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The behavior and performance of credit cooperatives: An analysis of cooperative governance rules

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The Ohio State University, 1994
THE BEHAVIOR AND PERFORMANCE OF CREDIT COOPERATIVES: AN ANALYSIS OF COOPERATIVE GOVERNANCE RULES

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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1994

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To My Parents
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INTRODUCTION

Credit Cooperatives are a form of organization characterized by a set of well-defined, uniform, and unique governance rules. These rules imply a particular distribution of property rights among the client-owners of these organizations. This property rights structure strongly influences, in turn, the behavior and performance of credit cooperatives.

Governments and donor agencies have intensely promoted credit cooperatives with the objective of improving access to financial services by marginal clientele in developing countries. Nevertheless, these organizations have been financially unstable, very vulnerable to minor changes in their environment, and highly dependent upon external subsidies. For the most part, credit cooperatives have not been able to capitalize the substantial subsidies traditionally granted to them.

This dissertation provides a theoretical explanation for these empirical regularities regarding the performance of credit cooperatives in developing countries. In particular, it examines the conventional institutional design of a credit cooperative. The underlying idea is that the standard mode of cooperative allocation of property rights —including voting— is what determines, in the last instance, who —and under what incentives— gets to define the organization’s policies. This influence takes place through the role of the property rights structure in contests for control of the
organization's assets. This analysis and interpretation have been missing in the literature on credit cooperatives.

The dissertation draws upon a growing literature on financial economics that analyzes organizational and ownership structures. Most of this earlier research has focused, however, on the stock corporations that are common in developed economies, and has ignored other, less traditional forms of organization, frequently found in developing countries. This literature has been ignored, in turn, by researchers in the field of finance and development. There is considerable potential in this literature, however, as a tool to understand the performance and as a guide in the design of rural financial intermediaries in developing economies.

This dissertation also conforms with recent important efforts to understand non-firm economic organizations and their major influence on the allocation of resources in developing countries. These issues are analyzed by adapting a general model of contests for corporate control developed by Harris and Raviv (1988), in order to consider the institutional characteristics of credit cooperatives.

The organization of the dissertation is as follows. Chapter I provides a general perspective on the nature of credit cooperatives. This chapter begins with a precise definition of credit cooperatives based on the features of their governance rules. A brief historical account about the origins of these financial intermediaries and their institutional design is provided next. The chapter concludes with a brief survey of the empirical evidence on the performance of credit cooperatives in developing economies.
Chapter II reviews the three areas of the literature directly related to this dissertation. It first examines the literature on finance and development and the literature on the generalized neoclassical economics [DeAlessi, 1983]. It argues that the institution-free view implicit in much of the finance and development literature represents an incomplete paradigm to explain the functioning of financial markets. Instead, significant insights may be obtained from the organizations-cum-contracts-cum-information-cum-institutions lines of inquiry that emerge from the generalized neoclassical paradigm.

Chapter II also examines the existing, mostly empirical, literature on credit cooperatives. It claims that this literature does not include adequate explanations of several of the facts about which it reports. The chapter concludes with a summary of the most important empirical findings and theoretical contributions of the literature on corporate control and governance rules. The literature in this field recognizes that departures from the one share-one vote governance rule influence the value and efficiency of corporations. Similar research on the governance rules of credit cooperatives, where departure from the one share-one vote regime is most extreme, has never been undertaken.

Chapter III adapts a general model of contests for corporate control developed by Harris and Raviv (1988), in order to consider the particular institutional design of credit cooperatives. The model fully characterizes the outcome of any tournament for the control of a credit cooperative's assets. It is shown that the
conventional institutional design of credit cooperatives determines the winner of such contests.

Chapter IV uses the predictions of the Harris and Raviv model to explain several empirical regularities about the behavior and performance of credit cooperatives that, until now, have not been satisfactorily resolved. The model postulates, among other things, that credit cooperatives will always be borrower-dominated; that they would not endogenously appear without the intervention of an external agent willing to finance borrower domination; that the regulation of credit cooperatives as financial intermediaries is particularly difficult given a sub-optimal amount of internal control; and that any attempts to redesign these intermediaries, aimed at improving their sustainability, would require severe departures from cooperative philosophy.

The chapter concludes by reconciling the empirical record of the German Cooperative Banking Group and of the credit unions in the United States with the predictions of the model. These two groups of cooperatives seem, at first glance, to be anomalies within the model. This dissertation claims that their record of financial stability is consistent with the prediction that the viability of credit cooperatives requires a complex and expensive regulatory infrastructure, such as those that supervise these two groups of cooperatives.
CHAPTER I

CREDIT COOPERATIVES: AN OVERVIEW

This chapter provides a precise definition of credit cooperatives in terms of the particular institutional design that characterizes these financial intermediaries. The basic conventional cooperative constitution is described in detail, because such collection of rules represents the main theme of analysis in this dissertation.

A brief history of credit cooperatives is included. This historical account illustrates the point made later on in this dissertation that both credit cooperative principles and the actual organizations are the product of a particular philosophy and of external support, rather than an endogenous economic arrangement among individuals.

Basic descriptive statistics of credit cooperatives in developing countries complement a summary on the evidence of their rather poor performance in terms of financial viability. The chapter includes a brief survey of the most important similarities and differences among credit cooperatives and other well-known forms of client-owned financial intermediaries.
1. CREDIT COOPERATIVES

Credit Cooperatives (CCs) are a particular form of economic organization. Specifically, they are mutual financial intermediaries. The most important institutional characteristic of a CC is that its clients are at the same time its owners. In contrast with most other types of cooperative and mutual organizations, however, CCs are the property of clients located at both ends of the market. This will be designated as the clients-are-owners issue. That is, CCs are owned and controlled simultaneously by depositors and by borrowers.

Other common forms of cooperative organization (e.g., producer and consumer cooperatives) are also controlled by their customers. The difference is that the customers who are in control are located at one end of their operations. That is, the owners of the organization are located either up-stream (e.g., producer and marketing cooperatives) or down-stream (e.g., consumer cooperatives) of the flow of transactions. These organizations, in contrast to CCs, are not controlled by customers at both ends of their activities.

Financial mutuals (e.g., mutual savings and loans) are also owned by some of their clients. The clients in control are depositors.¹ Borrowers have no participation whatsoever in the internal affairs of the organization (e.g., election of the board of directors), because they are customers but not owners.

¹ It has been argued that depositor ownership and control of mutual S&Ls is nothing else but a legal fiction, because depositors sign their proxies to management [Mester (1988)]. This does not contradict, however, the point that is being made, in the sense that in CCs two rival factions (i.e., depositors and borrowers) have a say in the organization's affairs.
The characteristic of CCs of having customer-owners at both sides of their operation is shared with the rotating savings and credit associations (ROSCAs).\textsuperscript{2} ROSCAs, however, provide very simple services and in most cases result from the endogenous initiative of their participants (i.e., without external incentives). The financial activities of ROSCAs are limited to the raising and allocation of a pot of money for each period in the life of the organization. The pot is made up by the equal contributions of all of the ROSCA members. In addition, in a ROSCA all depositors will be, by definition, borrowers at some point in time during every cycle. These are important differences with respect to CCs, where the amounts of savings are different across individuals, and where not all members will necessarily be borrowers.\textsuperscript{3}

Perhaps the most important difference between CCs and ROSCAs is that in the latter there is no latitude for discretiononal decisions on the part of the member in control (coordinator), because her only responsibility is the collection and disbursement of the pot. In ROSCAs all conditions and contingencies are contracted for at the beginning of the cycle. This differs significantly in the case of credit cooperatives, where there is a hierarchy, in the sense that a subset of members (board of directors) makes all operational decisions on behalf of the entire

\textsuperscript{2} Besley \textit{et. al.} (1991) provide a complete description and analysis of ROSCAs.

\textsuperscript{3} This is because in a CC there may be members whose only interest is to save in the organization, while other members may be denied a loan by the cooperative. Neither case is possible in a ROSCA.
membership. In CCs the control of the assets (e.g., the setting of interest rates and other lending terms as well as credit approval) is delegated to a management team.

Finally, CCs are institutionally very different from other forms of credit groups, such as village banks, self-help groups, and groups of borrowers. Examples of these credit groups are the village banks promoted by the Foundation for International Community Assistance (FINCA-International) and some groups of borrowers that are constituted as a result of the joint liability requirements imposed by some lenders (e.g., Grameen Bank, grupos solidarios associated with ACCION International).

One of the most important differences between CCs and credit groups is that all members in the latter are net borrowers. There is no financial intermediation among group members, because all loanable funds are provided by a third party, whereas in the case of CCs the organization must have, at the same time, net borrowers and net savers as members.\(^4\) This implies that within the normal CC both surplus and deficit units at any given point in time are members of the organization.

To summarize, CCs are a particular form of economic organization devoted to provide financial intermediation services to a group of individuals (members) who are simultaneously customers and owners, in which a subset of members are entrusted with control of the organization. Furthermore, CCs have a well-defined set of bylaws (cooperative principles) that define the rules by which the organization's

\(^4\) There exists the possibility that the credit cooperative issue enough debt to non-members (e.g., donor agencies) as to have all members be net borrowers. This case is studied in detail in this dissertation.
assets are to be controlled as well as the rights and responsibilities of members (their property rights). The basic governance rules of CCs are uniform across organizations and countries and represent a specific and unique set of arrangements. These governance rules are called here, interchangeably, the cooperative constitution and/or the cooperative institutional design. In a simplistic manner it might be said that CCs are a firm-like organizational form with very distinctive bylaws. The complete description of these governance rules is presented next.

2. THE INSTITUTIONAL DESIGN OF CREDIT COOPERATIVES

Credit cooperatives have a rather uniform institutional design across developing countries. It will be argued later on that the CC model or institutional design is based on a utopian desire for economic democracy. This philosophy has been promoted all over the world and backed with the financial support of governments and donor agencies. As a result, the basic design is more or less homogenous across countries. Furthermore, it will be argued that the property rights arrangements implicit in such a design are not likely to appear endogenously.

Credit cooperatives are the financial market equivalent of a firm controlled by the producers and the consumers of the same good. Based on the one man-one vote and simple majority rules, decisions about the prices and quantities of the good in question are made by the members. Clearly, this type of organization is singular.

The following is a general description of the institutional design or constitution of CCs in developing countries:
(a) **Membership**

Credit cooperatives can provide credit and mobilize deposits only from those individuals who are members. Credit cooperatives may not engage in financial transactions with people who are not members. They are able to borrow, however, from other cooperatives and organizations (e.g., donor agencies and banks). In principle, they should not lend to legal entities (non-individuals), because they are an "association of people" (Ballestero). This limitation has been waived when the CC makes investments in order to manage liquidity (e.g., certificates of deposit at a bank).

This characteristic of having owner-clients at both ends of the financial intermediation transactions may imply not only different, but antagonistic incentives for the parties that share the control of the organization (borrowers, depositors, and management). This conflict is more profound than the common problems of principals and agents. The literature on principal/agent relationships recognizes that the incentives of managers may be opposed to those of the owners. This situation is present in CCs as well.

In CCs, however, there is an additional source of conflict, between opposing groups of owners, that is not present in most other forms of organization. Not only may benefits for a group accrue at the expense of other owners, but some owners may obtain private benefits —as opposed to security benefits— at the expense of fellow members or of external lenders, by using —as clients— the services provided by the organization. This is one of the symptoms of the well-documented condition
of borrower domination in which a group of members (borrowers) capture the control of a CC to obtain some of the benefits that originate from being a customer—not an owner—of the CC.

Credit cooperatives have adopted the principle of open doors for the admission and exit of members. That is, any individual who so desires can be a member of the organization, while any current member may exit the organization and receive the amount corresponding to his/her equity shares at face value.

Membership entails the right to vote and to take part in the internal decisions of the CCs as well as to use their deposit services. Membership does not imply, however, the right to obtain loans which are, usually, approved by a credit committee appointed by the board of directors (see below).

Most CC in developing countries are open bond, which means that the only common denominator, if any, among members is that they are likely to reside in the same community. In most cases this is not a binding prerequisite. The literature on credit unions—as different from credit cooperatives—emphasizes the common-bond principle. This principle states that members of a credit union must have a common characteristic, which in most cases is given by their place of employment (e.g., they all work for the same firm). Most CCs in developing countries do not require this.

---

5 Some credit cooperatives have adopted a moral-standing clause but, in principle, anyone who is not a widely recognized criminal can become a member. In very few cases do credit cooperatives request more than symbolic admission fees.
The difference between credit unions and CCs is not obvious. Credit Unions—as defined above—are more commonly observed in developed countries and tend to be attached to the working place of their members. This provides them with significant advantages regarding information about borrowers and the enforcement of credit contracts, because they have access to employee information and are guaranteed repayment by payroll deductions. Hence, one necessary—and not even sufficient—condition to successfully default on a credit union loan is to change jobs. Such advantages are not available to open-bond cooperatives.\(^6\)

(b) Control of Cooperative Assets

Credit cooperatives are controlled, in the end, by a general assembly of members. Each member has the right to a single vote, regardless of the amount he/she has invested in the organization. That is, the conventional CC governance rules are characterized by the system of \textit{one man-one vote}. This is the cornerstone of the conventional cooperative constitution and, as such, it is also the most vigorously enforced of its principles.

Voting rights must be exercised directly by the member, because votes cannot be delegated to other members (i.e., it is not possible to vote by proxy). Obviously, this implies that voting powers cannot be accumulated by any member, because

\(^6\) Later on it is argued that this difference may be instrumental in supporting \textit{good} equilibria (i.e., not to flight by night) in the case of credit unions. This advantage is absent in the case of CCs.
voting by proxy is not allowed and votes are attached to members as individuals and not to tradable securities.

This principle implies that in the event of a contest for the control of a CC's assets, the most a candidate can do to acquire votes is to rent other members' votes, in order to depose the incumbent management or dictate particular policy changes. By renting it is meant here that naked votes are compensated for with side payments or bribes from a candidate. The only possibility in trading votes is to reward some members after they have voted for a particular candidate or in favor of the resolution proposed. Therefore, after a vote has been casted, the rented voting rights revert to the original owners, who also maintain their full ex-ante cash flow and/or residual profit claims.

Everyday decisions are made by management after guidelines established and monitored by a board of directors. The members of the board are elected by the general assembly. The board appoints a general manager who, in turn, hires and supervises the remaining personnel. The board of directors has the authority to adopt financial policies and to approve or reject all credit applications. Examples of the decisions made by the board are the CC's pricing policies for both deposits and loans and all other terms and conditions for the credit transactions between the cooperative and its members (e.g., collateral required, term to maturity).

(c) Share Capital, Cash Flow Claims, and the Members' Liability

Shares and other debt instruments cannot be traded among individuals. Only the cooperative itself may buy the shares or redeem deposits, at face value, from its
members. This implies that there is no observable market value for the cooperative. It also implies that individual members cannot appropriate the capitalized value of any cash flows generated by current investments that will accrue after they retire from the organization (i.e., future income of today’s investments).^7

In most developing countries credit cooperatives are required to buy back the shares of those individuals who want to cease their membership. The price per share is its face value plus/minus the corresponding adjustment for the current period’s already recognized profits/losses. Since members are able to withdraw their capital investment directly from the cooperative—as opposed to selling the share to another member—the share capital of the CCs is variable.

Another cooperative principle is that the return on capital should be limited. That is, profits must not be distributed among members simply according to the capital investment they have made in the organization. Rather, profit distribution should also depend on each member’s patronage of the cooperative. Most CCs distribute part of their profits in the form of interest rebates for borrowers. Borrower domination is reflected in the absence of equivalent implicit distributions for depositors. A limited amount of profits is returned to members according to their investment in shares. It should be noted that these profit allocation rules are usually asymmetric, in the sense that if losses occur they are allocated according to capital shares alone. Finally, the members’ liability in case of bankruptcy is limited

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^7 This is what Jensen and Meckling (1976) call the horizon problem. Some authors [Porter and Scully (1987)] argue that this problem represents a source of inefficiency for cooperatives in general.
to the shares purchased or, exceptionally, to a pre-established multiple of their investment. There is no unlimited personal liability of members.

3. BRIEF HISTORY OF CREDIT COOPERATIVES

The conventional constitution of credit cooperatives does not have a single origin. In fact there are several strands of development that may be traced back to the mid-nineteenth century in Europe. Two major cooperative movements developed in England and Germany. In England, the first cooperative to succeed for a sustained period of time was the Rochdale Society of Equitable Pioneers, established in 1844 in the locality of Rochdale. The Rochdale Pioneers adopted internal governance rules that still embody the philosophical principles of the international cooperative movement. The International Cooperative Alliance (ICA) established, after six international congresses over a span of 30 years, six cooperative principles that govern the operation of most cooperatives in developing countries. These six cooperative principles, internationally adopted in the Congress of Paris (1937) and ratified for the last time by the Congress of Vienna (1966), are:

(i) Open doors for the admission and withdrawal of members.
(ii) Internal democracy implemented as the one man-one vote rule.
(iii) Limited return on capital. Members should contribute to the cooperative's equity expecting no return or a limited one on their investment.
(iv) Operational surpluses should be either plowed back into the cooperative or distributed to reward patronage of the cooperative.¹

(v) Cooperatives should retain a proportion of their surpluses to be spent on educating their members on the "economic aspects and democratic virtues of the cooperative movement" (Ballestero).

(vi) Cooperatives should join with other cooperatives in establishing second-level organizations.

The Rochdale Principles have been the most influential force shaping the operations and legislation concerning CCs in developing countries.

The other European cooperative movement emerged, also in the mid-1800s, in Germany.² Financial cooperatives were established by Hermann Schultz-Delitzch in the urban areas of Germany, while Friedreich Raiffeisen organized credit cooperatives in the rural areas. Urban cooperatives were built on the basis of member share-capital investments. Hence, they stressed paying dividends on capital and limited liability. In contrast, early rural CCs had little or no capital at all, because the value of the shares held by members was minimal and basically represented a nominal entrance fee. Accordingly, these cooperatives paid no

---

¹ Cooperatives are supposed to be non-for-profit organizations. They avoid, therefore, the use of the terms profits or net income and use instead the terms cash surplus or operational surplus.

² This summary of the history of Germany's CCs closely follows the work of Bonus and Schmidt.
dividends and adopted a regime of unlimited liability of members. In the early 1930s the two groups of cooperatives began to converge into, basically, a single cooperative movement.

The main financial activity of these cooperatives was to bundle or package individual loans into collective credit applications to banks. There was little internal financial intermediation among the members. Clearly, in the case of the rural cooperatives banks received as collateral —up to enforcement problems— the entire endowment of wealth of the membership (given unlimited personal liability).

Both groups of cooperatives emphasized preventive and corrective measures to avoid and punish opportunistic behavior and/or malfeasance on the part of their members. The most important preventive measures were to limit membership to individuals with solid reputations and to elect honorable people (i.e., people who value their reputation) to their directive positions (e.g., clergyman, school teachers). German cooperatives never adopted the open doors policy to membership. The most significant corrective measure was the development of a very complex system of independent cooperative auditing associations, which supervise not only the accuracy of financial statements but the overall quality of management for every cooperative in the system.

As it has been the case of CCs in developing countries, German CCs received strong support from the state. In 1895 the Prussian State founded the Preussische Central-Genossenschaftskasee to promote the development of CCs. Between 1895 and
1898, the State of Prussia contributed 50 million Marks to fund the operations of this bank.

