POOLING VERSUS SEPARATING REGULATION:
THE PERFORMANCE OF BANKS AND MICROFINANCE IN BOLIVIA
UNDER SYSTEMIC SHOCKS

DISSERTATION

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ABSTRACT

Bank superintendents implement prudential regulation that simultaneously seeks protection of the stability and solvency of financial intermediaries and several dimensions of financial deepening. If they use only one instrument, a given level of safety is achieved at the expense of some intermediation. The question addressed by this dissertation are the excessive losses of intermediation efficiency from a single, uniform (pooling) regulation, which treated loan portfolios built with a traditional banking technology or with a microfinance technology as if they carried the same risk profile. Given significant differences between the two lending technologies, in their ability to match their clienteles and to recognize different risks, a differentiated (separating) set of prudential norms would contribute more to the dual goals of stability as well as financial deepening and breadth of outreach. This task is specially challenging in developing countries exposed to frequent systemic shocks.

The dissertation develops a simple theoretical framework to guide regulators about the welfare shortcomings of pooling regulation, compared to separating regulation. If the risk profiles of the portfolios are different, different prudential norms should be applied. The problem for the regulator, however, is incomplete information.
about these risk profiles and the high costs of overcoming the information imperfections about their characteristics. Given high operational costs, the regulator must determine if the efficiency losses from not differentiating justify the development of a separating regulation.

To illustrate the issues, the dissertation discusses in detail the experience of Bolivia with the emergence of a competitive and successful regulated and non-regulated set of microfinance institutions. Relying heavily on innovation, these institutions have achieved exceptional financial performance (growth, profitability, and low default indicators), even during adverse systemic shocks, in contrast to banks. The regulators are puzzled by this heterogeneous performance and the dissertation offers a framework to guide their efforts. The actual experience of Bolivia indicates that the differences are important enough for the authorities to seriously address the operational costs of a separating framework. It further suggests dimensions of different risk profiles that should be taken into account by the authorities, in order to accomplish the double goal of efficiency and stability.
Dedicated to my family
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CHAPTER 1
INTRODUCTION

There is a strong correlation, with a clear positive sign, between the development of the financial system and economic growth (Inter-American Development Bank, 2004). From a theoretical point of view, the direction of causality is not yet clear, but a series of empirical studies suggest that financial development has a strong influence on growth (King and Levine, 1993; Demirgüc-Kunt and Maksimovic, 1996; Levine, 1997; Rajan and Zingales, 1998; Levine, 2005).

Financial development is achieved through innovations that increase efficiency in the provision of financial services and when using instruments and institutions that offer better terms and conditions to the public and that reach a broader proportion of the population. From this perspective, the emergence of microfinance – which broadly refers to the provision of financial services to poor clienteles using appropriate lending technologies – has achieved a long desired social objective, namely, the expansion of the frontier of the financial system to include the most vulnerable populations. The microfinance accomplishments over the past 30 years have been nothing short of
astonishing, in terms of the millions of customers reached and the number of sustainable microfinance institutions now operating all over the world (Helms, 2006).

While microfinance is amply regarded as an innovative approach to expand the frontier of financial markets, contribute to the alleviation of poverty, and promote social change, there are a number of challenges ahead. One of these challenges is to find the most appropriate prudential regulation and supervision to deal with microfinance transactions.

So far, the literature has addressed regulatory concerns that arise when microfinance is starting to emerge in a financial system (Chaves and Gonzalez-Vega, 1994; Trigo Loubiere, 2003; Armendariz de Aghion and Morduch, 2005; Arun, 2005). Little is known, however, about optimal intervention to address the new regulatory issues that are puzzling monetary and financial authorities in markets with developed microfinance institutions. The challenge is greater where these institutions have been operating in an environment with successive and cumulative adverse systemic shocks.

For instance, Bolivia, a country regarded as having one of the most developed microfinance industries, has experienced numerous systemic shocks in the past ten years. Economic recession, political instability, and frequent social conflicts have afflicted the country repeatedly. As a consequence, most financial institutions have significantly cut their operations down in terms of deposits and loans. In effect, between 1999 and 2005, the performing loan portfolio of the banking system declined almost 45 percent, while deposits shrunk about 25 percent. At the end of 2007, when the
performing loan portfolio had slightly recovered, the reduction was 40 percent with respect to 1999, while the deposits were 4 percent less than earlier.

In contrast, from December 1999 to December 2007, microfinance institutions increased their performing loan portfolio by almost 385 percent and their deposits by 675 percent. This has been an episode of rapid growth in a mature industry, not simply the swift growth typically experienced in the early stages of development of a new sector. As a consequence, during that period, the market share of regulated microfinance institutions increased from 2 percent to 19 percent of the total outstanding loan portfolio of the regulated financial system. These contrasting financial results have been accompanied by substantial reductions in the loan interest rates charged by microfinance institutions, very low delinquency rates compared to those at the banks and, in general, a healthier financial performance.

The regulatory authorities have been puzzled by this differential performance and have been particularly concerned about the rapid expansion of the sector, even during periods of sustained adverse systemic shocks. A priori, it may seem that microfinance institutions are engaging in a classic Ponzi scheme, with their rapidly growing loan portfolios hiding their true delinquency rates. The short terms to maturity of microcredit contracts, however, would make such maneuvers short-lived, while an analysis of loans by cohorts indicates otherwise (Villafani-Ibarnegaray, 2002, 2003).

Opportunistic behavior and too-big-to-fail bets have also been considered as possible explanations of this performance, but there is clear evidence that a
microfinance bailing-out scenario has not been expected in Bolivia. As a result, a compelling explanation of these heterogeneous results is still needed.

This explanation would help understand the role and importance of financial innovation and would inform prudential regulation choices. This dissertation examines, in particular, the advantages and disadvantages of a pooling, rather than a framework of separating, regulation and supervision.

