Brunner, ed. Economics and Social Institutions, Martinus Nijhoff Publishing, Boston, 1979, p. 237.
- Aoki, M. "A Model of the Firm as a Stockholder-Employee Cooperative Game," American Economic Review, 70(1980):600-610.
- Aresvik, O. "Member Behavior and Optimal Pricing in a Marketing Cooperative," Journal of Farm Economics, 39(1957):169-172.
- Aresvik, O. "Comments on the Economic Nature of the Cooperative Association," Journal of Farm Economics, 37(1955):140-144.
- Arrow, Kenneth, "The Role of Securities in the Optimal Allocation of Risk Bearing," Review of Economic Studies, 31(1964).
- Baarda, James, State Incorporation Statutes for Farmer Cooperatives, Agricultural Cooperative Service, United States Department of Agriculture, Cooperative Information Report 30, 1982. p. 85.
- Bar, J. "A Mathaemactical Model of a Village Cooperative Based on the Decomposition Principle of Linear Programing," American Journal of Agricultural Economics, 57(1975):353-357.
- Bateman, D.I., et al., "Problems of defining a Cooperative as an Economic Organization," Oxford Agrian Studies, 8(1979):53-62.
- Blaug, Mark, The Methodology of Economics, Cambridge University Press, Cambridge, 1980, p. 59.
- Bowley, M., Nassau Senior and Classical Economics, A.M. Kelly, New York,

1948, p.43.

Cameron, N. "Incentives and Labor Supply in Cooperative Enterprises," Canadian Journal of Economics, 6(1973):16-22.

Carson, R. "A Theory of Cooperatives", Canadian Journal of Economics, 10(1977):565-589.

Caves, R.E., "Industrial Organization, Corporate Strategy, and Structure," Journal of Economic Literature, 18(1980):64-92.

Caves, R.E. and B. C. Petersen, "Cooperatives' Shares in Farm Industries: Organizational and Policy Factors," Discussion Paper Number 974, Harvard Institute of Economic Research, Harvard University.

Cheung, S.S., "The Contractual Nature of the Firm," Journal of Law and Economics, 26(1983):1-21.

Clark, E., "Farmer Cooperatives and Economic Welfare: a Rejoinder," Journal of Farm Economics, 34(1952b):404-407.

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

Coase, R.H., "The Nature of the Firm," Economica, 4(1937):386-405.

Conte, A.C., "On the Economic Theory of the Labor Managed Firm in the Short Run," Journal of Comparative Economics, 4(1980):173-183.

Council of Economic Advisors, Economic Report to the President, 1984.

Cyert, R. and C.L. Hedrick, "Theory of the Firm: Past, Present, and Future: An Interpretation," Journal of Economic Literature, ( ):398-412.

Davies, D.G., "The Efficiency of Public Versus Private Firms, The Case of Australia's Two Airlines," Journal of Law and Economics, 14(1971):149-165.

De Alessi, L., "Implications of Property Rights for Government Investment Choices," American Economic Review 59(1969):16-23.

De Alessi, L., "The Economics of Property Rights: A Review of the Evidence," Research in Law and Economics, 2(1980):1-47.

De Alessi, Louis, "Property Rights, Transaction Costs and X-Efficiency: An Essay in Economic Theory," American Economic Review, 73(1983), p. 65.

Domar, Evsey, "The Soviet Collective Farm as a Producer Cooperative," American Economic Review, 56(1966):735-757.

Dugger, W.M., "The Transaction Cost Analysis of Oliver E Williamson: A New Synthesis?," Journal of Economic Issues, 17(1983):95-114.

Emelianoff, Ivan, Economic Theory of Cooperation, Washington, D.C., published by author, 1948.

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

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

Fama, Eugene and Michael Jensen "Agency Problems and Residual Claims," Journal of Law and Economics, 26(1983b):325-349.

Fama, Eugene and Michael Jensen "Separation of Ownership and Control," Journal of Law and Economics, 26(1983a):301-325; and

Fama, Eugene and Michael Jensen, "Organizational Forms and Investment Decisions," Working Paper No. MERC 83-03, University of Rochester Managerial Economics Research Center, June 1983, pp. 5-8.

Feyerabend, P.K., Against Method,

Fischer, M.L., J.W. Hammond, and D.C. Dahl, The Impact of Farm Supply Cooperatives on Olygopolistic Farm Input Markets: A Theoretical Analysis, Staff Paper P81-16, Department of Agricultural and Applied Economics, University of Minnesota, July 1981.

Frech III, H.E., "The Property Rights Theory of the Firm: Empirical Results from a Natural Experiment," Journal of Political Economy, 84(1976):143-152.

Frech III, H.E., "Property Rights, The Theory of the Firm, and Competitive Markets for Top Decision Makers," Research in Law and Economics, 2(1980):49-63.

Friedman, Milton, "The Methodology of Positive Economics," in William Breit and Harold Hochman eds., Readings in Microeconomics, Holt, Rinehart, and Winston, New York, 1968.

Furubotn, E.G., "Toward a Dynamic Model of the Yugoslav Firm," Canadian Journal of Economics, 8(1971):182-197.