German cooperatives have been very successful, specially in the post World War II period. Nonetheless, in the 1980s they encountered some difficulties, evidenced by the failure of a number of primary banks. The fact to stress, however, is that in despite of several similarities between the conventional design of CCs in developing countries and the German cooperatives—mainly the one man-one vote principle—the latter have followed a path of institutional development that makes their institutional design different. These differences should be kept in mind when the predictions of the model presented in Chapter IV are contrasted against the stylized facts of credit cooperative performance in developing countries.

4. PERFORMANCE OF CREDIT COOPERATIVES IN DEVELOPING COUNTRIES

Credit cooperatives are an ubiquitous form of organization in developing countries. Magill reports that in the early 1990s, CCs affiliated to the World Council of Credit Unions (WOCCU) were present in 67 countries of Asia, Africa, The Caribbean and Latin America, for a total of 17,138 individual cooperatives which altogether had a membership of 8.5 million people and savings outstanding of about US$ 2 billion.

The record of credit cooperatives, in terms of institutional viability, has been at best mixed. These organizations have been financially unstable, susceptible to
minor changes in their environments, and with few exceptions have not been able to capitalize in their equity the significant subsidies that donors and governments have granted them. Credit cooperatives have received large amounts of loanable funds and operational subsidies from governments and donors. Such subsidies have allowed large numbers of them to subsist despite steady operational losses.

There is enough evidence to support the statement that CCs are *problematic* in that they experience consistent financial instability. In the wording of Williamson (1985), credit cooperatives seem to be *contractually unstable*. Huppi and Feder (1990) offer a very good survey and analysis of several evaluation reports of CC programs in a large number of countries. The success stories are vastly outnumbered by the failures. For instance, they report that in Thailand over 50 percent of loans through credit cooperatives were in arrears, while the arrears rate of loans to individual farmers ranged between 10 and 30 percent during the same time period. A similar story is told about the performance of CCs in India. The authors point out that high delinquency rates are probably the main reason of unsuccessful CCs in developing countries. They correctly argue that delinquency is a symptom rather than the underlying cause of the problem.

Adams (1993) also contributes an analysis and further evidence of CC failure as conduits for credit. He points out that "traditionally most credit cooperatives have been borrower dominated" and provides evidence of their almost epidemic failure in Latin America and Africa. He also provides, as Huppi and Feder do, few examples of successful stories.
The large volume of operational losses and the instability of CCs should not be a surprise, in light of their peculiar institutional characteristics. What does come as a surprise is that, given their ubiquity and widespread utilization by donors and governments as intended mechanisms to improve rural finance, the literature on CCs does not contain theoretically satisfactory reasons for their instability. A brief review of the relevant literature on credit cooperatives is presented next.
CHAPTER II
REVIEW OF THE LITERATURE

This chapter briefly reviews and integrates the literature relevant for this dissertation. The first section brings two strands of the literature which have evolved separately together. These two threads are the literature on finance and development a la Shaw, Gurley, and McKinnon, and a large body of contributions that may be loosely termed the economics of organizations-cum-contracts/information-cum-institutions. It has not been until recently that a few authors have integrated these two approaches into a cohesive body of knowledge.

The second section analyzes in detail the existing literature on credit cooperatives, and the third one reviews the main contributions on corporate governance rules. These two sections represent a natural prelude for Chapters IV and V, where both strands of the literature are merged in order to explain the behavior and performance of CCs in developing countries.

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10 In the next section it is argued that these seemingly different lines of inquiry result basically from the incorporation of information asymmetries and other real life constraints into neoclassical microeconomics.
1. **FINANCE AND DEVELOPMENT AND GENERALIZED NEOCLASSICAL ECONOMICS**

The work of Shaw, Gurley, and McKinnon in the late 1960s and early 1970s stimulated interest in the study of financial markets and their contributions to economic efficiency and development. These authors argued that financial markets and the policies that regulate them significantly influence the allocation of resources and the speed and direction of economic growth. The contributions of financial markets and institutions to economic development emerge from improvements in the efficiency of resource allocation and the management of risk by economic agents [Fry (1988)].

Based on this literature, policymakers and economists focused most of their attention on the government's financial policies at the macroeconomic level, but they overlooked in their analysis the role of institutions and organizations, treating them as exogenous. This was certainly the case in the analysis and practice of finance in developing countries.

There have been, on the other hand, important developments in another, seemingly separate branches of economics. One of such contributions has been the recognition and theoretical understanding of the role of institutions in determining the behavior of economic agents, including the organizations that operate in financial markets.

A major step in this direction was the realization that neoclassical theory could be generalized (leading to new institutional economics) by extending the utility
maximization hypothesis to all individual choices, including those of business managers, shareholders, and government employees [DeAlessi (1983)].

As a result, a better understanding of the functioning of organizations and markets has been possible, because individuals make the choices that determine, in the last instance, the behavior of such entities. In effect, Jensen and Meckling (1976), argue that:

*most organizations, such as the corporation, are simply legal fictions that serve as a nexus for a complex set of contracts among individuals* (p. 310).

These theoretical developments were complemented by a broader perspective on the limits on individual choices, to include institutional constraints (the system of property rights) as well as the constraints (transaction, information, and adjustment costs) imposed by nature and by the technology available at a given point in time.

These new developments allowed the expansion of the financial economist's interest from the Shaw and McKinnon world of financial markets and policies, to research on the behavior of economic agents within organizations and institutions. This work has been closely associated with research on the interaction among financial claims, organizational structure, governance rules, and firm performance.

The work of Alchian and Demsetz (1972), for example, sheds light on the advantage of residual claimants, as compared to other economic agents, in monitoring team production in organizations. Fama and Jensen (1983) analyze

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11 Residual claimants are those economic agents within the organization that appropriate the remaining cash flows once all factors of production have been paid out. Clearly, these agents may have a claim (i.e., responsibility) for
the distinguishing characteristics of organizational forms, such as corporations, partnerships, and non profits in terms of differences in the identity of the residual claimants of their net income. Lazear and Rosen (1981) and Hart and Holstrom (1987) recognize the important role played by managers in influencing firm behavior and study, therefore, managerial labor contracts and compensation.

A review of the professional economics journals shows that there is an important concern about understanding organizations in general (see below). Despite significant contributions, effort is still necessary to improve the understanding of the internal workings of economic organizations. Actually, in his recent Nobel lecture, Coase (1992) claimed that:

*The firm in mainstream economic theory has often been described as a black box. And so it is. This is very extraordinary given that most resources in the modern economic system are employed within firms...*(p. 714)

This need, felt by social scientists, to understand organizations is evidenced by the convergence on the subject of several branches of Economics and other disciplines. As pointed out by Jensen and Warner (1988), "work is progressing under various labels." These authors list the labels and provide, *inter alia*, the following references: the economics of contracting [Holstrom and Tirole (1987)], transaction costs [Williamson (1975)], property rights [Demsetz (1982, 1983)], and corporate finance [Grossman and Hart (1982)]. In Labor Economics work is progressing under the theory of compensation and hierarchies [Rosen (1982)]; in Accounting, under negative cash balances.
information and performance measuring [DeAngelo (1986, 1988)]; and in Law, under governance and contracting [Posner (1977)].

Development Economics has been influenced by this research as well. As a result, the understanding of, for example, agrarian institutions and organizations has improved. The literature on interlinked credit markets [Bardhan (1989)] and on share-cropping [Stiglitz (1986)] has benefitted significantly from the advancement of the economics of information paradigm.

The usefulness of this organizations-cum-contracts/information-cum-institutions line of inquiry goes beyond the knowledge of the inner workings of the firm, interesting per se. One may be curious about the extent to which the behavior of organizations significantly differs from that resulting from the generally assumed profit-maximizing conduct or whether different organizational forms would behave differently in the presence of the same type of government regulation. Understanding of these differences would have important implications for market outcomes and overall efficiency in the economy. Quoting Coase's Nobel lecture once more:

Consequently, the efficiency of the economic system depends to a very considerable extent on how these organizations conduct their affairs... (p. 714).

The unifying elements in this very diverse, but converging literature seem to be the recognition of information asymmetries and other "imperfections," such as transaction costs; the focussing of modeling techniques on individual choice; and the
constraints implied by the institutional environment in which such choices are made.\footnote{Here I refer to \textit{imperfections} as those real world constraints that are abstracted away in the neoclassical paradigm. That is, these imperfections are mostly deviations from theoretical models, but constitute real facts of life.}

The approach used in this dissertation to model the behavior of credit cooperatives is consistent with DeAlessi's generalized neoclassical theory of the firm. This approach integrates the managerial theories of the firm and the new institutional economics, based on the concepts of transaction costs, property rights, and agency theory.

Consistent with neo-institutional economics, credit cooperatives are conceived as collections of utility-maximizing individuals. Also, the traditional constraints on individual choice are expanded, to include property rights and the institutional environment (e.g., residual claims, entry opportunities).

The purpose is, therefore, to model rational choices made by individuals constrained by the institutional characteristics of credit cooperatives, as described in Chapter I. These decisions, combined with the strategic interactions among members, who may have antagonistic interests, will determine the organization's performance and stability.

The particular modelling strategy is to adapt mainstream Financial Economics models of corporate control [e.g., Harris and Raviv (1988)] to the institutional characteristics of credit cooperatives. This allows for predictions regarding the result of contests for the control of such organizations and, hence, about their performance.
The following two sections discuss the existing literature on credit cooperatives and on corporate control.

2. THE LITERATURE ON CREDIT COOPERATIVES

The literature on credit cooperatives may be classified into three broad categories. The first category consists of mainly descriptive papers which provide data about the volumes and types of financial transactions, by groups of cooperatives [Von Pischke (1983)]. This literature offers little explanation, beyond a general discussion of policy issues, of the success or failure of the particular group of organizations under study.

Arguments regarding too low rates of interest, weak collection efforts and high arrears rates, and fraud are commonly offered as explanations of failure [Illy (1983)]. The opposite type of arguments (e.g., strong collection efforts) are provided when a successful story is being described.

There are serious lapses of logic with respect to the suggested relationships of causality. The events that are most often cited as causes of the failure of credit cooperatives are, in fact, symptoms rather than the true underlying reasons. That is, lines of reasoning such as "credit cooperatives have failed as a result of weak collection efforts" ignore the fact that the collection effort itself is a variable over which individuals have control.

When it is observed that a weak collection effort is exerted, it must be concluded that no particular member of the organization—including management—
was in a position to make himself better-off by providing a higher level of effort. In short, it is not optimal (i.e., there are no incentives) for maximizing individuals within the organization to be aggressive in collecting loans.\textsuperscript{13}

A second strand of the literature recognizes the conflict of interests between net borrowers and net savers within credit cooperatives. However, even in these cases the literature is plagued with the black-box deficiency.

A significant number of applied papers, mostly for the United States and Canada, have been written within this second strand. Navratil (1981), for instance, constructs a six-equation econometric model to explain the flow of new loans and shares, net change in financial investments, the average price of loans and deposits, and the average maturity of loans for credit unions. Navratil concludes that:

*While the members act in a rational fashion there is some evidence that the credit unions do not...Specifically, it appears that loans and other assets are not close substitutes, as they would be in the portfolio of profit maximizing institutions* (p. 548).

The black-box mistake is present in Navratil's model, because he endows the credit union with an *ad hoc* objective function that is independent of the objectives of the individuals who control it. In particular, he assumes that credit unions maximize an objective function that takes into account only the membership's role as owners and not as clients. There is no reason to believe that the *aggregate objective* of the members, and hence that of the organization, is always determined by the

\textsuperscript{13} In loan collection efforts, *ex ante* screening and *ex post* monitoring of borrowers should be included. That is, successful collection results from all actions directed at improving recovery rates.
objectives of net savers; in particular when today's net savers will be tomorrow's borrowers.

Another example of empirical research with an *ad hoc* objective function is the work of Hempel and Yawitz (1977), who ignore the owners-are-clients issue and assume that credit unions maximize profits. Keating (1979), on the other hand, assumes that managers maximize their own utility function, subject to participation constraints on the part of the members.

This second strand of the literature offers few theoretical contributions that attempt to solve the black-box deficiency. The work of Smith, Cargill, and Meyer (1981), however, attempts to find a universally valid objective function for credit unions. They state that:

*There are two basic requirements for a framework to model CU behavior. First, the specification of the objective function should focus on the value of CU participation to the members...Second, the analysis should explicitly consider the possibility of conflict among members, and the resolution of that conflict being a preference to either the borrowers or the savers* (p. 519).

The authors proceed to suggest a generalized objective function for the credit cooperative that has as its *maximand* the weighted sum of net benefits to borrowers and net benefits to savers.¹⁴

¹⁴ The suggested objective function is the following:

$$\max \alpha NGL + \sigma NGS + \pi \frac{r}{r_s}$$

subject to the balance sheet constraint, and a non-negative operating surplus, and where:

NGL: net gain on loans, defined as the difference between the CU interest rate and the best market alternative,
The authors assume that the credit union will choose the optimal loan and deposit rates so as to maximize the total net gain available to its membership, for given weights $\alpha$ and $\sigma$, and subject to appropriate constraints. Four different analytical solutions for optimal rates are, therefore, possible. Namely, maximum surplus ($\alpha=\sigma=0$), complete borrower domination ($\alpha=1, \sigma=0$), complete saver domination ($\alpha=0, \sigma=1$), and neutrality ($\alpha=\sigma$). That is, the authors solve for the interest rates that would be optimal for a credit union, given assumed values of the parameters $\alpha$ and $\sigma$.

However, the challenge of appropriately modeling the behavior of credit cooperatives is precisely to understand the processes that generate equilibrium values for behavioral parameters such as $\alpha$ and $\sigma$. This should be done by taking into account the opportunities and incentives for individual member behavior implied by the institutional design of such organizations. Clearly, the challenge is not met by this second strand of the literature.

Finally, the third class of the relevant literature applies the state of the art in organization/contract theory to cooperative organizations in general. Sexton (1986), for instance, uses game theory to model the formation of cooperatives, by placing emphasis on the individual decision-makers and the incentives for them to undertake collective action. This represents an important methodological improvement upon earlier approaches.

NGS: net gain on savings, defined similarly, and $\pi$: operating surplus. The weights $\alpha$ and $\sigma$ are exogenously determined.
Unfortunately, Sexton’s model is not applicable to credit cooperatives, because the assumptions are too restrictive and at odds with their institutional characteristics. The cooperatives modelled by Sexton require that all members be on the same side of the organization’s operations. There is no possibility to sustain the equilibrium core when there is possible rivalry among members (i.e., there are no credible commitments).

On the other hand, credit cooperatives cannot be endogenously created by the collective action of its members, if there are start up costs, because of the free rider problem. Once a credit cooperative has been established, potential members would enjoy free entry. This claim is consistent with the empirical regularity that the creation of most credit cooperatives can be traced back to government or donor efforts. The endogenous emergence of credit cooperatives is inconsistent with the stylized facts of these organizations.

Bravermann and Guasch (1989) suggest an optimal design of credit cooperatives motivated by the theory of incentives and organizations. Their optimal credit cooperative or group is modelled in both static and dynamic frameworks.

The authors argue that agents would benefit from the formation of a credit group because of lower interest rates, lower transaction costs to borrow, larger lines of credit, and risk pooling. They recognize, however, that credit cooperatives experience many of the problems of common ownership and team production. That is, the arrangement fosters moral hazard and free rider problems. Therefore, a
system of incentives is required for an optimal solution. The authors suggest that the optimal design should include Holstrom’s (1982) solution of introducing a principal who should break the production budget constraint in the event that aggregate output falls below a pre-established level $Q^*$. They argue that the natural candidate for the role of principal is the group itself.

The dynamic extension of their optimal design of credit cooperatives consists of an adaptation of Green and Porter’s (1984) trigger-price strategy for self-enforcement of non-cooperative collusion. In this case, the equivalent trigger-output strategy would be that the credit group would self-dissolve for T-1 periods if aggregate output falls below a pre-established level $Q^*$. The intuition behind this is that the foregone benefits of belonging to the group for T-1 periods represent a strong enough punishment to ensure the supply of an optimal amount of effort.

It should be clear that Bravermann and Guash’s optimal design of credit cooperatives is inadequate, because rational agents would realize that the threats of punishment are non-credible. In particular, both equilibria (static and dynamic) would not survive re-negotiation. That is, Bravermann and Guash suggest that the cooperative itself may act as a principal, in the sense of inflicting a punishment (i.e.,

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15 These authors introduce moral hazard in the productive activities of the individuals as a result of joint liability among the CC members. Individual outputs depend on non-observable effort, while repayment performance depends on aggregate output.

16 In this case non-cooperative is a game theory term that implies rivalry among firms that are not able to either communicate and/or make credible commitments.
breaking the budget constraint or dissolve the group) to the individual members if there is evidence of moral hazard (e.g., $Q < Q^*$).

However, the cooperative is controlled by the individuals whom it is supposed to punish. Once output falls below $Q^*$, the members would certainly not punish themselves. Rational individuals realize that the ex post threat is not credible. Hence, the cooperative would fail as a result of moral hazard. In other words, the equilibrium suggested is not sub-game perfect. The model requires a completely external principal in order to make the punishment credible. In any event, the practical implications of the model are dubious.

Finally, Banarjee et al. attempt to model an optimal credit cooperative. Their work is interesting but has problems within the context of this dissertation. The authors use a model that falls into the category of principal-supervisor-agent models, designating a bank as principal, a monitor as supervisor, and a borrower as agent. Ignoring for now that very few cooperatives in developing countries receive loans from profit-maximizing banks, what the authors are actually modelling is a credit contract between a bank and a group of borrowers, which provides the monitor member of the group with the appropriate incentives to influence the borrower's choice of investment project. Their work is suitable for the understanding of any type of group lending arrangement, provided that two key assumptions, namely that there is no collusion among the members of the group and that punishments are credible, hold.
The Banarjee et al. model is removed from the nature of a credit cooperative as a particular form of organization with standard and well-defined charters and bylaws to allocate property rights among its members. The authors attempt to characterize the "optimal cooperative constitution" in terms of three parameters: internal and external flows of borrowing and the interest rate paid on internal borrowing. In the real world of firm-like cooperatives -- as those described in Chapter I -- these variables are simply the financial policies adopted by an incumbent management team. The ability to set such policies is determined, in the last instance, by rules that regulate, among other things, voting rights, the trading of cash flow claims, and the instances of decision making (e.g., general assembly).

The complete collection of these rules is what determines the actual constitution of a cooperative, in as much as they are the system of governance, bylaws, and principles by which a cooperative's assets are controlled. The challenge is, precisely, to design such a constitution by providing incentives such that winning incumbent teams adopt, endogenously, financial policies such as that characterized by Banarjee et al. This is because the main impact of the conventional institutional design of credit cooperatives (i.e., actual constitution) and its implied allocation of property rights -- including voting -- is through its influence on any contest for control which, in the last instance, determines who -- and under what incentives -- gets to define the organization's policies.
3. THE LITERATURE ON CORPORATE GOVERNANCE RULES

Attention shifts now to the literature on corporate control and corporate governance rules. It seems natural to explore this literature, because credit cooperatives are a form of organization that operates under well-defined governance rules which provide for discretionary decisions on the part of those members in control (i.e., there is a hierarchy).