The key question is if a uniform regulation, which treated banks and microfinance as if they carried the same risk profile, would actually contribute enough to the stability of the financial system or if, given significant differences between the two types of intermediaries (reflected, mostly, by the differences in lending technologies and by their ability to recognize and address different risks), a differentiated set of prudential norms would contribute more to the goals of financial deepening and of breadth and depth of outreach in the supply of financial services. Theoretical considerations about the welfare shortcomings of pooling equilibria, in contrast to separating equilibria, suggest that if the risk profiles of their portfolios are different, different prudential norms should be applied. Otherwise, welfare costs would emerge from insufficient financial deepening and from a non-optimal structure of the financial system.

The actual experience of Bolivia indicates that the differences between banks and microfinance are important enough for the authorities to seriously address the potential costs of the segregation in their approach. The dissertation suggests dimensions of the
different risk profiles that should be taken into account by the prudential authorities in order to accomplish the double goal of efficiency and stability.

1.1 Research question

Given the model specified in this dissertation, the purpose is to capture the degree and features of heterogeneity observed among deposit-taking financial entities and the extent to which microfinance institutions differ from other types of financial intermediaries, in ways that are relevant for the design of a framework of prudential regulation and supervision.

Further, the purpose of the dissertation is to establish if the theoretical analysis and the empirical evidence do reveal the optimality of adopting a separating regulation, which distinguishes between microfinance institutions and banks, rather than a pooling framework, with uniform rules, in a developing economy with an environment characterized by successive and cumulative systemic shocks and an incomplete institutional infrastructure. If a separating framework were justified, the purpose is to determine which should be the criteria that would inform the non-uniform rules to be adopted.
1.2 Research objectives

1.2.1 General objectives

This dissertation develops a model that identifies the consequences of a pooling versus a separating regulation, given by a capital adequacy rule based on the riskiness of the asset portfolio. The model is based on an analysis of the determinants of credit risk, at the portfolio level. Differences in portfolio risk influence both the expected profits of the deposit-taking intermediaries and the extent to which the institutions can leverage their equity base with deposits, to build a loan portfolio. The issues are illustrated using data from Bolivia.

1.2.2 Specific objectives

The dissertation achieves several specific objectives, namely:

(1) An exploration of the determinants of credit risk, in order to explain the heterogeneity observed in the performance of different types of regulated financial institutions. This model considers characteristics of the market segment reached (that is, the profile of the borrowers and the sector where they operate), loan contract terms and conditions, the lending technology used, and systemic shocks.

(2) A solution of an expected profit maximization model with respect to the loan portfolio, which represents the optimization problem faced by regulated financial institutions in their choice of assets, assuming
everything else constant and given specific regulatory constraints. The purpose is to assess the consequences of various regulation regimes.

(3) An exploration of options for optimal regulatory interventions and policy implications, based on results about the determinants of heterogeneity in the performance of different institutional types. The interventions address trade-offs between stability and financial deepening and the most efficient way to balance these objectives from the perspective of a regulator that protects the interests of society.

(4) An evaluation of the possibility of generalizing the lessons learned, from a discussion of the idiosyncrasy of the Bolivian scenario and the likelihood that the policy rules identified in this dissertation are robust in other environments.

(5) An identification of the main limitations of this exercise and suggestions for future research.

1.3 Earlier research

The costs associated with information acquisition and state verification, monitoring, and contract design and enforcement as well as shortcomings from missing transactions and institutions produce strong incentives for innovation in financial contracts, the creation of financial intermediaries, and the emergence of financial markets (Levine, 2005).
The ability that financial institutions have in reducing market frictions allows them to efficiently match deficit units (borrowers) with surplus units (depositors) across time and space (Shaw, 1973; Bhattacharya, Boot, and Thakor, 1998). Thus, financial intermediaries rely on two sources of efficiency. On the one hand, regarding borrowers, their greater efficiency is the result of specialization and economies of scale in screening and monitoring investment projects, which allow financial institutions to surmount the shortcomings that individual investors face in accomplishing these tasks.

Intermediaries can reduce screening and monitoring costs by investing in projects where they have special knowledge (Leland and Pyle, 1977). Intermediaries can also extract higher monitoring returns in information markets with imperfections (Allen, 1990). Additionally, diversification allows lower costs when financial institutions behave as delegated monitors of numerous investors (Diamond, 1984).

On the other hand, regarding their liabilities, efficiency is obtained by allowing depositors to share risks and by promising a payoff for delaying consumption (Diamond and Dybvig, 1986).

In low-income economies, where the stock market is not fully developed, the financial system mostly consists of the set of financial intermediaries, specifically banks and non-bank institutions (e.g., credit unions, savings and loans associations, and other institutional types that vary according to country-specific regulation frameworks). For this reason, this dissertation exclusively focuses on the performance and regulation of
deposit-taking financial organizations. That is, it examines the set of financial institutions that are authorized to mobilize deposits from the public.

Regulation, in the broadest sense, is a set of enforceable rules, procedures, and standards that control or govern the actions of market participants. The regulatory function can be performed by the market itself, without the need for non-market actors. Market failures of several kinds and the lack of completeness of the institutional infrastructure may justify, however, government regulation of financial intermediation. Nonetheless, the current consensus is that optimal regulation should seek to replicate the regulation mechanisms embedded in efficient markets (Klein and Leffler, 1981).

The literature on financial regulation has considered three types of market failure to justify intervention in financial markets. The first one is the emergence of a natural monopoly that comes from the presence of increasing returns to scale in the production function of banks. A key argument has been that, as a bank gets bigger, it can economize on the amount of reserves. However, the lack of empirical evidence to support this claim challenges this possibility (Dowd, 1992). Rather, by issuing a limited number of charters, regulation creates monopoly power.