Furubotn, E., "The Long-Run Analysis of the Labor Managed Firm: An Alternative Interpretation," American Economic Review, 66(1976):104-123

Furubotn, E.G., "The Socialist Labor-Managed Firm and Bank-Financed Investment: Some Theoretical Issues," Journal of Comparative Economics, 4(1980):184-191.

Furubotn, E.G. and S.E. Pejovich, "Property Rights, Economic Decentralization, and the Evolution of the Yugoslav Firm, 1965-1972," Journal of Law and Economics, 16(1973):275-302.

Furubotn, E.G. and S.E. Pejovich, "Property Rights and Economic Theory: A Survey of Recent Literature," Journal of Economic Literature, 10(1972):1137-1162.

Gorden, Donald, "Operational Propositions in Economic Theory," in William Breit, and Harold Hochman eds. Readings in Microeconomics, Holt, Rinehart, and Winston, New York, 1968, p. 49.

Gordon, D.F., "Operational Propositions in Economic Theory", Journal of Political Economy, (1955):150-161.

Hardie, I., "Shadow Prices as Member Returns for a Marketing Cooperative," American Journal of Agricultural Economics, 51(1969):818-833.

Helmberger, Peter and Sydney Hoos, "Cooperative Enterprise and Organization Theory," Journal of Farm Economics, 46(1964):603-617.

Helmberger, P., "Cooperative Enterprise as a Structural Dimension of Farm Markets," Journal of Farm Economics, 46(1964):603-617.

Henderson, James and Richard Quandt, Microeconomic Theory, McGraw-Hill, New York, 1971. p. 52.

Hirschman, A.O., Exit, Voice and Loyalty, Harvard University Press, Cambridge, 1970.

Hirshleifer, J. "Investment Decision Under Uncertainty," The Quarterly Journal of Economics, 79(1965):509-536.

Hirshleifer, Jack "On the Theory of Optimal Investment Decision," Journal of Political Economy, 66(1958), p. 329.

Hite, James, Room and Situation, Nelson Hall, Chicago, 1979, p. 78.

Hutcheson, Terrence, "Professor Machlup on Verification in Economics," Southern Economic Journal, 22(1956) p. 481.

Hutcheson, Terrence, The Significance and Basic Postulates of Economic Theory, A.M. Kelly, New York, 1938 (reprinted in 1965).

Israelsen, D.L., "Collectives, Communes, and Incentives," Journal of Comparative Economics, 4(1980):99-124.

Jensen, Michael, "Organization Theory and Methodology," The Accounting Review, 58(1983):319-339.

Jensen, Michael and William Meckling, "Rights and Production Functions: An Application to Labor-managed Firms and Codetermination," Journal of Business, 52(1979b):460-506.

Jensen, Michael and William Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure," in K. Brunner ed., Economic of Social Institutions, Martinus Nijhoff Publishing, Boston, 1979.

Jesse, E. and A. Johnson, "Marketing Cooperatives and Undue Price Enhancement: A Theoretical Perspective," N.C. Project 117 pap. wp-46, University of Wisconsin, 1980.

Jorgenson, D.W. and C.D. Siebert, "A Comparison of Alternative Theories of Corporate Investment Behavior," The American Economic Review, 58(1968):681-712.

Jorgenson, D.W., "Econometric Studies of Investment Behavior: A Survey," Journal of Economic Literature, ( ):1111-1146.

Kaarlehto, Paavo, "Cooperation as a Form of Economic Integration," Acta Agriculturae Scandinavica, 5(1954-55):87-97.

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

Knutson, R. "Cooperatives and the Competitive Ideal," Journal of Farm Economics, 48(1966):111-121.

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

Ladd, G. "A Model of a Cooperative Bargaining Association," American Journal of Agricultural Economics, 56(1974):509-519.

Leibenstein, H., "Aspects of the X-efficiency Theory of the Firm," Bell Journal of Economics, 6(1975):580-606.

Leibenstein, H., "A Branch of Economics is Missing: Micro-Micro Theory," Journal of Economic Literature, 17(1979):477-502.

Levy, C. "Agricultural Cooperative Theory: A Review," Journal of

Agricultural Economics, 34(1983):1-44.

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

Machlup, Fritz, Methodology of Economics and Other Social Sciences, Academic Press, New York, 1978.

Marris, R. and D.C. Mueller, "The Corporation, Competition, and the Invisible Hand," Journal of Economic Literature, 18(1980):32-63.

Marris, R., The Economic Theory of Managerial Capitalism, The Free Press, Glencoe, 1964.

Masson, R.T. and P. Eisenstat, "Capper-Volsted and Milk Cooperative Market Power: Some Theoretical Issues, Agricultural Cooperatives and the Public Interest, N.C. Project 117, Monograph #4, College of Agriculture and Life Sciences, University of Wisconsin, 1978, pp. 51-68.

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

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

Nagel, E. "Assumptions in Economic Theory," American Economic Review, (1963, May): 211-219.

Nicols, A., "Property Rights and Behavior", American Economic Review, 57(1967):337-347.