If cooperatives are viewed this way, then models that attempt to explain their behavior and performance should, somehow, resemble the theory of the firm as a nexus of contracts. Thus, two basic ingredients should be incorporated in the model, namely, the objectives and preferences of members and the rules of the game under which they interact. It is clear, therefore, that the literature on corporate governance (i.e., the rules of the game) may contribute meaningful insights to the understanding of credit cooperatives.

The literature on corporate governance rules is divided into two large groups. Empirical studies, the first group, have focussed on two issues, namely, whether voting rights are valuable per se in a corporation and how and whether change in the structure of governance rules affect firm value. The first set of studies has attempted to measure the value of voting rights in achieving consensus and the extent to which such rights have an economic value (i.e., someone is willing to pay for them). Examples of important references in this area are the work by Lease, McConneli, and Mikkelsen (1983); and DeAngelo and DeAngelo (1985).
One frequently studied case in the second area of empirical research has been the conversion of mutual S&Ls into stock corporations. Although consensus has not been achieved, most of the evidence suggests that changes in voting rights regimes do affect firm value. Important studies in the field are O'Hara (1981) and Masulis (1987). Both groups of empirical studies heavily rely on the availability of stock market data. Clearly, it is not possible to perform similar studies for credit cooperatives in developing countries. At least, however, the intuition that the allocation of voting rights matters is confirmed, although in a different setting.

At the theoretical level, the earliest effort to explain observed corporate governance rules is by Manne (1962). He attempts to explain the wide conformity of voting arrangements in corporate charters and argues that voting within corporations is a means to obtain control with less than the totality of equity. Manne inquires into the reasons that have shaped the law and the practice of corporate control into their current form. He ignores, however, the relationship between votes and cash flows claims.

Easterbrook and Fischel (1983) examine the legal rules and contractual arrangements that determine who votes, on what issues, and under what procedures within corporations. They inquire about why there is voting, and why voting rights are given only to shareholders and not to other security holders (e.g., bonds). They also examine the structure of the rules for voting on corporate positions (e.g., vote buying and irrevocable proxies).
These authors explain the shareholders' pervasive exclusivity of voting rights as a response to the agency problem created by the delegation of control to management. They argue that since shareholders are the claimants of the corporation's residual net income, they are the ones with the appropriate incentives—collective action difficulties aside—to make discretionary decisions.

Easterbrook and Fischel also assert that if the initial allocation of voting rights and profit claims is proportional (i.e., one share-one vote), then there would be no difference between the allocations achieved by trading votes bundled with residual claims and the allocations reached by allowing trading of naked votes (i.e., stripped from profit claims). The authors conclude that a buyer forced to pay the full value of a vote would be indifferent between purchasing votes alone and purchasing votes with shares. This contention is important for the case of CCs, as they do not allow the trading of profit claims but cannot prevent the trading (i.e., bribing) of votes.

Grossman and Hart (1988) and Harris and Raviv (1988) are concerned with many of the same issues that Easterbrook and Fischel analyze. They study the role of different assignments of voting rights to cash claims in corporate control contests and provide sufficient conditions for the social optimality of the simple majority rule and one share-one vote regime.

These authors focus their attention on multiple-class share structures. That is, they analyze corporate governance rules involving shares with enhanced or diminished voting rights. Their definitions of social optimality for alternative governance rules differ, because Grossman and Hart only consider the welfare of
outside shareholders, defined as the post-contest security benefits paid by the winning candidate. They assign a zero weight, therefore, to the private benefits that inside shareholders may be able to extract. In contrast, Harris and Raviv assign equal weights to security benefits and private benefits. Despite this difference, both studies conclude that the simple majority rule and one share-one vote regime are socially optimal.

Both papers perceive the corporation as a collection of assets where the unresolved question is who should control them. They see the corporation’s security voting structure as the mechanism for shifting control among rivals when there are disputes regarding the identity of the controlling party. They conclude that corporate governance rules determine the ease with which incumbent managers are replaced through takeover activity and, hence, such rules matter because they determine both who controls the corporation and the incentives to perform well.

In short, the dominant literature on financial economics has recognized, at both the empirical and theoretical levels, that departures from the one share-one vote regime affect firm value and efficiency. However, this regularity for corporations has not stirred the curiosity of researchers working in the field of credit cooperatives and other client-owned intermediaries, where the departure from the one share-one vote regime is most extreme.

Consequently, this dissertation claims that an understanding of the behavior and performance of the credit cooperative form of organization requires a deeper knowledge of its governance rules and of other factors that determine the distribution
of power among the different groups of owners (e.g., net savers and net borrowers).

So far, this has not been done at all. The theoretical literature on governance rules has not been applied, despite its evident relevance, to the understanding of other non-corporate forms of organization, such as credit cooperatives. This challenge is met in the next two chapters.
CHAPTER III

THE INSTITUTIONAL DESIGN OF CREDIT COOPERATIVES AND THE
MARKET FOR THEIR CONTROL

1. INTRODUCTION

The purpose of the model developed in this chapter is to fully characterize the outcome of any tournament for the control of a credit cooperative's assets. It shows that the conventional constitution or institutional design of cooperatives is the main determinant of the winner of such contests. It shows that the conventional cooperative governance rule that allocates voting rights not in proportion to the cash investments of members is incompatible with the financial health of these organizations. This provides a formal interpretation of their mixed record.

These results are used to formally explain several empirical regularities about the behavior and performance of the credit cooperative form of organization that, until now, had not been satisfactorily resolved. The model suggests, among other things, that credit cooperatives will always be borrower-dominated and that they would not appear endogenously, without the intervention of an external agent willing to financially support borrower domination. This formal understanding represents
a good foundation upon which sound policies for credit cooperatives, especially idiosyncratic regulation, may be derived.

The underlying idea is that the main impact of the standard cooperative allocation of property rights—including voting—is, through its influence on contests for control what determines, in the last instance, who—and under what incentives—gets to define the organization's policies. So far, this has not been analyzed in the literature on credit cooperatives.

The study conforms with the recent, nonetheless significant, efforts found in the literature in attempts to understand the behavior of non-firm economic organizations, as they influence resource allocation in developing countries. It also responds to an increasing interest in understanding and improving the design of organizations-cum-contracts in rural financial markets (Gonzalez-Vega, 1993).

The model used to analyze these issues is a modification, in order to incorporate the specific institutional characteristics of credit cooperatives, of a more general model of corporate-control contests developed by Harris and Raviv (1988).17

17 Harris and Raviv's model specifically deals with the traditional stock corporation as a form of organization. Besides some of the issues discussed in this dissertation, their model also analyzes the optimality of alternative majority rules.
2. THE MODEL

The situation considered here is that of a credit cooperative that is currently managed by a team of members, designated as the incumbent team or simply the incumbent. This incumbent is denoted by the letter \( j \). Another member—or group of them—who does not belong to the current management team desires to acquire control of the cooperative assets. This member is called the rival and is denoted by the letter \( r \).\(^{18}\)

In agreement with the literature on Organization Economics, the model distinguishes between two classes of benefits, private and security benefits. The distribution across members of possible values of these benefits depends on who controls the cooperative. Private benefits are those that can be enjoyed only by the party in control of the cooperative and are not accessible to the remaining members. Private benefits include everything from perquisites of control to—in extreme cases—the diversion of resources away from other members in favor of the controlling party. It is assumed that even though private benefits are observable, they are not verifiable, in the sense that claims cannot depend on the size of these benefits.

The total benefits generated by the cooperative's assets, contingent upon the identity of the party in control, are equal, therefore, to the sum of security benefits and the private benefits of control. Let \( m = r, j \) denote any of the contestants, \( V(m) \)

\(^{18}\) Both the incumbent and the rival teams will be referred to as the incumbent and the rival. Later in the model, it is assumed that the rival team is represented by a single individual. Any result found under this assumption may only be reinforced when it is assumed that the rival team is composed of several members.
represent total benefits when \( m \) is in control, while \( B(m) \) and \( y(m) \) denote private and security benefits, respectively. Clearly, \( V(m) = B(m) + y(m) \).

It is said that a contestant is better than another one when he/she generates larger security benefits. That is, contestant \( m' \) is better than contestant \( m \) —indicated by \( m' > m \)— if and only if \( y(m') > y(m) \). It is further assumed that the identity and the value of security and private benefits generated by any one of the contestants —were he/she in control— is information that is freely available to each one of the members of the cooperative.\(^ {19} \)

The cooperative is committed to the incumbent’s business plan. This plan completely determines the total benefits (i.e., security and private benefits) generated by the cooperative. On the other hand, the rival has a business strategy that may differ from the incumbent’s simply in that it changes the distribution across members of the total benefits generated by the cooperative. That is, the rival’s plan may or may not change total benefits but at least—if implemented— will change the identity of the members who obtain the private benefits of control.

The rival and the incumbent will disagree over their respective plans when their plans differ in, at least, the identity of the party that might appropriate the private benefits. This difference should be sufficient to ensure that either contestant will not simply hire the other to implement his/her plan. The assumption implies

\(^{19} \) The values of security and private benefits generated by each possible contestant may be drawn from a probability distribution. What is assumed here is that once a given contestant is drawn and he announces his intention to capture control of the cooperative, the value of these benefits is revealed to all members.
that implementation of each plan—and its implied level and distribution of benefits—is contingent upon the corresponding contestant gaining or remaining in control of the cooperative.

As a result of their institutional design and property rights structure, CCs may be assumed to have two classes of securities. The first class provides holders with voting rights, allocated under the principle of *economic democracy*. Every member of the cooperative is given, at no cost to himself, a voting share. The total number of outstanding voting shares (i.e., votes) is, therefore, equal to the number of members. Each individual member has the right to $1/N$ of the total votes. Votes may not be bought and sold among members, as they are attached to members as individuals. However, members may be compensated or bribed by the contestants in a given contest for control. That is, it is assumed that member votes may be *rented* by any of the contestants. Once the member voting right has been exercised as promised (i.e., voted for one particular candidate), the contestant pays the agreed lump sum and the member retains his vote until the next election.

It is reasonable, therefore, to assume that contestants bid for voting rights and that votes casted for them are paid for at an effective price implicit in the bid. This simplifying assumption is not detached from reality. In the real world, votes may be paid for by the winning candidate by sharing with those who voted for him some of his private benefits of control. From another perspective, the private benefits that accrue to the incumbent may be seen as the *bounty* that would be distributed among
a coalition of members (e.g., net borrowers) if the coalition is successful in gaining control of the cooperative.

The second class of cooperative securities provide holders the right to cash flows. Common cooperative shares are the typical security in this category. These shares give their holders residual claims on the net income generated by the cooperative. Common cooperative shares cannot be traded and thus do not have a market value that would reflect the cooperative's intrinsic value. Cooperative shares may be returned to the cooperative, however, at face value. Total share capital is, therefore, variable.

Other instruments that fall into this category of cash flow securities are forms of debt, mainly certificates of deposit, typically issued by these organizations. These are fixed-nominal-value securities that promise the holder a preestablished return. The effective rates of return on these securities are set by the cooperative's management.\(^{20}\)

In the model presented here, the contingent value of all cash flow claims (i.e., security benefits) is known by every CC member. Therefore, for the purposes and

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\(^{20}\) The argument here is that the cooperative's management determines the terms and conditions offered on these instruments. Members can decide whether to buy such securities or not. On the other hand, the risk-adjusted effective returns on their instruments clearly depend on the identity of the incumbent management team at any given point in time. Changes in management would, therefore, imply changes in expected returns.
implications of this model, profit claims and fixed-value instruments are equivalent. Therefore, as a result of these institutional characteristics, it is sensible to think about any individual member’s holdings in the cooperative as a portfolio of cash-flow claims and voting rights.

Assume that the cooperative has $N$ members, each of whom is indicated by $i \in \{1, \ldots, N\}$. Let $\lambda_i$ denote $i$’s relative claims on the total security benefits generated by the cooperative. Clearly, $\lambda_i \in [0,1]$ and for all $i \in I$, $\sum \lambda_i = 1$. On the other hand, member $i$’s fraction of total votes, denoted by $\nu_i$, is determined by the total number of members and the one man-one vote principle. Therefore, member $i$’s fraction of total votes is $1/N$. It is obvious that for all $i \in I$, $\sum \nu_i = 1$.

By using $\lambda_i$ and $\nu_i$, it is possible to describe $i$’s portfolio by the ratio $\lambda_i/\nu_i$. This is member $i$’s ratio of cash flow claims to votes and it is denoted by $\rho_i$. As a result of the institutional characteristics of cooperatives $\rho_i = \lambda_i N$, and $\rho_i \in [0,N]$ for any $i$. This defines the set of feasible portfolios for the individual members.

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21 This equivalency among some of the debt and profit-claims instruments issued by cooperatives is recognized in the real world by generally accepted accounting principles for cooperatives. These principles classify equity shares as long-term debt. The reason is that the total share capital of cooperatives is variable.

22 This range of possible values for $\rho_i$ is determined by the institutional characteristics of credit cooperatives. In contrast, the frequently observed corporate governance rule of one share-one vote implies that $\rho_i = 1$ for every $i$. That is, under one share-one vote, every stockholder in a corporation has a ratio of cash flow claims to votes equal to one.
3. THE SEQUENCE OF EVENTS

The model relies on a very stylized sequence of events. It is assumed that the cooperative has already been created and that it is functioning under the control of an incumbent management.\textsuperscript{23} Remember that incumbent management is denoted by $j$ and characterized by $B(j)$ and $y(j)$. Clearly, some individuals have already become members and have invested in portfolios characterized by $\rho_j$ as described above. The identity of a rival and his business plan are revealed to members. This implies that members obtain the information about the private $B(r)$ and security $y(r)$ benefits that would be obtained if the rival gains control.

Immediately afterwards there is a contest for the control of the organization. The contestants bid a price per vote for a given number of votes and an election is held. The winner, determined by simple majority, gains control over the cooperative's assets. The model mainly focuses on the bidding for votes, the voting decision on part of the members, and the results of the election or battle for control.

4. THE ACQUISITION OF VOTES

The following are the events in the stage of the contest for control during which the candidates bid for votes. Since the rival wants to take control of the

\textsuperscript{23} This is equivalent to assume that the cooperative was exogenously created. This assumption is consistent with the fact that the large majority of these organizations in developing countries have been created by external agents such as governments and international donors. In fact, one implication of the model detailed later on is that the endogenous creation of such organizations (i.e., by the members acting without external incentives) is very unlikely.
cooperative away from current management (the incumbent), it is realistic to assume that the rival has to bid for votes first. In fact, it may be thought that such bid for votes is what starts the contest for control in the first place.

It is further assumed that the rival is committed to his bid.\textsuperscript{24} Incumbent management responds by taking r's bid as given. This gives a second-mover advantage to the incumbent, in the sense that if the rival does not bid for votes, the incumbent may not need to bid to maintain control of the cooperative, while if the rival bids, then the incumbent has the choice to fight back or to surrender control.\textsuperscript{25}

When bidding, each candidate specifies the price offered per vote and the maximum number of votes that he wants to obtain. Candidate m's bid is represented, therefore, by the pair \([y(m), p(m)]\), where \(y(m)\) represents the maximum number of votes that \(m\) wants to acquire and \(p(m)\) represents the offered price per vote. The expenditure implicit in the bid is, therefore, \(y(m)p(m)\).

Let \(\gamma(m)\) be the number of votes actually received by candidate \(m\) at the voting stage. Clearly, \(\gamma(m)\) and \(y(m)\) do not have to coincide. Since candidates are assumed to be committed to their bids, they have to device an instrument to assure

\textsuperscript{24} This is reasonable if, as it is the case in most credit cooperatives, rival groups spend money in campaigning and soliciting votes before the general assembly meets.

\textsuperscript{25} Later on, when deriving equilibrium bids, this assumption is strengthened. It is assumed that the incumbent will have to bid—even if the rival offers to pay zero—when the rival is better than the incumbent. The reason for this is that if the incumbent is bad enough (i.e., \(y(r)-y(i)=\Delta y\) is large), some members would rather vote for the rival even if he paid nothing for votes. This would result from the security income component of the voting decision.
that the actual expenditure in votes $-\gamma(m)p(m)-$ does not exceed the maximum expenditure implied in their bids $-\varphi(m)p(m)$. That is, contestants must be assured that they will not be put in a situation in which they may be obligated to spend more than the amount they are prepared to spend in order to acquire control. This is achieved by introducing the following *pay-up ratio* $t(m) = \min\{\varphi(m)/\gamma(m), 1\}$ so that the effective price per vote paid to the members who voted for $m$ is $t(m)p(m)$. That is, $t(m)$ implies that if $\gamma(m)$ —the number of votes casted for $m$— is less than $\varphi(m)$ —the number requested— then each vote is compensated at $p(m)$, but if $\gamma(m)$ is greater than $\varphi(m)$ each vote would be compensated at a fraction $\varphi(m)/\gamma(m)$ of the offered price $p(m)$. It is obvious that $\varphi(m)p(m) = t(m)\gamma(m)p(m)$.

5. VOTING FOR THE CANDIDATES

The equilibrium notion assumed for the voting subgame is Nash. In the voting stage members decide for whom to vote simultaneously and independently. Define $[\delta^*]$ —the Nash equilibrium voting strategy profile — as the vector of voting decisions that results from solving the following optimization problem for every member of the cooperative:

Note that this *pay-up ratio* is equivalent to a *take-up ratio*, implying that if $\gamma(m) > \varphi(m)$ then only a fraction $\varphi(m)/\gamma(m)$ of votes casted for $m$ would be purchased. The effect of the two ratios is equivalent, because both limit the member's effective expected price per vote and impose a limit to the maximum expenditure incurred by $m$ in making a bid. Harris and Raviv use a take-up ratio.
\[ \max_{\delta(m)} \delta(m)t(m)p(m) + \nu_i \rho_i \gamma[W(\gamma)], \] (1)

subject to:

\[ \delta(m) \in \{0,1\}, \text{ and } \delta_r + \delta_j \leq 1 \]

taking as given:

\[ \delta_i \text{ for every } i' \neq i, \]

where:

\[ t(m) = \min \{ \varphi(m)/\gamma(m), 1 \}, \] (2)

\[ \gamma(m) = \sum_{i \in I} \delta(i,m) \] (3)

\[ W[\gamma(m)] = \left\{ \begin{array}{ll}
  j & \text{if } \gamma(j) > \frac{N}{2} \\
  r & \text{if } \gamma(r) \geq \frac{N}{2} \\
  \arg \max_{m \in \{j,r\}} \gamma(m) & \text{otherwise}
\end{array} \right. \] (4)

\(W[\gamma(m)]\) is a function that maps the tender distribution \([\gamma(r), \gamma(j)]\) to the winner of the election contest. Implicit in this winner function is the tie-breaking assumption that if \(\gamma(r) = \gamma(j) = N/2\), then \(r\) wins. That is, \(r\) needs exactly \(1/2\) of the votes to win. If there is a large enough number of abstentions so that none of the
candidates obtains a majority of the votes, the winner is the contestant with the largest security value. 27

The economic intuition behind the equilibrium voting strategy profile \( [\delta^*] \) is simply that members will take into account —when choosing among voting strategies— both the effective price received for the vote, and the effect —if any— that the voting decision would have on the value of their share of security benefits. The price component of the voting decision is captured by \( \delta_i(m) t(m) p(m) \), while the security income component is given by \( v_i \beta_\gamma [W(\gamma)] \).