The second type of market failure in the financial system is the presence of negative externalities. One of the most feared is the systemic contagion from the failure of one or more banks that causes bank runs. There are at least five explanations why such behavior may occur:
(1) an inter-temporal mismatch between promises of loan repayments and deposit devolutions (Corrigan, 1982),
(2) a contagion effect from a firm in trouble that conveys information about the performance of the rest of the industry (Lang and Stulz, 1992),
(3) poor confidence in the system and the effect of rumored bank failure (Bernanke, 1983),
(4) coordination failure (Diamond and Dybvig, 1983), and
(5) poor confidence in the quality of the loan portfolio (McCulloch, 1986).

Market failure related to information problems has been studied in the finance literature. There is an asymmetric risk-sharing relationship between financial institutions and depositors. The fixed-value nature of deposit contracts gives banks the chance to engage in risky activities, motivated by supra-normal rents, making the depositors to assume all the risk (Matutes and Vives, 1996).

The need of protecting depositors that are too small and unsophisticated to monitor banks is another explanation for the need of regulation. Further, even if depositors could monitor banks, the costs of engaging in such monitoring are too high, in terms of time and scale (Dewatripont and Tirole, 1999). Furthermore, there may be a failure of collective action that does not allow depositors to gain contract satisfaction ex post (Chaves and Gonzalez-Vega, 1994). As a consequence, there is a justification for government prudential regulation and supervision of the financial market.
A regulation framework can be defined as the set of rules that govern the operation of financial institutions. From a conceptual perspective, the regulation instruments are related to: (1) capital adequacy requirements and (2) reserve requirements (McKinnon, 1973; Shaw, 1973; Dewatripont and Tirole, 1999). In turn, an empirical perspective considers the instruments available as a function of the operational stage: (a) market entry, (b) operations, and (c) market exit. Besides capital adequacy and reserve requirements, the set of instruments considered from this perspective includes, for instance, (i) loan-loss provisions, (ii) equity ownership, (iii) reputation of the owners and executives, (iv) procedures and standards to disclose information, (v) limits and prohibitions, and (vi) bankruptcy procedures, among others (De Juan, 1996; Trigo Loubiere, 2003).

Prudential financial regulation refers to government intervention that pursues the stable and efficient performance of the financial system (Dewatripont and Tirole, 1999). Prudential regulation serves to: (1) ensure the solvency and financial soundness of all intermediaries, (2) provide consumer protection against undue risks of losses that may emerge from their interaction with financial intermediaries, and (3) promote the proper working of competitive market forces and innovation based on comparative advantages through neutral rules (Chaves and Gonzalez-Vega, 1994).

Typically, a regulation framework is always trying to keep pace with dynamic changes in the market. In fact, regulation is a dynamic process involving the interaction of different groups that are continuously allocating resources toward producing political
pressure (Becker, 1983). Furthermore, Kane (1988) argues that the financial process is not only dynamic but dialectic, since there is a permanent tension between the incentives that motivate the government and the regulated institutions, which is cyclically redefined by financial innovation (Kane, 1977).

The analysis of the regulation of microfinance has focused on its emergence as a player in the financial system and on the evaluation of the prudential principles that should be considered in organizing its operations. (Chaves and Gonzalez-Vega, 1994; Trigo Loubiere, 2003; Armendariz de Aghion and Morduch, 2005; Arun, 2005). The argument is that, once microfinance institutions become sustainable, either their funding sources are insufficient to keep pace with the expansion needed (desired) or the donor agencies that promoted their initial expansion are less likely to fund further growth.

Thus, the initial interest in the regulation and supervision of microfinance institutions responded to the desire of unregulated institutions to mobilize deposits from the public, in order to increase their loan portfolios. Additionally, there are economies of scope between lending and mobilizing deposits, which can be exploited if deposit-taking status is achieved.

There seems to be a consensus about some minimum principles, namely that:

(1) Credit-only institutions should not be prudentially regulated or supervised, as there is no public interest that requires protection in this case. Further, there is fear that innovation could be stunted and microfinance
development jeopardized if a repressive regulatory framework is adopted (Chaves and Gonzalez-Vega, 1994).

(2) Deposit-taking institutions should be regulated and supervised, although some experts agree that this is justified only in those cases where voluntary deposit-taking, in contrast to the forced savings of village banks and similar programs, is relevant (Christen and Rosenberg, 2000).

(3) The prudential authorities should be concerned about the design of a microfinance regulation framework only after a cost/benefit analysis determines that it is desirable (Gomez, Tabares, and Vogel, 2000) and there is effective capacity to enforce the rules (Christen and Rhyne, 1999; Vogel, Gomez, and Fitzgerald, 2000).

(4) Once microfinance is under the scope of the financial authorities, it should comply with the same regulation and supervision requirements as any other financial intermediary (Trigo Loubiere, 2003).

This dissertation attempts to go beyond these general guidelines, in an effort to understand better the criteria that the authorities should follow in the design of the regulation framework. Special attention is given to those dimensions of regulation that make distinctions according to credit risk.

The effort is important, because the history of microfinance has not validated some of the initial fears of the authorities. In effect, advanced microfinance industries
that operate in macroeconomic environments with successive and cumulative systemic shocks, such as Indonesia or Bolivia, have shown a differential (superior) performance during these episodes, when contrasted with other types of intermediaries (Robinson, 2002; Villafani-Ibarnegaray and Gonzalez-Vega, 2005; Gomez-Soto and Gonzalez-Vega, 2007). Preliminary evidence suggests that microfinance institutions perform better along the business cycle than other financial intermediaries and that, therefore, their influence is less pro-cyclical than that of banks.

This more robust performance has puzzled the financial authorities, which have observed the rapid expansion of microfinance institutions while the rest of the financial system is contracting, during a macroeconomic crisis. Research at The Ohio State University has hinted that this heterogeneity in results is mostly based on the superior financial technology used by the microfinance institutions and on the greater flexibility of microfinance clients, who can adjust more rapidly than other sectors of the economy to a changing macroeconomic environment.