O'Hara, M., "Property Rights and the Financial Firm," Journal of Law and Economics, 24(1981):317-332.

Ohm, H., "Member Behavior and Optimal Pricing in Marketing Cooperatives," Journal of Farm Economics, 35(1956):613-621.

Pejovich, S., "The Capitalist Corporation and the Socialist Firm," in K. Brunner ed., Economics and Social Institutions, Martinus Nijhoff, Boston, 1979.

Pejovich, S., "Towards a General Theory of Property Rights," reprinted from Zeitschrift fur Nationalokonomie, Band 31 (Heft 1-2, 1971):141-155.

Pejovich, S., "Towards a Economic Theory of the Creation and Specification of Property Rights," Review of Social Economy, 30(1972):309-325.

Phillips, A., "An Attempt to Synthesize Some Theories of the Firm," in

A. Phillips and O.E. Williamson eds., Prices: Issues in Theory Practice and Public Policy, pp. 32-44, University of Pennsylvania Press, Philadelphia, 1967.

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

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

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

Robotka, Frank, "A Theory of Cooperation", in M. Abrahamsen and Claud Scroggs, eds., Agricultural Cooperation, Minneapolis, University of Minnesota Press, 1957, 121-142.

Rowen, R. "A Farm Coop in the Hands of High Rollers" Fortune, April 20, 1981, pp. 151-160.

Samuelson, Paul, Foundations of Economic Analysis, Harvard University Press, Cambridge, 1948, p. 4.

Savage, J.K., "Comment on the Economic Nature of the Cooperative Association," Journal of Farm Economics, 36(1954):529-534.

Schmid, Allan, Property, Power, and Public Choice, Praeger New York, 1978, p.5.

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

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

Staatz, John, "Farmers' Incentive to Take Collective Action Via Cooperatives: A Transactions Cost Approach," in Cooperative Theory, USDA Agricultural Cooperative Service Report Number 18.

Swann, Harris, "Serving Small and Large Farmers Equitably: Managements Viewpoint," American Cooperation 1985, American Institute of Cooperation, Washington, 1985.

Trifon, R. "The Economic of Cooperative Ventures--Further Comments," Journal of Farm Economics, 43(1961):215-235.

Tullock, G., "The General Irrelevance of the General Impossibility Theorem." Quarterly Journal of Economics, 81(1967): pp.256-270.

U.S.D.A. Agricultural Cooperative Service, Legal Phases of Farmer

Cooperatives, Information Report 100, 1976.

USDA, Economic Research Service, Feed Outlook and Situation Report, May, 1985, p. 13.

Vitaliano, P. "The Theory of Cooperative Enterprise--Its Development and Present Status," in B. Marion ed. Agricultural Cooperatives and the Public Interest, N.C. Project 117, Monograph #4, College of Agriculture and Life Sciences, University of Wisconsin, 1978, pp. 21-42.

Waterloo, C. "Expanding too Fast, a Major Grain Coop Fell into Big Trouble," Wall Street Journal, July 18, 1983.

Williamson, O. E., "Transaction Cost Economics: The Governance of Contractual Relations," Journal of Law and Economics 22(1979):233-261

Williamson, O.E., Markets and Hierarchies: Analysis and Antitrust Implications, Free Press, New York, 1975.

Williamson, O. E., "The Modern Corporation: Origins, Evolution and Attributes," Journal of Economic Literature 19(1981):1537-1568.

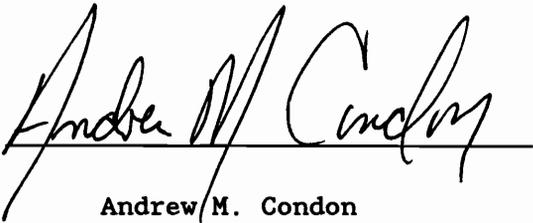
Yarrow, G.K., "On the Predictions of the Managerial Theories of the Firm," Journal of Industrial Economics, 24(1976):267-279.

Youde, J.G. and P.G. Helmberger, "Marketing Cooperatives in the U.S.: Membership Policies, Market Power, and Antitrust Policies.

Youde, J.G., "Cooperative Member Policies and Market Power," in B. Marion ed. Agricultural Cooperatives and the Public Interest, N.C. Project 117, Monograph #4, College of Agriculture and Life Sciences, University of Wisconsin, 1978, pp. 219-225.

## VITA

Andrew Michael Condon was born in Worcester Massachusetts on August 3, 1953, the youngest of three children of Chester F. Condon and the former Marjorie F. Smith. After graduating from St. Johns High School in Shrewsbury Mass., he attended the University of Massachusetts, from which he received a Bachelor of Arts degree in Elementary Education in 1975. Andrew received a M.S. from the University of Massachusetts in Agricultural Economics after having spent nearly three years in Colombia S.A. in the U.S. Peace Corps. From fall, 1981 through fall 1985, Andrew was in residence at the Department of Agricultural Economics at Virginia Polytechnic and State University where he received the Doctor of Philosophy degree in 1990. Dr. Condon currently resides in Underhill Vermont where he is an assistant professor of Agricultural and Resource Economics at the University of Vermont.



Andrew M. Condon