One key determinant of the equilibrium bidding strategies by each contestant is the perception regarding the voting size of the members. This assumption specifies the influence an individual member’s voting decision would have on the outcome of the election. The two extreme forms of this assumption are that members are always pivotal and that members are always infinitesimal. A member is pivotal when a change in voting decision will change the outcome of the election. By the same token, a member is infinitesimal when a change in voting decision would not alter the election outcome.

Assumptions about the size of individual member’s are, therefore, assumptions about voting powers. In a cooperative organization a member’s voting power is determined by the principle of economic democracy (i.e., one man-one vote), the size

27 Later on it is shown that in equilibrium all members present at the general assembly would cast their votes for one of the candidates. This implies, therefore, that in equilibrium there are no abstentions. The purpose here is not to unnecessarily limit the strategy space of members.
of the cooperative, and the closeness of the voting distribution. The first two
determinants are exogenous to the members of the cooperative.

The particular assumption adopted here is that individual members consider
themselves pivotal only when the election results are very close and consider
themselves infinitesimal otherwise. That is, even though members are collectively
pivotal, they do not always consider themselves to be pivotal and/or infinitesimal as
individuals.

The assumption is consistent with a credit cooperative’s institutional design.
Given free entry into the cooperative, current members may consider themselves to
be an infinitesimal part of an undetermined pool of potential members. However,
once the general assembly is being conducted and the election outcome is close, it
may be reasonable for an individual member to consider his vote as pivotal.

The modelling and practical implications of this not-always-infinitesimal
assumption are equivalent to assume that the cooperative has a sufficiently large

28 Under more general circumstances, the voting power of an individual member
may also depend on the majority rule chosen. The normal majority rule for
credit cooperatives is simple majority (i.e., one-half of the votes).

29 This is the concept of smallness used by Harris and Raviv. However, their
assumption applies to the portfolios held by stockholders after trading
common shares among themselves. That is, in their case they assume a
particular result for an endogenous process. Fortunately, in this case the
assumption results from the members exogenous small endowment of votes
as determined by the size of the cooperative and the one man-one vote princi-
ple.

30 Later on it will be demonstrated that in equilibrium no single member will be
pivotal. However, the fact that each member could be pivotal if the vote were
close enough determines the equilibrium offers for votes made by the conter-
tants.
number of members so that a member switching his vote would not significantly affect the effective price per vote offered by the contestants. Formally, if \( t(m) = \min\{1, \varphi(m)/\gamma(m)\} \), then \( \varphi(m)/\gamma(m) \) is close enough to \( \varphi(m)/(\gamma(m)+1) \). Otherwise, the problem would be untractable, as the change in the voting decision by an individual would considerably affect the effective price offered by candidates. This, in turn, would influence the optimal decision of the remaining members.

6. EQUILIBRIUM ELECTION RESULTS

The aim of this section is to calculate the price and the quantity components of each candidate's equilibrium bids for naked votes. These bids are a function of member portfolios, as characterized by the corresponding ratios of cash flows to votes, and of the magnitude and distribution of the total benefits generated by each candidate. For the moment these variables, member portfolios and private and security benefits associated with each candidate, are taken as given. Later on, using the results from this section, the distribution of total benefits according to successful candidates and the choice of portfolios by members will be made endogenous. This will allow an explanation of some empirical regularities regarding the behavior and performance of credit cooperatives in developing countries.

The notion of equilibrium adopted for this part of the game played by the contestants in making their bids is sequential. Although contestants have to bid for votes prior to the stage in which the election actually takes place, they will consider the anticipated results of such an election while making their equilibrium bids. It is
required that the candidates' strategies during previous stages be optimal once the anticipated member behavior in the next stage is taken into account.

Therefore, prior to their bidding, candidates would analyze the equilibria of the voting subgame, given their bids. Consequently, the procedure adopted here is to analyze the last stage first, by examining selected relevant equilibria of the voting subgame. The next step would be, then, to characterize the equilibrium offers for votes while taking into account equilibrium voting profiles on the part of the members.

(a) EQUILIBRIA IN THE VOTING SUBGAME

This subgame is played among members who may choose among three strategies: to vote for either candidate or to abstain from voting. The equilibrium notion assumed for this subgame is Nash. This requires that the equilibrium voting strategy profile \( \delta^* \) solves equation (1) for every member.

In equilibrium, every member will vote for one of the contestants. Abstaining from voting [i.e., \( \delta_i(r) = \delta_i(j) = 0 \)] is a dominated strategy, because member \( i \) could vote for the winning candidate without changing the election outcome and still receive the -non-negative-- effective price offered by the winner. This assures that, in any equilibrium of the voting subgame, all votes are casted (i.e., \( \gamma(r) + \gamma(j) = N \)).

The analysis of the voting subgame is centered on four possible equilibria. Each of the selected possible equilibrium outcomes is characterized by the votes received by \( r \). The purpose is to derive sufficient conditions for each candidate's bid that would support the proposed equilibrium, taking the members' portfolios and
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\(y(m)\) as given. This is equivalent to ask what conditions should be met by the bids of the contestants in order for a given outcome of the voting subgame to be an equilibrium—taking \(y(m)\) and \([\alpha]\) as given.

\textbf{Case I.} The profile of optimal strategies for every member—as Nash equilibrium of the voting game—is such that \(\gamma(r)=N/2\). That is, the rival wins with just the minimum required number of votes.

The following two conditions must be satisfied in order to have this case as the equilibrium outcome of the voting subgame.

(i) The members who voted for \(j\) do not want to vote for \(r\)

Any member who voted for \(j\) may vote for \(r\) without reversing the election outcome (i.e., \(r\) would win anyway). This implies that any member who voted for \(j\) would only consider the prices per vote paid by each candidate when deciding whether to change his decision and vote for \(r\) instead. This is because the value of his share of any security benefits would not be affected as a result of his decision. Therefore, for case \(i\) to be an equilibrium it must be that:

\[a(j)p(j) \geq a(r)p(r)\]  \hspace{1cm} (5)

(ii) The members who voted for \(r\) do not want to vote for \(j\)

Any member who voted for \(r\) is pivotal, in the sense that by reversing his vote he will also reverse the election outcome. That is, \(i\) while voting for \(r\) must have taken into account both the prices per vote offered by the candidates (price
component) and the change in the value of his share of the security benefits resulting from a change in the election result (security income component). Therefore, for every $i$ such that $\delta_i(r) = 1$ the following condition must be satisfied for case I to be an equilibrium:

$$\delta_i(r) \alpha(j)p(j) + \lambda_i y(j) \leq \delta_i(r) \alpha(r)p(r) + \lambda_i y(r)$$  \hspace{1cm} (6)

The left-hand side term in (6) represents the expected pay-off member $i$ would receive by voting for $j$ when $j$ is the winner of the contest for control. The right-hand side term represents the expected payoff $i$ would receive by voting for $r$ when $r$ is the winner of the control contest. In case I every $i$ who voted for $r$ is pivotal, hence (6) must hold. Condition (6) can be rearranged as:

$$\delta_i(r) [\alpha(j)p(j) - \alpha(r)p(r)] - \nu_i p_i \Delta y \leq 0,$$  \hspace{1cm} (7)

where, $\Delta y = y(r) - y(j)$.

**Case II.** The profile of optimal strategies for every member --as Nash equilibrium of the voting game-- is such that $N/2 < \gamma(r) \leq N$. That is, the rival wins with more than the minimum required number of votes.

In this equilibrium, no single individual is able to reverse the election outcome by changing his voting decision. That is, individual members are not pivotal to the election outcome. Individual members should consider the value of security benefits as given. Consequently, when making their voting decisions members take into
account only the effective price per vote paid by each candidate and ignore the effect of their decision on the value of security benefits. Hence, for case II to be an equilibrium the following condition must be satisfied:

\[ t(r)p(r) > t(j)p(j) \quad \text{if} \quad \gamma(r) = N \]
\[ t(r)p(r) = t(j)p(j) \quad \text{if} \quad \gamma(r) < N \]  \hspace{1cm} (8)

Condition (8) simply states that in order for case II to be an equilibrium, the effective price per vote offered by \( r \) should be at least as good as that offered by \( j \).

**Case III.** The profile of optimal strategies for every member --as Nash equilibrium of the voting game-- is such that \((N-2)/2 + \gamma(r) \geq 0\). That is, the incumbent obtains the minimum number of votes to win.

This is similar to case I. In order for this to be an equilibrium, the following two conditions must be satisfied.

(i) The members who voted for \( r \) do not want to vote for \( j \)

The outcome of the election would not be reversed if a member switches his vote from \( r \) to \( j \). Therefore, the effective price per vote paid by \( r \) must be as good as that paid by \( j \). Formally,

\[ t(r)p(r) \geq t(j)p(j). \]  \hspace{1cm} (9)

(ii) The members who voted for \( j \) do not want to vote for \( r \)

The outcome of the election would be reversed if any of the members who voted for \( j \) voted for \( r \) instead. If the outcome of the election is reversed, the value
of the security benefits would change from $y(j)$ to $y(r)$. Individual members would take this fact into account when making their voting decisions for an equilibrium such as case III above. Hence, the following condition must be satisfied for every $i$ such that $\delta_i(j)=1$ for case III to be an equilibrium of the voting subgame:

$$\delta_i(j)\pi(j)p(j) + \lambda_iy(j) \geq \delta_i(j)\pi(r)p(r) + \lambda_iy(r)$$

(10)

The left-hand side term in (10) represents the expected payoff $i$ would receive by voting for $j$ when $j$ is the winner of the control contest. The right-hand side term represents the expected payoff $i$ would receive by voting for $r$ when $r$ is the winner of the control contest. In case III every $i$ who voted for $j$ is pivotal, hence (10) must hold. Condition (10) can be rearranged as:

$$\delta_i(j)[\pi(r)p(r) - \pi(j)p(j)] + \rho_i \Delta y \leq 0,$$

(11)

where, $\Delta y = y(r) - y(j)$.

**Case IV.** The profile of optimal strategies for every member --as Nash equilibrium of the voting game-- is such that $0 \leq \gamma(r) \leq N/2$. That is, the incumbent obtains more than the minimum number of votes to win.

This case is symmetrical to case II above. When considering his voting strategy, $i$ would take into account only the effective price per vote offered by each candidate, because his vote is not pivotal and, hence, he would take $y(j)$ as given.
Therefore, for case IV to be an equilibrium of the voting subgame, the following condition must hold:

\[
\begin{align*}
\kappa(r)p(r) & < \kappa(j)p(j) & \text{if } \gamma(r) = 0 \\
\kappa(r)p(r) & = \kappa(j)p(j) & \text{if } \gamma(r) > 0 
\end{align*}
\]  \hspace{1cm} (12)

Condition (12) simply states that in order for case IV to be an equilibrium, the effective price per vote offered by \( j \) —the winning candidate— should be at least as good as that offered by \( r \).

This section has provided necessary and sufficient conditions on each candidate’s bids that would support four possible equilibria in the voting subgame, taking \( y(m) \) and \( [\rho_i] \) as given. The cases studied represent four among several possible equilibria of the voting subgame for any given bids, \( y(m) \) and member portfolios. This situation of multiple equilibria is solved in the next section, where equilibrium bids are derived by taking into account the equilibria in the voting subgame.

(b) EQUILIBRIUM OFFERS FOR VOTES

This section presents the equilibrium bids for each of the contestants. The idea is to find an offer \([p^*(m), p^*(m)]\) for \( m= j, r \) such that neither candidate would like to deviate from his offer once he takes into account his opponent’s reaction and the outcome of the voting subgame (e.g., the equilibrium voting strategies in each of the four cases discussed).

The first step is to establish that candidates will never submit a loosing bid for votes. This follows from the fact that at the time of the contest for control the
characteristics of the candidates \([i.e., B(r), y(r); B(j), y(r)]\) and the profile of member portfolios \((\{\rho_i\})\) are common knowledge. Also, the result of the outcome is deterministic, in the sense that if \(\gamma(r) \geq N/2\), \(r\) wins, otherwise \(r\) loses. Candidates with rational expectations about the contest outcome predict the winner with certainty. These assumptions about the information structure of the model combined with the fact that candidates are committed to their bids assure that a losing bid will not be submitted. The reason is that candidates bid for naked votes, hence the only return a bidder can make on those votes is through private benefits of control that are contingent upon winning. If a candidate submits a losing bid, he would incur in a cost equal to \(t(m)\gamma(m)p(m)\) and will receive zero private benefits of control. Hence no losing bids are submitted.

Given the second-mover advantage granted by the model to \(j\), the sequence of events is as follows. The rival will not submit a bid for which a profitable counterbid by \(j\) exists. This is because \(r\), prior to submitting a bid, would consider whether there is a counterbid by which \(j\) would win and spend less than his private benefits. If such counterbid existed, \(j\) would and still be win profitable and \(r\) would suffer a loss equivalent to whatever he spends in renting votes. Therefore, if \(j\) has a profitable counterbid to \(r\)'s bid, then \(r\) does not bid.

By the same token, \(j\) will only bid if he has a profitable counterbid to \(r\)'s bid. Hence, if there is a bid \([\psi(r), p(r)]\) by \(r\) such that \(\psi(r)p(r) \leq B(r)\) and for which there is not a profitable counterbid by \(j\) then \(r\) would bid and receive all the votes. In contrast, if the necessary expenditure to win exceeds \(r\)'s private benefits, then \(r\) will
not offer a positive bid. Then \( j \) will offer his least expensive bid and maintain control of the cooperative's assets. In this case \( j \) will take into account that all members will vote for him because \( r \) did not bid for votes. The incumbent's expenditure will be, therefore, \( t(j)\gamma(j)p(j) \).

In general there are several equilibria in the voting subgame beyond the four cases analyzed in the previous section. To find a unique equilibrium, it is assumed that in case there are two or more equilibria with contradictory election results (i.e., in one equilibrium \( m \) wins and in another \( m \) losses), then the equilibrium in which the better candidate wins [i.e., the one with higher \( y(m) \)] will always predominate. This is a reasonable assumption, given that the better candidate would always be preferred by the members, ceteris paribus. The assumption is incorporated in the definition of a profitable counterbid below.

The previous discussion is formalized by using the following concepts, defined as in Harris and Raviv for a similar problem.

**Winning profitably.** Given bids \([\phi(m),p(m)]\), and an equilibrium \([\delta^*] \) of the voting subgame that results in a distribution of votes \( \gamma(m) \), it is stated that \( m \) wins profitably \((m=j,r)\) if \( m \) wins (i.e., \( W[\gamma(m)]=m \)), and spends less than his private benefits of control [i.e., \( t(m)\gamma(m)p(m)<B(m) \)]. That is, if private benefits are not totally dissipated in the process.

**Profitable counterbid.** A bid \([\phi(j),p(j)]\) by an incumbent, \( j \), is a profitable counterbid against a bid \([\phi(m),p(m)]\) by a rival, \( r \), if and only if:
(a) \( r > j \), then \( j \) wins profitably in all possible equilibria \( \delta \) of the voting subgame, and
(b) \( r < j \), then \( j \) wins profitably in at least one of the possible equilibria of the voting subgame.

\textbf{Winning bid.} A bid \([\varphi(r), p(r)]\) by the rival, \( r \), is a winning bid if and only if there is no profitable counterbid by \( j \).

\textbf{Equilibrium of the election game.} An equilibrium of the election game is given by a set of three strategies \( \{[\varphi^*(r), p^*(r)]; [\varphi^*(j), p^*(j)]; [\delta^*] \} \) representing, respectively, bids by \( r \) and \( j \) and a strategy voting profile of the election subgame such that:

(i) If \( r \) could win profitably (i.e., there is a winning bid \([\varphi(r), p(r)]\) by \( r \) such that \( \varphi(r)p(r) \leq B(r) \)), then \( r \) would choose the bid that would imply the minimum cost of acquiring control of the cooperative. That is, \([\varphi^*(r), p^*(r)]\) is the winning bid that minimizes \( \varphi(r)p(r) \) over all winning bids by \( r \). Then \( j \) bids zero \([\varphi(j)p(j)=0]\), and all members vote for \( r \) \([\delta^*_i(r)=1 \text{ for all } i]\)

(ii) If \( r \) could not win profitably (i.e., there is no winning bid \([\varphi(r), p(r)]\) by \( r \) such that \( \varphi(r)p(r) \leq B(r) \)), then \( r \) bids zero \([\varphi(r)p(r)=0]\); \( j \), in turn, would bid the least expensive profitable counterbid (i.e., \([\varphi^*(j), p^*(j)]\)). This is the profitable counterbid against \([0,0]\) by \( j \) that minimizes \( \varphi(j)p(j) \) across all profitable counterbids by \( j \), and all members vote for \( j \) \([\delta^*_i(j)=1 \text{ for all } i \in I]\).\(^{31}\)

\(^{31}\) The result that all members vote for the same candidate is consistent with the fact that in credit cooperatives it is common to observe that members of the board of directors are elected by acclamation. This is equivalent to being
Remember that the purpose of this section is to characterize the bids for votes made in equilibrium by each one of the candidates. This allows predictions about the alternative outcomes of the contest for control under different circumstances. The analysis is further divided into two cases, depending on the value of the security benefits that would be generated by each candidate if he were in control. The first case assumes that the rival is better than the incumbent (i.e., \( y(r) > y(j) \)). The idea is to derive the sufficient conditions on \( B(r), B(j), y(r), y(j), \) and \( [\rho^*] \) that would enable \( r \) to take or not to take control of the cooperative.

**Case I: The rival is better than the incumbent**

The first step is to derive \( r \)'s minimum-cost winning bid. The goal is to measure the minimum expenditure that the rival must incur in order to get elected. This minimum expenditure depends on \( B(j), [\rho], \) and \( Ay \). Hence, the minimum expenditure required by the incumbent to win control depends on the amount of private benefits enjoyed by the incumbent, the distribution of member portfolios, and how much better \( r \) is with respect to \( j \).

Once the minimum expenditure required to win is calculated, the natural question to ask is whether acquiring control is profitable for \( r \) (i.e., are private benefits of control greater than the minimum cost of winning?). Clearly, if the

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...elected by unanimity (i.e. \( \delta_i(m) = 1 \) for all \( i \)) in a situation in which loosing bids were not submitted. In fact, in the German cooperatives current management proposes the list of members of the board to the general assembly, leaving it to the members to accept or reject the list *in toto* [Bonus and Schmidt, p.199].
required minimum cost of winning is less than \( B(r) \), then \( r \) will overthrow \( j \), otherwise \( j \) will remain in control.

Rival's minimum-cost winning bid

For a bid by \( r \) to be a winning bid it is necessary that a profitable counterbid by \( j \) does not exist. By definition, a profitable counterbid by \( j \) must cost less than \( B(j) \) and attract strictly more than \( N/2 \) votes. Therefore, the maximum price per vote that \( j \) would be able to pay in a profitable counterbid would be \( [B(j)]/[N/2] = (2/N)B(j) \). On the other hand, recall that \( y(r) > y(j) \). This implies that all members with strictly positive cash flow claims (i.e., \( \lambda_i > 0 \)) would prefer \( r \) to be in control, ceteris paribus. The larger a given member's loss in cash flow claims, the stronger his preference for \( r \) over \( j \). It follows that some members may be willing to sell their votes to \( r \) at a price below the one they would obtain by voting for \( j \) if they thought that their voting decision is pivotal to the result of the election.\(^{32}\)

Therefore, when \( r \) is better than \( j \), the least expensive way for \( r \) to acquire control has to be in an equilibrium in which every member who voted for him is pivotal and has a large cash flow claim. When \( r \) is better than \( j \) the best that he could hope for is a situation in which members value their security benefit superiority enough so as to be willing to sell their votes to him at a sufficiently low price. This

\(^{32}\) It is obvious that if a member considers that his voting decision would not change the election outcome, then he would vote for the candidate who offers a higher effective price per vote. That is, an individual would ignore the effects of his voting decision on security income when his individual decision is not relevant.
would be achieved, as argued above, when members are pivotal (i.e., case $i$ in the voting subgame) and have large cash flow claims.