The superiority of the microfinance technology, particularly of those organizations that rely on individual loans rather than group credit, becomes more evident in recessive periods (Villafani-Ibarnegaray and Gonzalez-Vega, 2005). These earlier attempts to explain the outcome have stopped short, however, of a rigorous theoretical and empirical evaluation of the sources of the differential performance. Such analysis and measurement are needed, however, to further identify regulatory implications.
1.4 Contribution

This dissertation addresses regulation concerns that arise in markets where the borders between microfinance institutions and the rest of the financial system are becoming blurred. In particular, the research tackles policy issues concerning the development of regulation frameworks when mature microfinance institutions operate in the market.

The literature has highlighted the importance of the neutrality of government intervention in financial markets, to create a level playing field and allow the revelation of comparative advantages in offering financial services to different segments of the population. One question, then, is if the regulation framework should be separating, rather than pooling. In particular, neutral treatment is not assured by treating unequal intermediaries equally (Chaves and Gonzalez-Vega, 1994). This dissertation explores the opportunities and limits of separating regulation frameworks. For this, the dissertation identifies the set of differences between microfinance institutions and other types of intermediaries to be considered by the regulatory regime, in order to promote the development of a sound financial system and to achieve economic growth.
CHAPTER 2

CREDIT RATIONING AND INNOVATION IN MICROFINANCE LENDING TECHNOLOGIES

2.1 Credit rationing

In a typical financial market, at the prevailing interest rate, the demand for loans is not completely satisfied by credit suppliers. In effect, the presence of unsatisfied demands reveals the existence of credit rationing, in a market that does not clear in equilibrium. This empirical condition has been studied in depth by the financial markets literature (Hodgman, 1960; Gonzalez-Vega, 1976; Keeton, 1979; Stiglitz and Weiss, 1981; Jaffee and Stiglitz, 1990).

If the delivery of the services supplied and the payment for acquiring them would coincide in time, rationing would take place through prices. In this sense, all buyers willing to pay the price set by the suppliers would receive the service. In credit markets, however, there is no coincidence between delivery and payment. The financial intermediary allocates a certain purchasing power (a loan) today in exchange for the
borrower’s uncertain promise to repay tomorrow. Consequently, the credit business relies on determining if the promise to repay will be fulfilled or not. That is, the main task of the lender is to measure ability and willingness to repay.

This task is challenging for several reasons and, when the obstacles cannot be sufficiently overcome, non-interest credit rationing may emerge. Moreover, when the costs incurred to overcome the obstacles are prohibitive, the market will be entirely missing. The next sections explore some of these difficulties and the consequences on the market for loans.

2.2 Stochastic ability to repay

Ability to repay mainly depends on the cash flow that will be generated over time by the potential borrower. Since this flow will be produced in the future, depending on the state of nature, it is not a deterministic but rather a stochastic value. That is, the cash flow will have some value if things go well and a lesser value otherwise. These scenarios are not necessarily dichotomous (good, bad); rather, there is a continuum of possible states of nature between these to extreme values. Therefore, the lender has to estimate the probability of getting full repayment, given the distribution of these results.

If risk is measured as a function of deviations of the cash flow below its expected value, depending on different circumstances, it would be possible, given some knowledge of the distribution of the likely outcomes, to determine a potential client’s
quality. If the flow stays relatively unaltered, regardless of a favorable or unfavorable scenario, the risk associated to the cash flow is low and the client’s quality is high. That is, the probability distribution of bad (riskier) clients has a greater kurtosis than the distribution of good (less risky) clients, even when the mean cash flow is the same for both groups.

2.3 Adverse selection

In the presence of asymmetric information, the lender cannot sufficiently separate loan applicants of a different risk type, who look indistinguishable given the imperfect information available, while some potential borrowers may have incentives to disguise their risk profile and the lender cannot verify their true type. In these circumstances, the screening of applicants is a complex task, to a large extent because the pool of loan applicants is not independent of the terms and conditions of the loan contract. In particular, if the loan interest rate increases, the quality of the pool of applicants decreases. This happens because the higher interest rate discourages the entry of good (safer) applicants. There is adverse selection (Stiglitz and Weiss, 1981).

In particular, the financial institution will be willing to disburse a certain loan amount \( L \) such that the expected cash flow \( E(y) \) is sufficient to cover the principal plus interest \( L(1 + r) \), where \( L \) is the loan amount, \( r \) is the interest rate, and \( E(y) \) is the expected income from the borrower’s portfolio of activities. Then, unless the state
of nature changes or the lender makes a mistake, the promised repayment $L(1 + r)$ will never be greater than $E(y)$.

If the intermediary initially sets an interest rate ($r_o$), it will attract a pool of good (less risky) and bad (riskier) potential borrowers, whose quality cannot be distinguished, given the lending technology used. However, on the aggregate, a loan portfolio will be developed when the lender can assume that the proportion of good borrowers is sufficient to make it worthwhile to disburse loans to at least some applicants in the pool. Specifically, the good borrowers would generate sufficient surplus for the intermediary to cover the losses produced by the bad clients.

Thus, the lenders’ willingness to offer loans will be given, in part, by their beliefs about the proportions of good and bad borrowers in the pool of applicants. The higher the proportion of bad borrowers that the lenders assume exists in the pool, the stricter will be their credit rationing criteria. If they believe that the proportion of bad applicants is too high, the market will break down.

Furthermore, if the financial institution decides to increase the interest rate to ($r_1$), the pool of potential clients decreases, fulfilling the law of demand. However, the decline in the number of good clients in the pool of applicants is proportionally greater than for bad clients. As a result, the pool of applicants requesting loans at the new and higher interest rate would be of lesser quality. This reduction in the quality of the pool
(a higher proportion of riskier applicants) will lead to more strict credit rationing by the lenders.

2.4 Incentive incompatibility and moral hazard

Additionally, there is incentive incompatibility between the borrower and the lending intermediary, given the range of potential benefits and costs for both parties. The loan is a fixed-amount contract. If the cash flow scenario is favorable for the borrower, the intermediary will get at most the principal disbursed plus interest \([L(1 + r)]\). In contrast, the net income for the borrower after repaying principal plus interest \([y - L(1 + r)]\) increases without limit, as long as the cash flow is higher than the loan obligation.

In turn, if things go wrong and the cash flow is insufficient to repay the principal and interest, the financial intermediary will get at most the total cash flow generated, namely the amount \([y < L(1 + r)]\). In this case, the borrower does not get a penny. At the same time, however, if the borrower believes that partial rather than full repayment may result in the rejection of future loan applications, she may decide not to repay at all (the unfavorable production outcome would have induced a lack of willingness to repay). In this case, the lender does not get a penny.

In other words, on the one hand, there is a ceiling on the lender’s potential earnings, independently of how favorable the state of nature is. On the other hand,
given her limited liability, when the state of nature is unfavorable there is a ceiling on the borrower’s losses. There is not a ceiling, however, on the potential borrower gains.

Given the relationship between risk and returns on the borrower’s potential portfolio of productive activities, to accept a higher level of risk implies an increase in the borrower’s expected profits, while this choice will decrease the lending intermediary’s expected profits. Thus, incentive incompatibility emerges because the borrower may be willing to engage in activities that, while attractive bets for the borrower, may potentially increase the expected losses for the intermediary. That is, moral hazard arises, and the borrower may have incentives to hide the nature of the actions that she is undertaking. This behavior will be more probable if the financial intermediary’s capacity to monitor the borrowers is weak (Conning, 1999). Moreover, the probability of the borrower’s opportunistic behavior (moral hazard) increases as the interest rate charged on the loan increases, both through the choice of riskier projects and the reduced willingness to exercise diligence (Keeton, 1979; Stiglitz and Weiss, 1981).

These considerations imply that the financial intermediary will be prone to voluntarily limit the interest rate that it will be willing to charge, in order to maximize its expected net profits. At the maximum interest rate that the intermediary will be willing to charge, the demand for credit will exceed supply. For this reason, non-interest credit rationing emerges in equilibrium.
Given the intermediary’s imperfect information set, this outcome will be a pooling equilibrium, where both good and bad borrowers are offered the same contract terms and conditions and, in particular, are charged the same interest rate. Rationing emerges because, at the interest rate that the intermediary sets, there are potential borrowers not being served (rejected applicants) who have characteristics equivalent to those of borrowers being served at the going loan interest rate. Thus, the amount of loans disbursed will be smaller than the amount of loans demanded and credit rationing will occur.

In an alternative scenario, where the lender cannot perfectly differentiate among applicants and it still charges a uniform interest rate (that is, when the lender cannot behave as a perfectly discriminating monopolist), applicants are not rejected but they get a size of loan smaller than the amount demanded at the going interest rate (Gonzalez-Vega, 1976; Jaffee and Modigliani, 1976). Again, excess demands for credit will prevail in the resulting pooling equilibrium.

The presence of adverse selection and of moral hazard thus creates a particular relationship between the interest rate charged by the intermediary, the extent of credit rationing that the lender is willing to exercise, the resulting probability of default (given by the proportion of bad borrowers in the emerging pool of applicants and the propensity of borrowers to behave opportunistically), and the intermediary’s net profits (that is, lender returns net of losses from default).
Figure 2.1: The Stiglitz-Weiss curve

The resulting relationship between interest rates and lender profits is shown in Figure 2.1. For simplicity, other intermediary costs are not considered, except the losses associated with default. In the presence of perfect information and, therefore, if neither moral hazard nor adverse selection problems existed, a direct relationship between interest rates and default rates would not be present. To highlight this effect, Figure 2.1 assumes that, in the absence of default, the intermediary’s profits per dollar borrowed ($\pi$) would be equivalent to the interest rate contracted ($r$), as is depicted by the 45 degree line. The presence of the phenomena associated with asymmetric information
produces, however, the bell-shaped curve that describes the relationship between the intermediary’s profits and the interest rate, with the wedge measuring default rates.

That is, in the presence of adverse selection and moral hazard, as the loan interest rate increases, profits increase less than proportionately, up to a maximum level of profits, corresponding to an interest rate threshold, where an optimal interest rate \( (r^*) \) is determined. For higher levels of the interest rate, the intermediary will get lower profits. Furthermore, there will be a limit to the interest rate that can be contracted before profits turn negative, \( (r^{**}) \). Higher interest rates will only generate losses to the financial institution, because at those levels the default rate will be higher than the interest rate charged.

In an environment \( \text{à la Stiglitz-Weiss} \), it would be expected that profit-maximizing financial intermediaries will take into account all of these considerations, when determining the optimal interest rate to charge on loans. For this reason, even when an external agent (third party) that regulates or supervises the market is absent, it would be expected that these financial intermediaries will voluntarily limit the interest rate charged, in an effort to avoid excessive levels of moral hazard and adverse selection.

Credit rationing ensues, however, and the allocation of resources through the credit system is not a Pareto optimum. The unsatisfied excess demands for credit represent legitimate productive opportunities that are not undertaken because of the information imperfections in the credit market. The accompanying gaps between the
marginal rates of return of deficit and surplus units reflect the resulting fragmentation of financial markets (Gonzalez-Vega, 1976).

Moreover, the combination of a pooling equilibrium and credit rationing (with equivalent applicants either receiving loans or not receiving them, even if they possess identical productive opportunities) means that marginal rates of return are not equated across all loan applicants (even if they are good applicants, they may not be recognized as such by the lender). Thus, opportunities to improve efficiency in the allocation of resources are missed and the economy does not realize its full potential.

At the same time, there are similar information and incentive imperfections in the market for deposit mobilization. Deposits are a fixed-amount contractual obligation for the intermediary, independent of the state of nature. Deposit-taking institutions, however, transform these deposits into a risky loan portfolio. If the state of nature is favorable, bank owners keep the extra profits. If things do not go well, their limited liability restricts their losses, at most, to their equity contributions.