In such an equilibrium, every member who voted for $r$ is pivotal; therefore, the following condition on $t(\pi)p(\pi)$ must hold for every $i$ such that $\delta(\pi)=1$:

$$\delta_i(\pi)\pi(\pi)p(\pi) + \lambda_i\gamma(\pi) \geq \delta_i(\pi)\frac{2}{N}B(j) + \lambda_i\gamma(j),$$

(13)

Otherwise, member $i$ would rather reverse his vote from $r$ to $j$. Note that the left-hand side expression in (13) represents the total income received by $i$ when he votes for $r$ and $r$ wins, while the right-hand side represents total income when $i$ votes for $j$, $j$ offers his highest possible price per vote, and $j$ wins. Because it is being assumed that $i$ is pivotal (i.e., $\gamma(\pi)=1/2$), he would vote for $r$ only if (13) holds. The condition could be rearranged as follows

$$[\delta_i(\pi)\pi(\pi)p(\pi) - \lambda_i\Delta\gamma] \frac{N}{2\delta_i(\pi)} \geq B(j)$$

(14)

which, in turn, equals:

$$\pi(\pi)p(\pi) \geq \frac{2}{N}B(j) - \frac{\rho_i}{N\delta_i(\pi)}\Delta\gamma$$

(15)

where $\delta_i(\pi)=1$, $\rho_i=\lambda_iN$, $\Delta\gamma=\gamma(\pi)-\gamma(j)$, and $\Delta\gamma>0$ because $\gamma(\pi) > \gamma(j)$.

Condition (15) is a necessary and sufficient condition on the effective price per vote offered by $r$ in order to induce member $i$ to vote for him and not switch his vote to $j$ when $i$ is pivotal for the election result.
So far the two conditions for \( r \) to win that have been analyzed are that 
\[
\gamma(r) = \frac{N}{2} \text{ (i.e., every } i \text{ such that } \delta_i(r) = 1 \text{ is pivotal)}, \text{ and that condition (15) holds for every } i \text{ such that } \delta_i(r) = 1. \] 
These satisfy the requirement that \( r \) wins in a situation in which every member who voted for him is pivotal.

However, there may be several different Nash equilibrium voting profiles \([\delta^*_i]\) that satisfy such condition. The vector \([\delta^*_i]\) represents the equilibrium voting decisions of the \( N \) members in the cooperative. The objective, however, is to find \( r \)'s minimum-cost winning bid. Recall that if \( y(r) > y(j) \), then it suffices for \( r \) to win in some equilibrium. Hence, the analysis is focussed on the particular distribution of member voting decisions (i.e., the equilibrium value of the vector \([\delta^*_i]\)) that minimizes \( r \)'s cost.

From condition (15) it is observed that \( t(r)p(r) \) is negatively related to \( \rho_i \), which implies that the larger \( \rho_i \) the lower the \( p(r) \) that would induce \( i \) to vote for \( r \). Also note that if (15) is satisfied for \( \rho_i \), then it is duly satisfied for any \( \rho_i' \) such that \( \rho_i' > \rho_i \). This is equivalent to say that if member \( i \) has the incentive to vote for \( r \), then all other members who have portfolios with cash flow claims larger than \( i \) also have the incentive to vote for \( r \). In other words, the effective price that \( r \) needs to offer in order to induce \( i \) to vote for him decreases as \( i \)'s cash flow claim increases. Formally, if 
\[
t'(r)p'(r) = (\frac{2}{N})B(j) - (\rho_i'/N)\Delta y, \quad \text{and} \quad t(r)p(r) = (\frac{2}{N})B(j) - (\rho_i/N)\Delta y;
\] 
then 
\[
t'(r)p'(r) < t(r)p(r) \text{ if and only if } \rho_i' > \rho_i.
\]
Accordingly, the equilibrium voting profile \([\delta^*] \) that minimizes \(r\)'s cost of winning would be given by the solution to the following problem:

\[
R = \max_{\delta} \left[ \min_{i} \left( \frac{\psi_{ij}(r)}{\delta_{ij}} \right), \text{ for } i \text{ s.t. } \delta_{ij}(r)=1 \right]
\]

subject to \( \sum_{i=1}^{n} \delta_{ij}(r) \geq \frac{N}{2} \)  

(16)

Since \(R\) solves the problem above (i.e., \(R\) is the maximized value of \(\psi_{ij}/\delta_{ij}\) above) it represents the minimum ratio of cash flow to votes (\(\psi_{ij}\)) among the members who voted for \(r\) in an equilibrium in which \(\gamma(r)=N/2\) (i.e., \(r\) barely wins and every \(i\) such that \(\delta_{ij}(r)=1\) is pivotal). Informally, it may be said the \(R\) represents the maximized-minimum of the \(\psi_{ij}/\delta_{ij}\)'s.\(^{34}\)

The price component of \(r\)'s minimum-cost winning bid may be expressed as:

\(^{33}\) It should be noted that reference is being made to \(r\)'s minimum cost to win when he makes a non-discriminatory bid for votes. This implies that \(r\) pays the same effective price to all members who vote for him. If \(r\) could make a discriminatory bid he would pay every member with \(\delta_{ij}(r)=1\) the price that would solve condition (19) with an equality. In this case \(r\) would gain control with a lower expenditure. It is assumed, however, that contestants cannot make discriminatory bids. This is reasonable, when the information requirements and transaction costs required for such bids are taken into account.

\(^{34}\) The following example illustrates this. Assume that the ratios of cash flow to votes of the members of a cooperative with \(N=4\) are given by \(\psi=[8,7,6,5]\). In this case \(R=7\) and \(\delta^*=[1,1,0,0]\) will be the voting profile that would allow \(r\) to gain control at minimum cost. Note that any other voting profile such as \(\delta^*=[1,0,1,0]\) would give control to \(r\) but not at minimum cost, because \(R'=6<R=7\).
\[ P(R) = \max\{\frac{2}{N}B(j) - \frac{R}{N} \Delta y, 0\} \] (17)

The minimum price per vote that \( r \) has to pay is a function of the minimum ratio of cash flow to votes among the members who voted for him. Given that \( r \) may bid zero and it is possible to have that \((2/N)B(j) < (R/N)\Delta y\), \( P(R) \) is defined as:

\[ \max\{\frac{2}{N}B(j) - \frac{R}{N} \Delta y\} \] (18)

It follows that \( r \)'s minimum-cost bid winning bid is given by \([N/2, P(R)]\), which implies that the minimum amount of money that \( r \) must spend to acquire control is:

\[ \left(\frac{N}{2}\right)P(R) = \max\{B(j) - \frac{R}{2} \Delta y, 0\} \] (19)

Clearly, \( r \) will make an offer for votes only if his private benefits are at least equal to the minimum cost of acquiring control [i.e., \( B(r) \geq (N/2)P(R) \)], otherwise he would bid zero. When \( r \) submits his minimum cost winning bid there is no profitable counterbid by \( j \). Since \( j \) would not submit a loosing counterbid, then \( j \)'s best reaction to \( r \)'s bid is to counterbid \([0,0]\) (i.e., \( j \) surrenders). When \( B(r) \leq (N/2)P(R) \), the rival will not bid. In such case \( j \) must offer a profitable counterbid against \( r \)'s bid of \([0,0]\).

Given that in this equilibrium every member who voted for \( r \) is pivotal, it suffices for \( j \) to induce one individual to switch his vote from \( r \) to \( j \). Recall that for the pivotal member, condition (15) is satisfied with an equality. Accordingly, it suffices for \( j \) to offer a price slightly more than \( R\Delta y \) to convince the critical member (i.e., the member for whom \( \rho_j/\delta_i = R \)) to vote for \( j \). In short, when \( r \) bids \([0,0]\) the incumbent
retains control, by bidding for just above \(N/2\) the votes at a price slightly above \((R/N)\Delta y\).

The following proposition summarizes the discussion and describes the conditions under which a better rival may or may not take over control of the cooperative from an inferior incumbent management team.

**Proposition 1.**

Proposition 1 has two parts:

(a) **When a better rival gains control of the cooperative**

Assume that the rival is better than the incumbent and that the portfolios of the members are given. If the following condition is satisfied:

\[
S(r) - PiR = \max\{B(j) - \frac{R}{2} \Delta y, 0\}
\]

then, the equilibrium of the election game is characterized by:

(i) The rival's equilibrium bid is \([N/2, P(R)]\).

(ii) The incumbent's equilibrium bid is \([0, 0]\).

(iii) \(\delta^*_i(r) = 1\) for every \(i\) (i.e., all members vote for \(r\)).

(iv) Clearly, the better rival obtains control of the cooperative.

(b) **When a worse incumbent remains in control of the cooperative.**

Under the same assumptions, if the previous condition is not satisfied, then the equilibrium of the election game is characterized by:

(i) The rival's equilibrium bid is \([0, 0]\).
(ii) The incumbent's equilibrium bid is \( [N/2, (R/N)\Delta y] \).

(iii) \( \delta^*(j) = 1 \) for every \( i \) (i.e., all members vote for \( j \)).

(iv) Clearly, the worse incumbent retains control of the cooperative.

For proof, see the Appendix at the end of the dissertation.

**Case II. The incumbent is better than the rival**

This second case studies the circumstances in which a superior incumbent may or may not be ousted by an inferior rival. Once again, the main purpose is to find the minimum expenditure that the inferior rival would have to incur in order to gain control of the cooperative. The idea is to determine the circumstances under which \( r \)'s least expensive winning bid is a profitable winning bid (i.e., are \( r \)'s private benefits of control greater than his minimum-cost winning bid?). Hence, conditions on \( B(r) \), \( B(y) \), \( \Delta y \), and \( \rho \) under which the inferior rival may win control of the cooperative are obtained.

It should be remembered that \( r \) must prevent \( j \) from winning in any equilibrium of the voting subgame because \( y(r) < y(j) \). On the other hand, since \( y(r) < y(j) \), members would prefer, *ceteris paribus*, to have \( j \) in control of the cooperative. In particular, those members with high ratios of cash flows to votes \( (\rho_i) \) have a strong preference for \( j \). Finally, the least costly way for \( j \) to maintain control is by getting just above 1/2 of the votes (i.e., Equilibrium III -- \( j \) barely wins-- in the voting subgame).
In analogy to the previous case $j$'s minimum cost winning bid must satisfy the following condition:

$$\delta_{i}(j)\pi(r)p(r) + \lambda_{r}y(r) = \delta_{i}(j)\pi(j)p(j) + \lambda_{r}y(j),$$

which after rearrangement becomes:

$$\pi(j)p(j) = \pi(r)p(r) + \frac{J}{N} \Delta y,$$

where $J$ is defined as the $\text{argmax}$ of the following problem:

$$J = \max_{\delta} \left[ \min_{i} \{ \pi_{i} / \delta_{i}(j) \}, \text{ for } i \text{ s.t. } \delta_{i}(j)=1 \right]$$

subject to $\sum_{i=1}^{N} \delta_{i}(j) \geq \frac{N}{2}$.  

The minimum expenditure for $j$ to win is given, therefore, by:

$$(N/2)\pi(j)p(j) = (N/2)[\pi(r)p(r) + J\Delta y]$$

This corresponds to the minimum price per vote times the amount of votes purchased. It has been shown already that the maximum price per vote that the incumbent can bid is $(2/N)B(j)$. The rival would like to set the price component of his offer as to insure that the incumbent's minimum expenditure to win is greater than his willingness to pay for control. If the rival's offered price per vote satisfies the following condition, the incumbent could not afford a winning bid (i.e., $j$ cannot make a profitable counterbid). More precisely:
\[
\frac{2}{N} B(j) \geq \kappa(r) p(r) + \frac{J}{N} \Delta y \implies \kappa(r) p(r) \geq \frac{2}{N} B(j) - \frac{J}{N} \Delta y.
\] (25)

Therefore, the rival solves (25) with equality and offers an effective price per vote of \(P(J) = (2/N)B(j) - (J/N)Ay\). Finally, \(r\) needs at least \(N/2\) of the votes to win because, since \(y(r) < y(j)\), all members who did not vote for \(r\) would vote for \(j\). The minimum expenditure that is required for \(r\) to gain control is \((N/2)P(J) = B(j) - (J/2)Ay\). If the rival is able to make a profitable bid [i.e., \(B(r) \geq (N/2)P(j)\)] he will do so and, since the incumbent will surrender (i.e., \(j\) bids zero), then the rival wins the control contest. In the opposite case, in which the rival cannot win profitably [i.e., \(B(r) < P(j)/2\)], then the rival does not bid and, since \(y(r) < y(j)\), the incumbent does not need to bid to retain control because members prefer him anyway.

The following proposition summarizes the discussion and describes the conditions under which an inferior rival may or may not take over control of the cooperative from a superior incumbent management team.

**Proposition 2.**

Proposition 2 has two parts:

(a) **When a worse rival takes over control of the cooperative**

Assume that the rival is worse than the incumbent and that the portfolios of the members are given. If the following condition is satisfied:

\[
B(r) \geq \frac{N}{2} P(J) = B(j) - \frac{J}{2} \Delta y
\] (26)

then, the equilibrium of the election game is characterized by:
(i) The rival's equilibrium bid is \([N/2, \frac{P(J)}{2}]\).

(ii) The incumbent's equilibrium bid is \([0,0]\).

(iii) \(\delta^*_i(r) = 1\) for every \(i\) (i.e., all members vote for \(r\)).

(iv) Clearly, the worse rival obtains control of the cooperative.

(b) When a better incumbent remains in control of the cooperative

Under the same assumptions, if the previous condition is not satisfied, then

the equilibrium of the election game is characterized by:

(i) The rival's equilibrium bid is \([0,0]\).

(ii) The incumbent's equilibrium bid is \([0,0]\).

(iii) There is no contest for votes.

(iv) Clearly, the incumbent retains control of the cooperative.

For proof, see the Appendix at the end of the dissertation.

Propositions 1 and 2 provide a complete mapping between any combination

of values for \(B(r), y(r), B(j), y(j), [\rho]\) and the aftermath of the competition for

control of the cooperative. In other words, these two propositions fully characterize

the outcome of any tournament for control of the cooperative, given the alternative

values of five variables.

These results are used below to formally explain some stylized facts and

empirical regularities about the behavior and performance of the credit cooperative

form of organization. This formal understanding represents a good foundation upon

which sound policy implications regarding cooperatives may be constructed. The idea
is to assume values for the relevant variables that are agreeable with the institutional characteristics of credit cooperatives and predict, through corollaries of propositions 1 and 2 and with additional propositions, the outcome of the contest for control and the implied performance of a cooperative under alternative circumstances.
CHAPTER IV

EMPIRICAL REGULARITIES AND PERFORMANCE OF CREDIT COOPERATIVES

1. INTRODUCTION

Sufficient conditions have been established on the distribution of member portfolios \([a]\) and private and security benefits under which the rival may, or may not, be able to take control of the cooperative. These explain some important empirical regularities regarding the performance of credit cooperatives. In particular, the conventional institutional design of credit cooperatives seems to be incompatible with their financial health. This provides a formal explanation of their mixed record.

Before continuing, two additional assumptions regarding the magnitude and allocation of the total benefits generated by the cooperative that are introduced. These assumptions are essential in order to capture factual cooperative features. Fortunately, the assumptions not only improve the reality and robustness of the model but also facilitate the analysis.

A first assumption is that the total benefits generated by the cooperative are invariant to the identity of the incumbent. The cooperative's assets produce a return that does not depend on who the controlling party is. The assumption reflects the
fact that the clients—at both ends of the operation—are at the same time its owners. This implies that any profits and/or losses are generated at the expense of a group of owners for the benefit of another (i.e., there is a binding budget constraint). It is sufficient to realize that, for example, credit losses benefit some owners at the expense of others. Therefore, the allocation of benefits is what varies with respect to the party in control and not their magnitude. In short, this assumption implies that $B(m)+y(m)=B(m')+y(m')=V_{mar}$.

The second assumption is that borrowing represents the instrument used to extract private benefits. It follows that in order to extract private benefits from the cooperative, it is necessary to become a net borrower. The most obvious examples of private benefits are interest rates below market levels and delinquency on loans. These are the most extreme manifestations of why private benefits are a problem. There are, however, other more subtle and sophisticated mechanisms to obtain control benefits from cooperatives. Examples are long-term borrowing at fixed rates in unstable macroeconomic environments and non-pecuniary benefits such as reductions in the transaction costs and waiting periods to obtain loans.

Another typical source of private benefits is the reduction in the risk-adjusted effective rates of interest on loans that may be available for the incumbent (i.e., net borrower) but not for members outside the group in control. This occurs when loans

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35 Assume that the cooperative is a collection of financial assets (i.e., cash), that there are no operational costs (i.e., normalized to zero), and that the maximum feasible risk-adjusted return on such assets is given by a best practice frontier.
are given to members of the coalition in control on less strict collateral requirements while charging them the same nominal rate of interest as others. Along these lines, another source of private benefits is the absence of peer monitoring on non-collateralized loans that allows moral hazard to occur and the associated transfer of risk to the cooperative.

An interesting but unexplored source of private benefits for an incumbent has to do with increases in his risk-adjusted security benefits. When control of the cooperative provides an informational advantage regarding eventual negative realizations of security benefits (i.e., losses), the incumbent may avoid his portion of the losses by obtaining a loan to be subsequently defaulted on, thereby withdrawing his investment in the cooperative's securities. This is a result of the clients-are-owners feature. In the presence of risk, the result is to change or skew the incumbent's distribution of security benefits, to include only positive values. To counter the implicit opportunities for moral hazard prudential regulation and supervision would be required. To take advantage of this it is necessary, once again, to be a borrower.

In contrast, net savers have neither as many, nor as effective opportunities to capture private benefits when they are in control. In fact, there is no way in which a net saver may generate significant private benefits for himself. The reasons become apparent through the following comparison.36

36 The more traditionally mentioned private benefits of control such as prerequisites and other payments in kind are, basically, assumed away. It is reasonable to think that such private benefits would be taken advantage regardless
Cooperatives that charge below-market rates of interest confront an excess demand for loans simultaneously with a deficient demand for securities, because in order to maintain the low rates on loans, they have to set the returns on securities at low levels. Hence, to be able subsidize lending rates the cooperative has to engage in non-price credit rationing, incur operational losses at the expense of equity shares, and/or obtain injections of external subsidized funds provided by donors to compensate for the lack of internal funds. The point is that borrowers may have mechanisms to protect their private benefits (e.g., non-price rationing), while savers do not. If, for example, the cooperative paid higher than equilibrium risk-adjusted rates on savings, it would be flooded with funds it that would be impossible to lend.

These two additional assumptions are combined and summarized as:

**Assumption 1.** \( \text{V}_{\text{max}} = B(m) + y(m) \) for \( m = j, r \), where \( B(m) > 0 \) only if \( m \) is a net borrower, \( B(m) = 0 \) only if \( m \) is a net saver. Clearly, \( y(m') > y(m) \) for any \( B(m) > 0 \), hence an incumbent net saver team is always better (i.e., generates more security benefits) than an incumbent net borrower team.

Now it is possible to formally explain some empirical regularities regarding credit cooperative behavior and performance.
2. **BORROWER DOMINATION**

Several authors have argued that the poor performance of credit cooperatives in developing countries results from *borrower domination* [Poyo (1988), Vogel (1982)]. Borrower domination occurs when a group of members acquire control of the cooperative with the purpose to seize private benefits mostly generated at the expense of security benefits. Hence, one of the symptoms of borrower domination is the generation of low security benefits and/or operational losses. Borrower domination (i.e., the extraction of private benefits) is thus incompatible with the viability and financial health of any cooperative. This is obvious from the examples of borrower-dominated financial policies reported above. There are, however, two questions regarding borrower domination which so far have not been satisfactorily answered by the literature on credit cooperatives. The first question is the possibility of borrower domination itself. How is it possible to have borrower domination under a regime of one man-one vote, majority rule, in which the majority of members are net savers?\(^{37}\) The *natural* prediction is that large private benefits, at the expense of security benefits, should not be possible under such governance structure.

The *logic* and analytics of borrower domination under majority rule parallels the case of industrial democracies where taxpayers outnumber any other group in

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\(^{37}\) The number of net depositors is usually greater than the number of net borrowers (i.e., depositors have more votes) because average loan sizes are generally larger than average deposit sizes. This is particularly true in the case of internally-financed credit cooperatives, because the amounts lent to an individual are a multiple of his deposits.
society and where smaller groups are, nonetheless, able to extract rents form the public at large [Olson (1965)].

The other puzzling question regarding borrower domination is why savers do not behave in the same manner and seek to dominate the cooperative, to extract private benefits (i.e., saver domination).\(^{38}\) The answer, already hinted at, is simply that, in contrast to borrowers, savers are not able to capture private benefits. It becomes now possible to state the following proposition.

\[\text{Proposition 3. Credit cooperatives will always be borrower dominated, regardless of the number of members who are net savers or net borrowers.}\]

Proposition 3 is demonstrated by using propositions 1 and 2 as lemmas. In order to prove proposition 3, it is sufficient to show that given any possible initial incumbent, the only result for the control contest is one in which inferior incumbents are perpetuated in control and/or one in which inferior rivals always oust superior incumbents.\(^{39}\) That is, in the end the cooperative will always be under the control

\(^{38}\) Some authors (e.g., Patin and McNiel, 1991) measure the rates on debt instruments of a cooperative (i.e., security benefits) and argue that if such rates are higher than the best alternative market rate, the cooperative is saver dominated. This approach, besides not being consistent with the extraction of private benefits, is flawed because it compares nominal rates that must include risk premia. Clearly, it is possible to observe a cooperative paying nominal rates that imply lower risk-adjusted returns than any other market opportunity.

\(^{39}\) Remember that one assumption of the model is that the cooperative is functioning prior to the battle for control. In order not to lose generality it
of a coalition of borrowers. The exposition is facilitated by the following figure and by letting \( m = r_j \) now instead become \( m = b, s \), where \( b \) stands for net borrower and \( s \) for net saver.\(^{40}\)

![Diagram](attachment:image.png)

**INITIAL INCUMBENT**

**RIVALS**

**CASES**

**RESULTS**

Borrower domination

Borrower domination

Figure 1. Combinations of Incumbents, Rivals, and Outcomes in a Contest for Control.

In case (S-S) there is no control contest, because both the rival (a saver) and the incumbent (another saver) are committed to the same business plan and

\(^{40}\) That is, \( m = b \) means that candidate \( b \) is a net borrower while \( m = s \) means that candidate \( s \) is a net saver. The specific role—as rival or incumbent—played by each candidate is evident from the context.
allocation of benefits \([i.e., V_{\text{max}} = y(s)]\). Therefore, in this case the rival does not challenge the incumbent. Where both the rival and the incumbent are net borrowers (B-B), if there is a contest for control its only outcome would be that a net borrower will be in control. Proposition 3 must be demonstrated, therefore, by showing that in cases (S-B) and (B-S) the winner is always the net borrower.

Situation (S-B) corresponds to proposition 2, part (a), which states that an inferior rival wins the control contest when \(B(r) \geq B(J) - (J/2)Ay\). This could be expressed, using assumption 1, as \(B(b) \geq -(J/2)[y(s) - y(b)]\), which is equivalent to \(B(b) \geq (J/2)B(b)\). Rearranging terms, the borrower wins when \([1 - (J/2)]B(b) \geq 0\). It follows that the borrower wins if \(2 \geq J\). It suffices to show that \(J\) is bounded from above by 2 to prove that in situation (S-B) the winner is always the borrower. Recall that \(\rho_i = \lambda_i N\), then \(\Sigma \rho_i = \Sigma \lambda_i N = N \Sigma \lambda_i = N\), since \(\Sigma \lambda_i = 1\). The sum of cash flows to votes ratios, over all members, must equal \(N\). Also, since \(J\) represents the \(\rho^*_i\) of the median or critical member, all members to the right of the critical member must have \(\rho_i \geq \rho^*_i\). Hence, the maximum possible value that \(J\) may attain, given the restriction \(\Sigma \rho_i = N\), is 2 \([i.e., (N/2)2 = N]\). In situation (S-B) the winner is always the net borrower.

Situation (B-S) corresponds to proposition 1 part (b), which states that an inferior incumbent remains in control of the cooperative when \(B(r) < B(J) - (R/2)Ay\). This could be expressed, using assumption 1, as \(B(b) > (R/2)[y(s) - y(b)]\), which in turn is equivalent to \(B(b) > (R/2)B(b)\). Rearranging terms, the borrower wins when \([(R/2) - 1]B(b) < 0\). It follows that the borrower wins if \(R < 2\). Since \(R\) and \(J\) are
defined analogously, $R$ is also bounded from above by 2. In situation (B-S) the winner is always the borrower.\footnote{As a result of the tie breaking assumption, the borrower's expenditure in acquiring control is constrained by a strict inequality. Thus, in strict mathematical sense there is still the remote possibility that the borrower does not win when the median member's $p_i$ equals its upper bound of 2. In practice, however, the borrower has two options to defeat such case. First, the borrower would be indifferent between bidding $R \Delta y$ and $R \Delta y + \zeta$ for $\zeta$ arbitrarily small. In any event, the borrower, who is the incumbent, may take advantage of the free entry principle and bring one additional member with $p_i = 0$ reducing, thereby, $R$ to zero.} Credit cooperatives are always borrower dominated (Q.E.D.).

3. CREATION OF CREDIT COOPERATIVES

One of the empirical regularities that characterize credit cooperatives in developing countries is that the large majority of them have been created with heavy participation of governments, donor agencies, and/or religious organizations. For instance, Poyo (1985) reports that credit cooperatives in Honduras were launched in large scale by the implementation of a United States Agency for International Development (USAID) project. Among other things, USAID donated, in 1966, US$ 647,000 to finance the creation of a federation of credit cooperatives, so that it would channel highly subsidized credit resources to recently created or strengthened cooperatives. This pattern was replicated in most Latin American countries [Rabines, 1981].

The nourishment of credit cooperatives has been an important policy objective in Asia and Africa as well, where such organizations have been intensely promoted...
by external forces. In fact, it has been suggested that credit cooperatives should be the organizational form of choice in efforts to develop financial markets in low-income countries. The World Council of Credit Unions (WOCCU) is currently involved in the development, funded by donor agencies, of cooperative financial structures in several countries of Eastern Europe and the former Soviet Union.

This concerted effort among agencies that are in a position to spend large amounts begs the question of whether the preferred organizations are just the result of an utopian philosophy (e.g., economic democracy) rather than an endogenous organizational form. In other words, given that the cooperative philosophy has been promoted all over the world with significant financial support, the question is whether these organizations may have appeared endogenously and with the same conventional cooperative institutional design.

This is a relevant question on two counts. The first one is related to the recent interest in the literature to understand non-firm economic institutions in developing economies as they significantly influence the allocation of resources in those settings [Bardhan, 1989]. Research on credit cooperatives along this vein has mainly focused on explaining why credit cooperatives exist and how they would function as endogenous organizations. However, if cooperatives are actually exogenous organizations, as important evidence seems to suggest, then their existence should rather be explained with different arguments (e.g., new political economy, bad policy). In such a case, research should focus on studying the efficiency and efficacy of the policy of promoting these organizations. Economic models regarding credit
cooperatives should not only be consistent with their existence but also with the stylized facts of their mixed record.

The other reason why this question of endogeneity is important has to do with the design and evaluation of government/donor interventions in financial markets. From a perspective of institutional viability and self-sufficiency, a reasonable question to ask before an organizational form is promoted is whether the intended beneficiaries would invest their own resources—were they not liquidity or wealth constrained—in acquiring equity in the organization to be created. For instance, in the case of cooperatives managed by their owners, presumably with an information and enforcement advantage, their reluctance to invest—had they the capacity to do so—would strongly signal that the organization may be doomed from the beginning by moral hazard and opportunistic behavior. There is plenty of evidence about the chronic under-capitalization of credit cooperative systems worldwide, even among those considered "successful." The following are reports of national credit cooperative systems suffering from undercapitalization in developed countries: McArthur et al. for England, Laville et al. for France, Zevi for Italy, Morales for

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42 It is obvious that the best signal about the viability of the intended intervention is that the owners "put their money where their mouths are" by investing some resources of their own. This has two problems, the first one being that many of the intended beneficiaries simply may not have the resources. Second, in the case of credit cooperatives the clients-are-owners-issue makes the signal indecipherable because it may be profitable to invest a minimal amount to extract larger private benefits.
Spain, and Guerard for Canada. Similar reports are even more frequent for cooperative systems in developing countries.43

One reasonable method to examine the endogeneity question is to ask whether N individuals—potential members—would actually invest or purchase the cooperative's equity shares while having rational expectations and complete knowledge of the prevailing cooperative governance rules (i.e., able to predict election outcomes).

In order to formalize what already seems quite an obvious result, let $c_i$ be the amount of $i$'s available resources that he chooses to invest in acquiring securities issued by the cooperative, where $c_i \geq 0$. Members have alternative investment opportunities that generate a weighted competitive return of $\pi$ with certainty, where $\pi > 0$. Let $d_i$ be the amount invested in all other activities. It is assumed that $c_i + d_i = A_i$ (i.e., member $i$ is subject to a budget constraint).

If, in equilibrium, the members' investment profile is such that the $c_i = 0$ for every $i$, then the cooperative will have no assets (i.e., it will be at most a "group of friends"). Hence, if it is observed that, under the same governance rules, a cooperative has positive assets, despite the fact that members would have not invested in it, then it should be the case that some external agent (e.g., donor agency) must have financed the cooperative's assets and/or provided members with some sort

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43 The under-capitalization of most credit cooperative systems in the world results either from lack of capacity and/or unwillingness to invest on the part of the owners. This evidence, at least, does not contradict the statement being made that without external forces (e.g., subsidies) many cooperatives may not have been created for lack of owner investment.
of incentive (e.g., subsidy) to invest strictly positive amounts. The following definition summarizes this notion of endogeneity.

**Definition** It is said that a credit cooperative is endogenous if \( c_i^* > 0 \), for at least one \( i \in \{1, \ldots, N\} \). In contrast, the cooperative is exogenous if \( c_i = 0 \), \( \forall i \in \{1, \ldots, N\} \).

This analysis of endogeneity is a natural extension of the model, because it allows members to anticipate the election outcome and, therefore, the pay-off resulting from equilibrium strategies \( c_i^* \). The sequence of events studied is as follows. Potential members get together to create an organization that will be governed by the conventional cooperative rules. Members choose individually and simultaneously the values of their \( c_i \). The cooperative's assets (i.e., \( \sum c_i \)) are collected and given to an initial incumbent chosen by "nature." This is followed immediately by a contest for control. Finally, the winner implements his business plan which results in an allocation of \( V_{\text{max}} \) among the members.

The equilibrium notion assumed for the investing subgame is sequential in the sense that members will take into consideration the anticipated results of subsequent stages. However, while choosing \( c_i \) members decide on the amount simultaneously and independently. Define \( [C'] \) – the Nash equilibrium investment strategy profile – as the vector of investment decisions that results from solving the following optimization problem for every member of the cooperative,
\[
\max_{c_i, d_i} \left( \frac{y(W(m))}{\sum_i c_i} \right) c_i + \theta d_p
\]  \hspace{1cm} (27)

subject to:

\[c_i + d_i = A_p\]

and taking as given:

\[c_i \text{ for every } i \neq i.\]

Remember that \([W(y(m))]\) is the function that maps the voting distribution to the winner of the control contest. Thus, \(y[W(y)]\) represents the security benefits contingent on such winner. The expression \((y[W(y)]/\Sigma c_i)\) represents the rate of return received by member \(i\) on his investment \(c_i\). Given the linearity of the problem, the following corner solution ensues: \(c_i = A_i\) for every \(i\) when \((y[W(y)]/\Sigma c_i) \geq \pi\), while \(d_i = A_p\), otherwise. Equivalently, if the rate of return implicit in the security benefits generated by the cooperative is less than the rate of return on \(i\)'s other investments, then the member will choose not to buy the cooperative securities. Since \(\pi > 0\), it suffices to show that \(y[W(y)] = 0\) to establish that cooperatives are exogenous organizations.

The confirmation that \(y[W(y)] = 0\) follows directly from proposition 3. Because of symmetry, consider only the case in which the initial incumbent is a borrower who will attempt to remain in control with maximum profitability for himself. The minimum required expenditure to maintain control is \((R/2)(y(s) - y(b))\). Since the borrower can keep the difference between \(B(b)\) and the required minimum
expenditure in votes, he sets \( y(b) \) to maximize such difference while taking into account that his choice of \( y(b) \) would affect his expenditure in votes.

Hence, he wants to max \( B(b)-(R/2)[y(s)-y(b)] \), which by assumption 1 equals \( (1-R/2)y(s)+(R/2-1)y(b) \). Then, \( y[W(y)]=y(b)=0 \) if \( R \leq 2 \), which is always the case because it was already shown that \( R \) is bounded from above by 2.\(^{44}\) In other words, all income generated by the cooperative's assets will be allocated between the incumbent's private benefits and his expenditure in votes. The above discussion motivates the following result.

**Proposition 4.** Credit cooperatives are not endogenous organizations and require, therefore, external incentives or support to be created.

The economic intuition behind proposition 4 is that an individual with rational expectations and knowledge of the prevailing cooperative governance rules (i.e., able to predict election outcomes) realizes that his gains from being a member of the proposed cooperative originate from having a naked vote and/or obtaining control to extract private benefits. Since such non-security benefits are generated at the expense of security benefits (i.e., those who invested), all potential members understand that the only sensible strategy is to invest nothing.

\(^{44}\) This result is used later on because it has further implications. For the moment, note that if \( R=2 \), the borrower would be indifferent between being the incumbent or not (i.e., his net profit is zero), while if \( R<2 \) he makes strictly positive profits by remaining as incumbent.
There are important insights to be gained by further analyzing proposition 4. First, note that the expected return on any member’s investment \( \{y[W(\gamma)]/\Sigma c_i \} \) represents the actual return paid to the member as a function of the winning candidate. This is not the potential or genuine return that the cooperative may produce. The genuine return is \( (V_{max}/\Sigma c_i) \), which by assumption 1 equals \( y(s)/\Sigma c_i \). Therefore, the problem is not necessarily lack of profitability of the underlying financial intermediation services to be provided by the cooperative. The problem resides in that the institutional features and governance rules of credit cooperatives would allow some individuals to reduce, by borrower domination, security benefits to zero.

Furthermore, since proposition 4 holds for any \( \pi > 0 \), with \( \pi \) arbitrarily small, it is possible to have \( [y(s)/\Sigma c_i] > \pi \). This means, in turn, that potential members would benefit from transferring resources from \( c_i \) to \( c_q \). Members are precluded, nonetheless, to take advantage of the opportunity because there is no credible mechanism by which all of them may commit not to extract private benefits at the expense of security benefits, although it is possible they might benefit by creating the cooperative (e.g., prisoner’s dilemma). This inherent problem of credit cooperatives nicely sets the stage for the following section, which considers some issues of credit cooperative regulation.

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45 The prisoner’s dilemma arises when players who would find it to their advantage to cooperate, choose strategies with lower pay-offs because of lack of credible commitments to cooperation.
Before continuing it is important, however, to analyze the function of an external agent in the creation or strengthening of a cooperative, by providing funds. External funds and subsidies do nothing but provide the funds to sustain a borrower domination status quo. The empirical regularity is that credit programs, funded by development agencies, using credit cooperatives as conduits have failed [Adams (1993)]. In fact, not only the credit programs themselves have failed—as measured by recovery rates—but also the participating cooperatives have experienced significant financial stress. These cooperatives have experienced extreme delinquency rates, operational losses due to insufficient operating income (i.e., low effective rates), and even malfeasance. These are the symptoms of extraction of private benefits by an incumbent coalition of net borrowers. The donors have contributed the money that members would not be willing to invest because of opportunistic behavior. This allows, thereby, the functioning of a cooperative composed of net borrowers who compete amongst themselves for private benefits. The result could not be other than a dismal financial performance of the organizations involved.

4. REGULATION OF CREDIT COOPERATIVES

The analysis of this dissertation offers a sensible explanation of credit cooperatives' rather poor record, including a high degree of financial instability. It would be interesting to inquire about the implications concerning prudential regulation as well. The model's predictions about their behavior of make conventional banking regulation ineffective when applied to credit cooperatives. The most
important regulatory device in the case of the banking industry are capital requirements. According to the model above, however, these requirements would be ineffective in preventing the failure of credit cooperatives. Imposing minimum capital requirements would not affect the likelihood of their failure. The analysis below is a first step towards an understanding of optimal regulation of client-owned intermediaries, including credit cooperatives.

The main objective of prudential regulation of credit cooperatives should be to enhance their stability while protecting, thereby, outside member depositors and the financial system as a whole. Clearly, the performance of cooperatives would be enhanced when a superior rival is able to depose an inferior incumbent and/or when a superior incumbent does not lose to an inferior rival. Unfortunately, the model predicts that cooperatives are condemned to experience precisely the opposite outcomes. Clearly, the avoidance of borrower domination is a necessary condition for the financial stability of the cooperative. More importantly, not only are election winners worse than their losing counterparts, but they are actually able to win by reducing security benefits.

The first and preeminent regulatory challenge regarding credit cooperatives becomes, therefore, the avoidance of borrower domination. The question is whether this is possible and, if so, how to achieve it. Some intuition is gained by further analyzing the causes behind the borrower domination of credit cooperatives.

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46 This assumes that cooperatives are already allowed to mobilize deposits and that their institutional design cannot be changed.
(proposition 3). As already stated, borrower domination is either perpetuated (i.e., borrower remains in power) or established (i.e., saver is ousted). The following corollary rephrases proposition 3 in a more detailed manner.

**Corollary 1.** A "status quo" characterized by borrower domination is perpetuated (established) when the private benefits extracted by an incumbent net borrower (rival net borrower upon gaining control) are sufficient to buy the votes from that half of the members with the lowest ratios of cash flows to votes at, the price per vote that makes the critical member indifferent between the two candidates. That is:

(C1.a) perpetuation requires: \( B(b) > \frac{R}{2} [y(s) - y(b)] \)

(C1.b) establishment requires: \( B(b) \geq \frac{J}{2} [y(s) - y(b)] \).