In these circumstances, bank owners may behave opportunistically, unless they are constrained by prudential regulation and supervision (Chaves and Gonzalez-Vega, 1994; Bhattacharya, Boot, and Thakor, 1998; Dewatripont and Tirole, 1999). Thus, even if financial intermediaries voluntarily limit their loan interest rates in order to maximize their profits after default, in this choice they will be guided by considerations of private profits rather than by social costs and benefits.
Moreover, in developing economies characterized by an incomplete or weak institutional infrastructure (including inadequate prudential regulation and supervision) and subject to high levels of macroeconomic instability and other systemic risks, the self-discipline of lenders in limiting the interest rates they charge, in order to avoid loan defaults due to adverse selection and moral hazard, may not be fully present. This will be particularly the case if any changes in the borrower’s cash flow are positively correlated to the macroeconomic shocks (McKinnon, 1989). This opportunistic behavior is analyzed in the next section.

2.5 Opportunistic behavior of intermediaries

In Bolivia, like other developing countries, the absence of dynamic stock markets, where shares of stock are publicly traded, implies that the pivot of the financial market are the set of banks and non-bank intermediaries with monetary functions. For this reason, the country’s financial authorities face the delicate task of creating an environment of regulation and supervision that balances, on the one hand, the monetary functions of banks and, on the other, the financial intermediation and risk acceptance functions, which are simultaneously provided by the financial system (McKinnon, 1989).

In this scenario, prudential regulation typically favors the promotion of a prudent risk exposure by the deposit-taking financial entities, in order to protect the stability of the payments system. This preference sacrifices the financial intermediary function and
the greater risk-taking associated with high-return investments, which are key for the enhancement of productivity and economic growth, in an effort to protect the monetary function of banks (McKinnon, 1989).

To accomplish these objectives, prudential regulation and supervision usually cover a diverse spectrum of mechanisms that include, for instance, minimum capital requirements, reserve requirements, restrictions on related transactions, and loan-loss provisions according to loan-risk categories.

One of the key goals of the prudential authorities is to promote the orderly exit of inefficient institutions. However, if the bankruptcy of a particular intermediary may compromise the monetary function of the whole system, given the negative externalities associated with runs on deposits, the same authorities might be forced, under certain circumstances, to bail out the troubled institution. For this purpose, they will use fiscal resources, in order to avoid further losses to the economy. At the same time, depositors aware of the public interest in the double function of the financial system perceive that the state is responsible for the safety of their deposits, even when explicit deposit insurance is not in place.

The challenge of achieving a delicate balance between the stability of the monetary function, on the one hand, and the development of the intermediary function and risk acceptance, on the other, is accentuated if the economy is subject to macroeconomic shocks. Following McKinnon (1989), macroeconomic instability translates, first, into greater variability of forecasted cash-flows (increased idiosyncratic
risk). In addition, the presence of macroeconomic instability redefines the covariance of cash flows typically found among clients with similar characteristics. In effect, the systemic shock actually creates a high covariance among all results in the economy (systemic risk). When the economy is expanding, the cash flows of all (or almost all) the borrowers increase. By the same token, if the macroeconomic conditions are adverse, the cash flow of all (or almost all) the borrowers would be adversely affected.

Furthermore, in this scenario, as social and macroeconomic instability get worse, prudential regulation usually requires financial intermediaries to adopt higher loan-loss provisions, in order to face the expected decline in the borrowers’ cash flow and anticipate potentially higher rates of default.

As a consequence of the systemic shock, the relationship between profits per dollar of loan ($\pi$) and the contractual loan interest rate ($r$) shifts downwards and to the left, such that now, at any given interest rate ($r_1$), default rates are higher and profits are lower ($\pi_1$) than those corresponding earlier ($\pi_1$) to the same interest rate. Similarly, if $r_0^*$ was the profit-maximizing interest rate under the conditions existing before the shock, this will be no longer the case. At this interest rate, the rate of default will now be higher than expected prior to the systemic shock.

Unfortunately, the intermediary may not be able to instantly renegotiate contracts to correct for this unexpected change in the state of nature, and a reduction in profits and an increase in default rates will be observed. The new loan transactions will be negotiated, however, taking into account the new position of the Stiglitz-Weiss (SW)
relationship, in order to maximize expected profits under the new state of nature. Given the adverse shock, the opportunity to generate bank profits is not as attractive as it was before.

For instance, a recessive environment has adverse systemic consequences on loan portfolio quality, since the expected cash flows of all borrowers will have a lower value and the borrowers will earn lower expected profits. As the lending technologies that have been designed to mitigate idiosyncratic risk in a normal environment may not be effective in addressing systemic risk, the shock may induce higher default rates in the whole system, including banks and the microfinance institutions.

Figure 2.2 shows the downward shift of the SW curve. As a consequence, the interest rate that maximizes profits is lower, declining from $r_0^*$ to $r_1^*$. In their efforts to protect the monetary function of the banking system, the financial authorities may adopt even more demanding regulations than before the shock, in order to induce the intermediary to become more prudent. Directly or indirectly, these regulatory interventions may attempt to encourage banks and other intermediaries to reduce their levels of default and further lower the interest rates charged on loans, as shown in Figure 2.2
In any case, those intermediaries that recognize the impact of the systemic shock will voluntarily become more prudent, unless they behave opportunistically. Additional prudence, either voluntary or induced by the prudential supervisor, will translate into a lower optimal interest rate—in recognition of the reduced set of productive opportunities—and, as a consequence, it will translate into a greater degree of credit rationing. Either only high quality clients (that is, low risk applicants) will receive loans, the proportion of rejected applicants from an indistinguishable pool will increase, or the
size of loans granted will decline. Any one of these outcomes implies a reduction of the outreach of the financial system (less financial deepening).