An immediate implication from corollary 1 is that the likelihood of borrower domination decreases as the amount of private benefits that may be extracted decreases and the critical member's ratio of cash flow to votes increases (i.e., \( R \) and \( J \)).

Recall that, by assumption 1, private benefits \( B(b) = y(s) - y(b) \) are bounded from above by an exogenous maximum return \( y(s) = V_{\text{max}} \). On the other hand, both the possibility to extract and the amount seized of \( B(b) \) are determined by the members' ratios of cash flows to votes. This is because the expenditure required to win depends on the price per vote that makes the median or critical member indifferent between candidates. Therefore, for any given distribution of cash flows
to votes—as characterized by feasible $R$ and $J$—private benefits *per se* are the cause for borrower domination.

The other side of this is that $J$ and $R$ determine the possibility of borrower domination, for any given $V_{\text{max}}$. It was shown above that for some values of $J$ and $R$ the borrower is indifferent between taking and not taking over the cooperative. However, the conventional cooperative design allows the borrower to modify $R$ and $J$ in order to gain control and make a profit (see p.82 and footnote 41).

The distribution of cash flows to votes among members—as characterized by the values of $R$ and $J$—are said to be, from now on, the institutional cause of borrower domination. The analysis that follows ignores this institutional cause, because it is assumed here that the regulator cannot change the cooperative's institutional design. In other words, the regulator cannot modify essential characteristics of cooperatives such as the one man-one vote principle. The institutional or governance causes of borrower domination will be studied in detail in the next section, which deals with the optimal design of credit cooperatives. For the moment, the analysis concentrates on the role of private benefits in borrower domination. The main conclusion in this regard is:

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47 This is the case in most developing countries where the complete institutional design of cooperatives is given by legislation beyond the superintendence of regulators. On the other hand, such design is what distinguishes cooperatives anyway. Given the cooperative design the only way the regulator would be able to avoid borrower domination is by decreeing $J=R=2$. This is impossible, because it requires that $\rho_i=2$ for $N/2$ members and $\rho_i=0$ for $N/2$ members.
Corollary 2. The institutional design of credit cooperatives is such that organizational viability cannot be achieved in the absence of an external agent with the ability to deprive the incumbent from any private benefits of control.

The candidate for such a role is an external regulator with the ability to supervise the cooperative's operation and the authority to penalize management when private benefits are extracted. When incumbents are prevented from capturing private benefits conditions (C1.a) and (C1.b) above imply that the candidate who offers the largest security benefits will be the winner. When borrowers have no access to private benefits to finance the acquisition of naked votes, members would be influenced only by security benefits in casting their votes for the candidate who offers the largest security benefits. In fact, members will be completely indifferent between the candidates because, by assumption 1, if $B(b)=B(s)=0$ then $y(b)=y(s)$.

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48 Note that this agent must be external to the cooperative, because any other internal mechanism to remove or punish current management requires a decision by the cooperative's general assembly. This is just a repetition of the control contest modelled so far. Therefore, the net borrower would not be penalized if he was able to get elected in the first place. This rules out any mechanisms such as internal auditors.

49 In such case, members are indifferent between candidates. The question is whether candidates would be interested in taking control in the absence of private benefits. As a result of the institutional characteristics of credit cooperatives, particularly that shares cannot be traded, members may have weak incentives to monitor and acquire control of the cooperative. This may have negative consequences as well.
The tempting, nonetheless deceiving, policy implication apparently suggested by corollary 2 is that cooperatives may become stable organizations whenever there is an adequate regulatory and supervisory infrastructure. This is so because, the argument would go, without private benefits borrower domination is not possible.

Unfortunately, the complexity of a regulatory solution to borrower domination may render it non-implementable, given its costs. The reason is that, in this context, the main purpose of regulation is to avoid the extraction of private benefits. This would require, given the institutional design of cooperatives, so much supervision that it would be necessary that the regulator itself managed the cooperative. The following contrast illustrates this point.

Sound regulation of most other depository financial intermediaries (e.g., a bank) relies on two basic principles: capital adequacy and separation of owners and borrowers [Chaves and Gonzalez-Vega, (1994)].\(^{50}\) The capital adequacy requirement entails that banks should have, at every moment, a given amount of resources pledged by the owners to play the role of a deductible. On the other hand, the separation of owners and borrowers prevents banks from lending to its owners. When these two regulatory constraints are binding, regulation is said to be incentive compatible. In this context, incentive compatibility means that the owners of the bank have the incentive to avoid, for instance, credit losses because they, themselves,

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\(^{50}\) Most other complementary regulations (e.g., diversification rules) attempt to maintain the expected value of losses close to the value of equity.
would have to replenish the bank's equity when such losses occur. In short, all owners are punished when losses occur.

In contrast, when there is no separation between borrowers and owners, losses (e.g., arrears) may benefit some owners at the expense of others. Thus, some owners may find it privately profitable that the cooperative incurs in losses. To make the problem worse, the prevailing cooperative governance rules deny control to those members who would suffer value consequences (savers), while granting control to those who privately benefit from such value losses. Borrowers will take advantage of this opportunity as long as governance rules allow them to do so. This motivates the following result:

**Proposition 5.** An incentive compatible minimum capital regulation is not implementable given the conventional institutional design of a credit cooperative.

To avoid borrower domination it would be necessary to *ex ante* police or supervise operations in ways that would make the regulator almost the actual manager of the cooperative. The supervision required to eliminate borrower domination may be too expensive and probably ineffective. Donors and governments should take this regulatory need into consideration before allowing or promoting credit cooperatives to mobilize savings from the public. In several instances this

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51 Examples of actual implementation of this type or regulation are provided in section IV.6.
practice has led to the loss of significant sums of money by outside members and/or to expensive government bail-outs of cooperative systems [Chaves and Poyo].

The question remains, however, as to why it is necessary to *ex ante* restrict potentially opportunistic behavior and other forms of mismanagement by borrowers, rather than punish them *ex post*, as is the case with other transactions in the economy. That is, why is it necessary to implement (preventive) regulation of cooperatives, as opposed to resorting to common law tort suit and/or criminal law prosecution (remedial).

Common law is a remedial option in the sense that it represents a recourse for outside members when the cooperative fails because of borrower domination. The possibility to suit successfully in the cooperative case is very limited for two reasons. There will usually be a multitude of comparatively small members, while the costs of collective action may be too high (Olson). Many individual depositors with small balances may thus not induce suit or may simply free ride on the efforts of others. A second, and very important, aspect of this problem is that the causality of morally hazardous behavior in cooperative failures may be difficult to establish in a court of law. It is difficult to prove, for instance, that loans were not defaulted on because of exogenous events—or simple bad judgement—but actually because leniency about delinquency was used as payment to the members of the coalition in control. To make things worse, recall that in developing countries court systems may be prohibitively expensive, corrupt, or inefficient, further reducing the probability for a successful punishment of delinquent borrowers.
5. THE OPTIMAL DESIGN OF CREDIT COOPERATIVES

There have been few attempts to design an optimal credit cooperative. The most relevant are the work by Bravermann and Guash (1989) and by Banerjee et al. Bravermann and Guash's optimal design is not implementable because it depends on the cooperative disciplining its own members when there is evidence that moral hazard is present. Rational agents would realize that the threats of punishment are non-credible (i.e., renegotiable). Hence, the cooperative would fail as a result of moral hazard anyway.52

The work by Banerjee et al. presents some problems within the context of this dissertation. First, their model is not consistent with observed empirical regularities regarding the performance of credit cooperatives in developing countries. Credit cooperatives, for the most part, have not been successful as monitoring devices for credit contracts. These authors use a model that falls into the category of Principal-Supervisor-Agent models, assigning a bank as principal, a monitor as supervisor, and a borrower as agent.

Not only do few credit cooperatives receive loans from regular banks, but what Banerjee et al. are actually modelling is a lending arrangement between a bank and a group of borrowers which provides the monitor, a member of the group, with the appropriate incentives to influence the borrower's choice of investment project. Their work is suitable for the analysis of any type of group lending arrangement, as

52 A complete critique of the work by Bravermann and Guash is presented in the chapter of literature review.
long as their assumptions that there is no collusion among the members of their cooperative and that punishments are credible hold.

The Banerjee et al. model is removed from a credit cooperative as a particular form of organization, with standard and well-defined charters and bylaws that assign property rights to its members. These authors attempt to characterize the "optimal cooperative constitution" in terms of three parameters: internal and external borrowing and the interest rate paid on internal borrowing. In the real world of firm-like cooperatives, these variables are simple financial policies adopted by an incumbent management team. The ability to set such policies is determined, in the last instance, by provisions regulating, among other things, voting rights, trading of cash flow claims, and instances of decision making.

The complete collection of these rules is what determines the true constitution of a cooperative, in as much as they are the system of governance, bylaws and principles by which a cooperative's assets are controlled. The challenge is, precisely, to design such a true constitution, which provides the structure of property rights and the incentives such that winning incumbent teams have the endogenous incentives to adopt financial policies such as those characterized by Banarjee et al. This is because the main impact of the institutional design of a conventional credit cooperative (i.e., actual constitution) and its implied cooperative allocation of property rights—including voting—is, in its influence on any control contests, what actually determine who—and under what incentives—gets to define the organization's policies.
The intuition embodied in this dissertation is that the endemic problems of cooperatives arise because their institutional characteristics, in particular the principles of one man-one vote and free entry, allow for heterogeneity of the ratios of cash flows to votes among members. This, in turn, implies that different members may be willing to "sell" their votes (i.e., accept different compensations) at different prices. This results in an upward sloping supply curve of votes.

Given that \( R \) and \( J \) proxy the critical member's valuation of the vote he casted for the corresponding contestant. In a situation in which members are pivotal to the result of the election, those with larger \( \rho_i \)'s value their votes more than the critical member, while those with lower \( \rho_i \)'s value their votes less. Hence, if there are enough members who assign low values to their votes, it is possible for one member an/or a coalition of them to take over the cooperative, by using private benefits to finance the "purchase" of a sufficient number of, rather inexpensive, votes.

This implies that changes in the values (i.e., \( \rho \)) of \( R \) and \( J \) would change the likelihood of success of a take-over attack. In cooperatives, the importance of the distribution of the cash flow to votes ratios \([\rho]\) is enhanced by the extensive opportunities to extract private benefits that result from the clients-are-owners component of their design.

In contrast, in those other economic organizations whose governance rules (i.e., constitution) decree a regime of one share-one vote, the supply curve of votes is flat. This means that under the above circumstances, every member values his portion of total votes by the same amount. This contrast between the one-man one
vote and the one share-one vote regimes is the intuitive basis for the analysis that follows.

In the previous section the values of R and J were called the institutional cause of borrower domination. This is because if R and J achieved values of 2 then the cooperative would be protected from borrower domination. Constraining \( R = J = 2 \) seems an attractive endogenous method to avoid borrower domination. The problem is, however, that under the conventional cooperative design, these good values for R and J are not feasible and/or they may be strategically modified by the candidates. The natural step is to examine the reasons why R and J cannot attain a value of 2. Before doing so, however, the institutional reason for borrower domination is described a little more formally, by using the following corollary to proposition 3.

**Corollary 3.** In the absence of an external regulator, the only situation in which a credit cooperative is not borrower dominated is when the critical or median member is characterized by \( R = J = 2 \) and it is not possible for any candidate to strategically modify the value of such variables. These conditions cannot be met given the conventional design of a credit cooperative.

Protection from borrower domination follows from conditions (C1.a) and (C1.b) above. Condition (C1.a) guarantees that savers are able to overthrow incumbent borrowers when \( B(b) \leq (R/2)[y(s) - y(b)] \), which by assumption 1 and for
R=2 is satisfied as \( B(b) \leq (R/2)B(b) = B(b) \), for any \( B(b) \geq 0 \). By symmetry, net savers can defeat rival borrowers when \( J=2 \). It is concluded, as stated before, that an endogenous protection from borrower domination would be given by \( R=J=2 \).

The reason for this is that when \( R=J=2 \) the borrower would have to incur in an expense to acquire control equal to \( [y(s)-y(b)] = B(b) \) (by assumption 1). That is to say, the borrower spends all his private benefits by paying for votes. This, in turn, implies that members would be completely indifferent between having the saver in control and receiving \( y(s) \) as security benefits and having the borrower in control and receiving \( B(b) = y(s) \) in payment for their votes.

By the same token, the borrower would also be indifferent between being or not in control because his net surplus from control is always zero. An \( R=2 \) implies that, for all practical purposes, the cooperative is being "sold" to the borrower at a total price equal to the maximum security benefits that could be generated by the organization. By symmetry, the outcome is equivalent for \( J=2 \).

To return to the second part of the corollary, regarding why the conventional cooperative constitution does not allow \( R \) and \( J \) to attain "good" values, recall the definition for \( M = R_J \) with \( m = r_J \)

\[
M = \max_{\delta} \left\{ \min_i \left\{ \frac{\rho_i}{\delta_i(m)} \right\}, \text{ for } i \text{ s.t. } \delta_i(m) = 1 \right\}
\]

subject to \( \sum_{i=1}^{a} \delta_i(m) \geq \frac{N}{2} \) \hspace{1cm} (30)

\( M \) is the minimum ratio of cash flows to votes actually casted for candidate \( m \) in an equilibrium that is most favorable to \( m \) when he is better than his opponent.
There are two features within the constitution that prevents $M=2$. The first is the governance rule implicit in the principle of one man-one vote. Its most obvious consequence is that this principle allows $\rho_i$ to take any value in $[0,N]$ subject to $\sum \rho_i = N$. On the other hand, under a governance rule by which voting rights are assigned proportionally to cash flow claims, it must be that $\rho_i = 1$ for all $i$. Note that the cooperative principle of free entry is, in fact, a variation of the one man-one vote principle, because if votes were assigned proportionally to cash flows any individual who invested nothing in the cooperative would also have no vote.

The second problem of the one man-one vote principle is that the proportion of member $i$'s votes casted for candidate $m$ is either 1 or 0 (i.e., $\delta_i(m) \epsilon \{0\} \cup \{1\}$). This is so because votes are not attached to securities but to individuals. Clearly, in a regime in which votes are attached to divisible securities $\delta_i \epsilon [0,1]$.

Finally, under the cooperative design there is only one possibility to have $M=2$, which corresponds to the peculiar situation in which $N/2$ of members each has a $\rho_i=2$, while each one of the remaining $N/2$ has a $\rho_i=0$. This rather unlikely distribution cannot prevent borrower domination in any case, however, because candidates may strategically modify by bringing in an additional member with $\rho_i=0$ making, thereby, $M=0$ instead of $M=2$ as desired.

Hence, in the search for an optimal design of a credit cooperative that is endogenously able to prevent borrower domination, it would be necessary to institute radical modifications in the conventional institutional design of these organizations. The change would be so drastic that they would not be credit cooperatives. Along
these lines, one of the major conclusions of Harris and Raviv's (1988) regarding the traditional stock corporation is that the only governance rule that guarantees that the better candidate always wins is the one share-one vote.\textsuperscript{53}

This is so because under such regime $\rho_i=1$ for every stockholder and when, e.g. the rival is better, the most favorable situation for him is one in which each stockholder tenders to him exactly one-half of his votes (i.e., $\delta_i=1/2$ for every $i$). This situation has the advantage that each investor in the corporation is pivotal. This means that every one would consider the security benefits dimension of their voting decision. Finally, because under one share-one vote $\rho_i=1$ and divisibility of votes allows $\delta_i=1/2$, then $R=J=M=\rho_i/\delta_i=1/(1/2)=2$. The "good" values for these key variables are invariably met, actually they are met for every stockholder. Clearly it is not possible for candidates to modify the values of $M$.

The conclusion regarding the optimal design of credit cooperatives is that the only way they could protect themselves is by allocating voting rights proportionally to cash flow claims and by permitting situations in which every member would consider the security benefit dimension of his voting decision. In order to do so they would have to become an organizational form very similar to a stock corporation. In other words, the search for an optimal cooperative makes not much sense, because they were already given a suboptimal design.

\textsuperscript{53} Harris and Raviv's objective is to find a socially optimal governance rule for corporations. Their criterium for optimality is the maximization of total benefits $B(m)+y(m)$. They impose, however, the restrictive assumption that better candidates (i.e., larger security benefits) also produce the most total benefits.
6. POSSIBLE ANOMALIES WITHIN THE MODEL

Economists consider a piece of empirical evidence as an anomaly if it is difficult to rationalize it and/or if implausible assumptions are necessary to explain such result within a given paradigm. This section is devoted to analyze the empirical record of two groups of cooperatives which, at first glance, may seem to be anomalies within the model presented in this dissertation. A group of cooperatives would be considered anomalous if it has experienced extended periods of financial stability, absence of borrower domination, and/or endogenous creation.

In the world there are a few groups of CCs and/or very similar organizations that seem to be anomalies in the context of the model's predictions. The number of instances of success is small enough to have made these exceptions *vix populi* among observers. This sections reconciles the model's predictions with the two most important of these *alleged* exceptions. In fact, it is shown that these cooperative groups rather than contradicting the model, actually lend support to its predictions. The two most conspicuous anomalies of the model are credit unions in the United States and the Cooperative Banking Group in Germany.

Credit unions (CUs) are financial intermediaries in the United States. In the mid-1980s there were 17,561 chartered credit unions, out of which 10,142 were federally chartered and 4,932 were state chartered. The large majority of these intermediaries (i.e., 15,074) enjoyed federal deposit insurance. Federally chartered CUs and all state chartered-federally insured CUs are supervised by the National

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54 The following data on credit unions is taken from Patin and McNiel (1991).
Credit Union Administration (NCUA). This administration also insures the shares (i.e., deposits) of the supervised CUs through its National Credit Union Share Insurance Fund.

Credit Unions and CCs have basically the same institutional design. Credit unions embrace the cooperative principles that shape the conventional cooperative constitution described in Chapter I. A significant difference, however, is that, contrary to the CC's "open door" membership rule, membership in federally insured CUs (i.e., the large majority) is limited to groups with a common bond. That is, there is free entry to the cooperative only for people who belong to a specific group, which is limited anyway.

The chartering requirements imposed by the NCUA and the pertinent legislation recognize three classes of common bonds. The first type is an associational common bond, which is limited to individuals who are members or employees of fraternal, professional, trade associations, other cooperatives, religious organizations, or labor unions. The second common bond is occupational, which requires all members to work for a single employer. Lastly, the third common bond is residential, which restricts membership to residents of well-defined geographic locations.

Although the three types of common bonds are feasible, the number of residential common bond CUs is disproportionately low. In fact, residential CUs represented only 4 per cent of the total, while occupational and associational represented 82 and 14 percent, respectively. The reasons that explain this
unbalanced distribution have to do with the advantages regarding information on borrowers, enforcement of credit contracts, subsidies, and other forms of support traditionally granted to occupational and associational CUs, which are not available to residential CUs. These advantages are detailed next.

It is possible to track the emergence and development of large numbers of CUs in the United States to significant promotional efforts and nourishment from the government and other donors, just like the efforts to create CCs in developing countries. The perceived "social benefits" of credit unions such as being accessible to the working classes afforded the CU movement a role in the War on Poverty programs of the 1960s [Cargill (1973)]. Credit unions have received significant subsidies from the Federal Government in the form of tax exempt status, deposit insurance, and preferential regulatory treatment. For example, CUs were not subject to the limits on interest rates paid on deposit accounts implied by Regulation Q neither to the branching restrictions of the McFadden Act. The preferential treatment and nourishment of CUs is summarized by Black and Dugger (1981) who report that:

As credit unions are different and unique financial institutions, the NCUA is also a different and unique supervisory agency, in that it has traditionally helped organize Federally chartered credit unions. For example, in 1979, NCUA staff members organized 84 of the newly chartered Federal credit unions (p. 532).

Black and Dugger also report that the immense majority of CUs (i.e., occupational and associational) also receive important subsidies by the members' employer. In most cases the employer or sponsor subsidizes the operation of the CU
by providing office space, payroll deduction, computer services and paid time off from work for the volunteer CU officers. The government supports further the subsidization of CUs because the expenses incurred by the sponsor are deductible as regular business expenses. The experience of CUs in the United States matches the record of CCs in developing countries of extensive support from governments and donor agencies and does not contradict the model's prediction that CCs are not endogenous organizations.

The model also suggests that the institutional design of CCs is such that organizational viability cannot be achieved in the absence of an external agent with the ability to prevent the extraction of private benefits (corollary 2). It is submitted that in the absence of such an agent private benefits large enough to hinder viability would be extracted.

The ostensible stability of CUs in the United States does not contradict this prediction, because CUs possess mechanisms that function just as an external agent supporting outcomes different from borrower domination. Besides the complex regulatory structure developed by the government, CUs enjoy significant advantages regarding enforcement of credit contracts, because they are guaranteed payment by payroll deductions. Hence, one necessary—not even sufficient—condition to default successfully on a credit union is to change jobs. In short, the employer-sponsor acts as an external agent in preventing the extraction of private benefits through loan default. This advantage is not available to CCs in developing countries.
The second important possible anomaly of the model is given by the Cooperative Banking Group in Germany. The group’s current institutional design evolved from the credit cooperative movement that emerged in the mid-1800s in Germany (see Chapter I). At the end of the 1980s the group was composed of about 3,500 individual cooperative banks, five regional cooperative "central banks", and the Deutsche Genossenschaftsbank (i.e., GD Bank). The cooperative banks had a total membership of about 11 million individuals.

As it has been the case with cooperative movements elsewhere this group has received, since its origins, strong support from the state. In 1895 the Prussian State founded the Preussische Central-Genossenschaftskasse—a prototype GD Bank—to promote the development of CCs with a contribution of 50 million Marks to fund its operations.

In contrast to cooperative movements elsewhere, however, these banks have shown significant stability. This may, at first glance, seem to contradict the predictions of the model. However, the group’s evolution leads to a different institutional design than that for CCs in developing countries and allows for the development of safeguards against the extraction of excessive private benefits by incumbents in control. In particular, the cooperative banking group established mechanisms of supervision upon managerial activities that actually replaced the

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55 From late 1930s to late 1980s no single cooperative bank in Germany went bankrupt. However, in 1987 the failure of primary banks in the region of Bavaria led to the DG-Bank having to take over the two cooperative central banks of the region.
board of directors in their role as supervisors of management and removed much of managerial discretion in the direction of the cooperative. In short, in this case an external agent to the cooperative may have prevented extreme borrower domination, as suggested by corollary 2.

Every cooperative bank must be a member of one of 14 regional cooperative auditing associations which, in turn, are members of the Federal Association of Cooperative Banks. The association represents the interests —as a pressure group— of the cooperative banks. These auditing associations have taken over many of the functions that normally are the responsibility of incumbent management teams. Bonus and Schmidt (1990) summarize the significance of these auditing associations by stating:

*Thus it is not the task of a cooperative’s Supervisory Board to check whether the accounting and general management of affairs by the Management Board is adequate and orderly in a technical sense. Rather, this is the responsibility of the regional auditing associations.* (p. 183).

The regional auditing associations operate an equal number of deposit insurance schemes, which require of additional supervision of the primary banks. German cooperative banks are also subject to the German Banking Law and all banking regulations imposed by the country’s Central Bank (*Bundesbank*). Hence, the regulation and supervision of these intermediaries is very intense.

The German cooperative banks are different in other important dimensions with respect to CCs in developing countries. Although the cooperative banks share the one man-one vote system of corporate control with the CCs, they did not adopt the free membership principle. In order to become a member, an individual must
be approved by the management board and buy at least one share in the bank's capital. The cooperative banks are free to conduct any business transaction with non-members. These characteristics are not shared with CCs in developing countries.

Another institutional characteristic of German cooperative banks is that their ownership is obscure. As put by Bonus and Schmidt:

*Today members receive fixed interest but do not claim residuals as owners should; de facto they are turned into bondholders, not equity holders. Consequently, they tend to dissociate themselves from their cooperative, are generally not interested in how the cooperative is managed, and do not show up for elections in large numbers* (p. 203).

Bonus and Schmidt also report that the General Meeting of Members has been reduced to electing Representatives, who are proposed to the members by a list submitted by management. Members have to accept or reject the list *in toto*. Thus, the evidence suggests that the cooperative banks do not have owners in an ordinary sense. In a number of countries there are rather large organizations with this attribute. A prominent example are the savings and loans (S&Ls) in the United States. This may be the case with the German cooperative banking group which, much as the S&Ls, have accumulated considerable equity thanks to favorable tax treatment.56

Comparisons of the efficiency of the cooperative banking group and its form of organization with other familiar alternatives such as stock corporations and limited liability corporations are not available. If, in fact, these banks are not fully

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56 Retained earnings represented a 68 percent of the group's equity balance for 1990.
controlled by their owners, the widely reported inefficiencies of manager-run firms may ensue.

A detailed analysis of the path of evolution of the German cooperative bank group, albeit interesting, is beyond the scope of this dissertation. It suffices to argue that their stability does not necessarily contradict the predictions of the model, because these organizations have important institutional differences with respect to CCs in developing countries and, above all, have developed a system of supervision which, it seems, has prevented the extraction of excessive private benefits.
APPENDIX

1. PROOF OF PROPOSITION 1

Lemma 1. Assume that the distribution of member portfolios as characterized by \( R \) is given, that the rival is better than the incumbent \( (r>j) \), and that the price component of the minimum cost bid for the rival is positive \( P(R)>0 \). Then, any offer for votes \( [\varphi(m),p(m)] \) by \( r \) such that \( \min\{\varphi(r),N/2\}p(r) < (N/2)P(R) \) is not a winning bid.

Proof. Since \( r>j \), then, by assumption, \( j \) has to prevent \( r \) from winning in any equilibrium of the voting subgame. If \( j \) can prevent \( r \) by winning in equilibrium \( i \) there is no other case in which \( r \) wins. So it suffices to prove that \( j \) can defeat \( r \) in equilibrium \( i \) taking \( [\varphi(m),p(m)] \) above as given. Consequently, let \( [\varphi(j),p(j)] \) be a bid by \( j \) with \( \varphi(j)>N/2 \) and assume that \( \delta^* \) is a equilibrium voting profile such as I. In that case, for every \( i \) such that \( \delta(r)=1 \) it must be that \( \delta_i(r)[t(j)p(j)-t(r)p(r)]-\rho_i\Delta y \leq 0 \), which may be rearranged as:

\[
\kappa(j)p(j) \leq \kappa(r)p(r) + \frac{\rho_i\Delta y}{\delta_i(r)} \tag{A.1}
\]

Hence, it suffices for \( j \) to set \( p(j) \) greater than the right hand side of (A.1) for any \( i \) with \( \rho_i/\delta_i(r) \) minimal to prevent \( r \) from winning in equilibrium \( i \). Since \( \Delta y>0 \),

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p(j) may exceed (A.1) with \( \rho_j/\delta_l(r) \) replaced by \( r \) which is the minimum \( \rho_i/\delta_l(r) \) among those \( i \) with \( \delta_l(r) = 1 \). Consequently, for \( \varphi(j) > N/2 \), and

\[
p(j) > \min\{\lambda(r)/(N/2),1\}p(r) + R\Delta y, \tag{A.2}
\]

there is no equilibrium in which \( r \) wins.

Now it has to be proven that \( j \) has a profitable counterbid to \([\varphi(r),p(r)]\) such that \( \varphi(j) > N/2 \), \( p(j) \) satisfies (A.2) and an equilibrium voting profile \( \delta^* \) exists for such bids. By assumption, \( \min\{\varphi(r)/(N/2),1\}p(r) < P(R) \) then \( B(j) > (N/2)[\min\{\varphi(j)/(N/2),1\}p(r) + R\Delta y] \). Consequently, it would be profitable for \( j \) to make an offer for votes \([\varphi(j),p(j)]\) such that \( \varphi(j) > N/2 \) and \( p(j) \) satisfying (A.2) such that \( \varphi(j)p(j) < B(j) \).

Finally it has to be shown that there exists an equilibrium \( \delta^* \) of voting subgame for those bids. If \( \varphi(j)p(j) \geq p(r) \), then \( \delta_l(j) = 1 \) for all \( i \) is an equilibrium \( \delta^* \). If \( \varphi(j)p(j) < p(r) \), then, since \( \varphi(j) > N/2 \), \( p(j) \) satisfies (A.2) and let \( \mu = (N-2)/2 \), such that \( F(\mu,r) = F(N-\mu,j) \), where, for \( m = r,j \), \( F(\mu,m) = \min\{\varphi(m)/\mu,1\}p(m) \). Since \( \mu < N/2 \), \( N-\mu > N/2 \). Therefore, it is possible to have a voting profile such that \( \gamma(j) = N-\mu \). Then \( j \) wins easily (case IV), and since no member is pivotal the only equilibrium condition is (6). Q.E.D.

**Lemma 2.** Assume that member portfolios as characterized by \( R \), and that the rival is better than the incumbent (i.e., \( r > j \)). Then any bid \([\varphi(r),p(r)]\) by the rival such that \( \min\{\varphi(r),N/2\} \geq (N/2)P(R) \) is a winning bid. That is, any bid by a better
rival equally or more expensive that the minimum cost winning bid is also winning bid.

Proof. The first step is to establish that there is no profitable counterbid for j to such bid by r. It suffices to show that for any counterbid \([\varphi(j), p(j)]\) by j, there is an equilibrium \(\delta^*\) in which j does not win profitably. Since \(r > j\), it is enough to show that there is an equilibrium in which \(r\) wins. The other possibility is that there is no equilibrium for the voting subgame in which \(r\) wins (i.e., there is no case \(i\) such that \(\gamma(r) = N/2\)). This requires either (A.3) or (B) below. (A.3) should be satisfied for any \(\delta^*\) such that \(\gamma(r) = N/2\),

\[
\min\left\{\frac{\varphi(j)}{N/2}, 1\right\}p(j) > \min\left\{\frac{\varphi(r)}{N/2}, 1\right\}p(r) + p_r\Delta\gamma\delta_i(r), \quad \tag{A.3}
\]

for any \(\delta_i(r) = 1\). If this does not hold then the following condition (B) must hold:

\[
\min\{\varphi(j)/(N/2), 1\}p(j) < \min\{\varphi(r), 1\}p(r).
\]

First assume that (A.3) holds for every equilibrium in which the rival barely wins (i.e., \(\gamma(r) = N/2\)). Since \(\Delta\gamma > 0\), replace \(p_i/\delta_i(r)\) in (A.3) by \(R\). Since \(\min\{\varphi(r), N/2\}p(r) \geq (N/2)p(R)\), then j's expenditure exceeds \(B(j)\). Which proofs that if (A.3) holds then there is no profitable counterbid by j.

Now assume that (A.3) does not hold. Then it must that (B) holds. If that is the case there is an equilibrium \(\delta^*\) in which \(r\) wins. There are two possible situations to consider. The first situation is when \(p(j) > \varphi(r)p(r)\). Since (B) holds and let \(\mu\) stand for \((N+2)/2\), then \(\mu > N/2\) such that \(F(\mu, r) = F(N-\mu, j)\), where \(F(\mu, m) = \min\{\varphi(m)/\mu, 1\}p(m), m = r, j\). Let \(\delta\) be any voting strategy such that \(\gamma(r) = \mu\).
In order for \( \delta \) to be an equilibrium the conditions for equilibrium II must hold. Then, it must be shown that (6), for \( \delta_i(r) = 1 \), and (8) hold for any member who voted for \( r \) and is pivotal. The first of these conditions must hold because for this voting profile \( \gamma(r) = \mu \). Furthermore, (8) implies (6) because \( \Delta y \geq 0 \). Therefore, \( \delta^* \) is a Nash equilibrium voting profile, and, since \( \mu > N/2 \), \( r \) wins in this equilibrium.

The other situation to be consider is when \( p(j) \leq \varphi(r) p(r) \). In this case (6) holds with \( \gamma(r) = N \), so that \( \delta^* \) such that \( \delta_i(r) = 1 \) is an equilibrium (case II) in which \( r \) wins. Q.E.D.

**Proof of Proposition 1.** From lemma 1 it follows that for \( r \) to have a winning bid he must make an offer for votes such that \( \min\{\varphi(r), N/2\} \geq \gamma(r) \geq (N/2)P(R) \). In short, he must spend at least \( (N/2)P(R) \). On the other hand, lemma 2 implies that any bid by \( r \) such that \( \min\{\varphi(r), N/2\} (N/2)P(R) \) is a winning bid. Thus the minimum cost winning offer for \( r \) is \( \lceil N/2, P(R) \rceil \). Thus, if \( B(R) \geq (N/2)P(R) \), the corresponding offer by \( r \) together with \( \lceil \varphi(j), p(j) \rceil \) and \( \delta_i(r) = 1 \) for all \( i \) is an equilibrium of the election game. Clearly, the rival will bid such that \( \varphi(r) p(r) - (N/2)P(R) \).

If in contrast \( B(r) < (N/2)P(R) \), then \( r \) cannot win profitably. Thus by definition of equilibrium he bids \( [0, 0] \). In order for \( [\varphi(j), p(j)] \) to be a profitable counterbid by \( j \) to \( [0, 0] \), \( j \) must win in every equilibrium of the voting subgame. This requires that \( \gamma(j) \geq (N+2)/2 \). Also, suppose that \( p(j) > R \Delta y \). Because \( p(r) = 0 \) the dominant strategy for all --including pivotal-- members is to vote for \( j \). Hence, for
such offer \( j \) wins in all equilibria of the voting subgame. If, in contrast \( p(j) \leq R \Delta y \), then (5) holds and there is a \( \delta^* \) in which \( \gamma(r) = N/2 \) and (6) holds. This is the case for any \( \delta^* \) in which \( \min(p_i/\delta_i(r)) = R \) for \( \delta_i(r) = 1 \). Therefore, if \( p(j) \leq R \Delta y \), there is an equilibrium in which \( r \) wins (case I). Consequently, the minimum cost winning bid for \( j \) against a bid of zero is \( \varphi(j) = N/2 \) and \( p(j) = R \Delta y + \zeta \), for \( \zeta \) arbitrarily small.

The final part of the proof is to establish that this offer is profitable for \( j \). Because \( \varphi(j)p(j) \) can get as close as wanted to \( (N/2)R \Delta y \) (i.e., \( \zeta \) is arbitrarily small), the only way for the bid not to be profitable is if \( (N/2)R \Delta y \geq B(j) \). However, this implies that \( P(R) = 0 \) which, in turn makes \( B(R) \geq (N/2)P(R) \) hold. Clearly, there is a contradiction as it was assumed, for this part of the proof, that \( B(r) < (N/2)P(R) \).

Q.E.D.

2. PROOF OF PROPOSITION 2

Lemma 3. Assume that \( J \) is given and that the rival is worse than the incumbent, then any offer for votes by the rival \([\varphi(r),p(r)]\) such that \( \varphi(r) < N/2 \) and/or \( p(r) < P(J) \) is not winning offer.

Proof. It is necessary to find a profitable counterbid by the incumbent. First, since \( r < j \), if \( \varphi(r) < N/2 \), then \( \varphi(j) = p(j) = 0 \) is a profitable counterbid by \( j \). On the other hand, if \( \varphi(r) > N/2 \) and \( p(r) < P(J) \) or, equivalently, \((N/2)[p(r) + R \Delta y] < B(J)\). Let \( \delta^* \) be any voting strategy profile such that \( \gamma(j) = (N+2)/2 \) and \( \min(p_i/\delta_i(r)) = 1 \), for \( \delta_i(r) = 1 \). For \( \delta^* \) to be a case III equilibrium (i.e., \( j \) barely wins), \( p(j) \) must satisfy \( p(r) + R \Delta y \leq t(j)p(j) \leq p(r) \). On the other hand, the \( j \)'s offer for votes must be profitable
which implies it has to satisfy $t(j)\varphi(j)p(j) \leq B(j)$. Finally, since $(N/2)[p(r) + J\alpha y] < B(J)$, then $j$ can set $\varphi(j) = (N+2)/2$ and $p(j)$ as to satisfy the previous two inequalities. Since $j$ has a profitable counterbid to $[\varphi(r), p(r)]$ as described above, then such bid by $r$ is not a winning bid. Q.E.D.

**Lemma 4.** Assume that $J$ is given and that the rival is worse than the incumbent. Any bid by the rival such that $\varphi(r) \geq N/2$ and $p(r) \geq P(J)$ is a winning bid.

**Proof.** It is enough to establish that there is no case III equilibrium in the voting subgame in which any offer $[\varphi(j), p(j)]$ allows $j$ to win profitably. Assume that $\delta^*$ is a case III equilibrium of the voting subgame. Then condition (11) must hold. That is, $t(j)p(j) \geq p(r) + \rho J\alpha y/\delta(j)$, for $\delta(j) = 1$. Here it should be noted that $t(r) = 1$ because $\gamma(r) < N/2$. The previous inequality involving $p(j)$ should hold if $\rho J/\delta(j)$ is replaced by $J$. Making the substitution and multiplying both sides by $\gamma(j)$ gives:

$$t(j)\gamma(j)p(j) \geq \gamma(j)[p(r) + J\alpha y] > (N/2)[B(j)/(N/2)] = B(J).$$

Therefore, $j$'s offer is not profitable for $j$. Q.E.D.

**Proof of Proposition 2.** Lemma 3 implies that for $r$ to have a winning bid he must chose $\varphi(r) \geq N/2$ and $p(r) \geq P(J)$. Hence, for any winning offer by $r$, $\varphi(r)p(r) \geq (N/2)P(J)$. On the other hand, lemma 4 implies that any offer by $r$ with $\varphi(r) \geq N/2$ and $p(r) \geq P(J)$ is a winning bid. For the rival to minimize his expenditure across all winning bids he has to choose $[\varphi(r), p(r)]$ such that $\varphi(r) = N/2$ and $p(r) = P(J)$. Thus,
if \( B(r) \geq (N/2)P(J) \), \( r \) offering this minimum cost winning bid, \( j \) offering zero, and all members voting for \( r \) is an equilibrium of the election game.

If \( B(r) < (N/2)P(J) \), then it would not be profitable for \( r \) to win at minimum cost \((N/2)P(J)\). He offers, therefore, \([0,0]\). Now it is necessary to show that \([0,0]\) is a profitable counteroffer by \( j \) against \([0,0]\). This requires in turn that there is an equilibrium \( \delta^* \) in which \( j \) wins. This is obvious because if both contestants bid zero, and \( r < j \), then one equilibrium is all members voting for \( j \). Clearly, \( B(j) \geq 0 \), which means \( j \) wins profitably. Q.E.D.
LIST OF REFERENCES