Following McKinnon (1989), if the system of regulation is weak, with insufficient loan-loss provisions and, particularly, capital adequacy requirements, the implicit or explicit commitment of the state to protect the monetary function of the financial system may induce moral hazard and the opportunistic behavior of the owners of financial institutions.

In these circumstances, financial intermediaries may consider it attractive to lend to riskier clients, or to reduce their rate of rejection of loan applications from a non-differentiated pool, or to increase the size of loans granted to observationally indistinguishable borrowers, while charging atypically high interest rates. That is, financial intermediaries will make profit-maximization decisions based on a truncated perspective of the relationship between their choices and expected profits, since they will not be liable for all the losses caused by their opportunistic behavior. This is equivalent to the upward shift in the SW curve shown in Figure 2.2. Under these conditions, higher interest rates will be charged.

This behavior would be based on the simultaneous assumptions that: (1) if a favorable scenario for the borrowers’ cash flow occurred, the riskier clients would reimburse principal and interest, with low default rates and high profits for the bank or (2) if an unfavorable scenario occurred, and the borrowers’ cash flows declined, potentially inducing a massive loan portfolio loss (even to the whole financial system),
the authorities would be forced to bail out the institutions in trouble. In particular, the biggest institutions would have a higher probability of being rescued, engaging in too-big-to-fail behavior (Sprague, 1986).

In fact, under these circumstances, private financial intermediaries face a very attractive bet, which at the same time is potentially harmful to the state, since they can seek extraordinary profits without having to pay for the total resulting social losses from their opportunistic behavior. Moreover, an adverse systemic shock, such as a recession, reduces the actual value of the intermediary’s charter (which is given by the present value of expected future profits) and, as a result, it encourages opportunistic behavior on the part of bank owners who would have less to lose under these circumstances (Hellmann, Murdock, and Stiglitz, 1997).

The possibility of engaging in such opportunistic behavior exists only if the cash flows of all borrowers are positively covariant with the macroeconomic shock. If the economy is stable, the borrowers’ cash flows will vary according to their exposure to idiosyncratic risks and, as a consequence, the SW curve does not shift and the financial intermediary will maximize its profits by charging an optimal interest rate $r_0^*$ under normal conditions.
2.6 Innovation in microfinance lending technologies

Microfinance institutions constantly find new ways to improve their operations. In fact, microcredit is an extreme example of innovation based on learning-by-doing (Villafani-Ibarneagaray and Gonzalez-Vega, 2007). Improvements in these lending technologies are not costless, but since they come from the daily operations of the organizations and represent substantial sunk costs from the accumulation and use of information, they cannot be instantly reproduced by competitors.

Figure 2.3: Innovation in lending technology

Innovation in lending technologies is reflected in a higher profitability for the lender and, in the case of microfinance, in reductions in the rates of default. Eventually,
through competition, these innovations result in better credit contract terms and conditions for the borrower. In this sense, a technological shock (innovation) redefines the SW relationship, shifting it upwards and to the left, as is shown in Figure 2.3. That is, the processes of screening and monitoring as well as contract design are improved. The result is a better separation of good and bad borrower’s in the pool of applicants. In consequence, the interest rate charged at the new pooling equilibrium which excludes bad borrowers more effectively will be lower, and the extent of credit rationing among the new set of borrowers, after the successful exclusion of some bad applicants from the pool, will decline.

In practice, the innovations introduced by microfinance institutions have allowed a monotonic reduction of the interest rates charged. While the reductions in interest rates is what is explicitly considered here, it is worthwhile noticing that, in Bolivia, the reductions in transaction costs for the clients have been even more dramatic (Gonzalez-Vega and Villafani-Ibarneagaray, 2007). These lower transaction costs imply that the fears of adverse selection and moral hazard due to the high cost of credit would be less than if the interest rate charges comprised the only component of the total cost of funds for the borrowers.
CHAPTER 3

REGULATORY REGIMES FOR SCENARIOS CHARACTERIZED BY
FREQUENT, SUCCESSIVE AND CUMULATIVE SYSTEMIC SHOCKS

At the core of this dissertation is the objective of establishing if the regulatory authorities in a developing country with a mature microfinance industry (i.e., a microfinance sector that has grown rapidly for over two decades and has enlarged the portfolio of its services) should adopt a differentiated (“separating”) regulation for microfinance institutions, particularly in an environment characterized by successive and cumulative systemic shocks. For these purposes, a prudential regulation framework can be defined as the set of rules that govern the operations of financial institutions. From a broad perspective, these regulation instruments fall into two main categories: (1) capital adequacy requirements and (2) loan-loss provision requirements. This dissertation focuses on the role of capital adequacy requirements as a constraint on the holdings of risk-adjusted assets.
While the effects that systemic shocks have on the performance of financial institutions are multidimensional, this dissertation is particularly interested in the rearrangement of credit risks in their loan portfolios when such shocks occur and in the challenges that these differentiated and imperfectly appreciated changes in risk profiles pose for the prudential authorities. The challenges are more pronounced when the shocks are frequent and when their effects accumulate over time. For this reason, the analysis of regulatory choices in this dissertation focuses, on the one hand, on the regulation associated to loan-loss provisions and reserves and, on the other hand, on the capital adequacy ratio.

3.1 Loan-loss reserves

Financial intermediaries allocate purchasing power today and the borrowers promise to repay tomorrow. These promises may be fulfilled or not. Thus, the potential to generate profits depends, not only on the volume of the outstanding loan portfolio, but most importantly in the ability to collect loans according to the contractual repayment schedules.

For this reason, displaying the total loan portfolio in the balance sheet, without an adjustment for expected but uncertain losses, is misleading. Rather, some sense of the proportion of loans that will be effectively repaid is needed. However, it is difficult to determine in advance which loans will not be repaid. Thus, some estimation is required.
The amount so estimated is the reserve for loan losses (also known as provision or allowance for loan losses), which is an account that most banking regulators require banks and other financial intermediaries to include in their financial statements. This account reflects losses that the bank has already identified as well as a cushion for loans that currently are in good standing but that potentially may become delinquent in the future (Walter, 1991).

The account of loan loss provisions is periodically calculated from the revision of a sample of specific loans. Higher provisions are required when loans cross thresholds (usually, days in arrears) that signal the deterioration of the probability of repayment. The loan loss reserves are usually accounted in the assets side of the balance sheet as a deduction from the total loan portfolio and by charges against earnings in the income statement.

3.1.1 Perspectives about loan-loss reserves

The financial literature studies loan-loss provisions from two main perspectives. One is interested in the procedures that determine a sound accounting disclosure of the performance of the financial institution. The other one analyzes the incentive mechanisms that influence financial management, in particular risk exposure.

In effect, the accountant’s view of loan-loss reserves is concerned with the measurement of a bank’s net income over a given period. Thus, it focuses on losses expected to result from events during a given period and it explicitly excludes the
expected effect of future events (Wall and Koch, 2000). This view is particularly relevant when the objective is to determine the market value of a given pool of loans to be sold in a secondary market, most commonly through a securitization process.

From an economist’s perspective, however, the purpose of loan loss reserves is twofold. On the one hand, it relates to the transparency that results from this type of provisions about the institutions, in providing good pricing signals to the market, in particular, to depositors, potential investors and the government. On the other hand, loan loss reserves work as a mechanism to align incentives between bankers and depositors and the government, as they have a direct impact on profits. This incentive mechanism is a key component of prudential regulation. It stimulates the embracing of a prudent risk exposure by the financial entities.

This prudence, however, may come at a cost, since it may diminish the degree of financial deepening. Specifically, when loan loss provisioning requirements are excessively high, the cost of credit artificially increases. Bankers may increase interest rates to protect their profits, but adverse selection and moral hazard threats may prevent them from increasing prices further. At some point, instead, they restrain the size of their portfolio. As a result, credit rationing hardens and financial deepening diminishes.
3.1.2 Loan-loss provisions and credit risk

The borrower’s ability to repay a loan mainly depends on the cash flow that will be generated over time. Since this flow will be produced in the future, it is not a deterministic but rather a stochastic value. That is, the cash flow will have some value if things go well and a lesser value otherwise. If a random variable $Y$ represents the borrower’s cash flow under different scenarios, the risk of a loan can be measured as a function of deviations of the cash flow from its expected value $[E(Y)]$ and, in particular, of deviations large enough to lower the expected cash flow below the amount required for repayment. As a consequence, it is possible to determine a potential client’s quality. If the flow stays relatively unaltered regardless of a favorable or unfavorable scenario, the risk associated to the cash flow is low and the client’s quality is high. That is, the probability distribution of bad clients has a greater kurtosis than the distribution of good clients, even when the mean cash flow is the same for both groups.

The financial institution will be willing to disburse a certain loan amount ($L$) such that the expected cash flow $[E(Y)]$ is more than sufficient to cover the principal plus interest $[L(1 + r)]$, where $L$ is the loan amount and $r$ is the interest rate, given the degree of risk exposure that the lender is willing to take. Thus, unless the state of nature changes (and, therefore, the whole distribution shifts to the left) or the lender makes a mistake (that is, the lender has a wrong belief about the location of the distribution), the promised repayment $L(1 + r)$ will never be greater than $E(Y)$. 

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In a market with imperfect information, at a given interest rate, the lender will attract a pool of good and bad potential clients, whose quality cannot be fully distinguished. Lending technologies will differ in the extent to which they allow the lender to accomplish some distinction of credit risk types, but no perfect lending technology exists. However, if the financial institution is sustainable, on the aggregate the proportion of good clients will be sufficient to make it worthwhile to disburse loans to the pool. Specifically, the good clients will generate sufficient surplus for the intermediary to cover the losses produced by the bad clients.
3.2 Lending Technologies

For the purposes of this dissertation, a lending technology is defined as a structured method of lending through the systematic use of information and incentives (Gonzalez-Vega, 2003; Navajas and Gonzalez-Vega, 2003). The diversity of lending technologies is rooted in the facts that information acquisition and contract design are costly and that various types of lenders use different options to deal with these problems (Gonzalez-Vega, 1998b; Pearson, 2008).

It should be clear that there is not a superior lending technology across all segments of the credit market. Superiority is understood here as the quality of achieving relatively more profits and less risk exposure, for the intermediary, given certain measurable and rank-feasible intrinsic characteristics either of the loan or the borrower. These include, on the one hand, characteristics such as the size of the loan, the enforceability of the contract, or the market value of the collateral pledged. On the other hand, they include the size of the client’s business (number of employees and volume of sales), degree of formality of the client, or the transparency, availability and reliability of the client’s financial information.

Consequently, there will be segments of the market where microfinance lending technologies are superior to that of banks (for instance, in reaching poor and rural micro-entrepreneurs). In turn, banks will have a competitive edge reaching bigger corporations and formal clients.
£_i_ represents some measurable characteristic of the borrower, which explains a difference in efficiency between banks and MFIs. The MFI’s technology is superior (more profitable) in regions II and III compared to banks, while the latter’s technology is superior in regions IV and V.

Figure 3.2: Superiority of lending technologies circumscribed to credit market segments.

Figure 3.2 shows how loan portfolio marginal profits, denoted by π(£_i_), change when certain characteristics of the market segment reached (£_i_) change. That is, π(£_i_) indicates the potential of a lending technology to generate profits in certain market segment. Accordingly, when comparing MFIs with banks, six regions may be distinguished, denoted by the Roman numerals I to VI in the graph, that result from
comparing the potential of generating profits that each technology has, given the characteristic $E_i$.

If $E_i$ is, for example, the borrower’s degree of formality (ranging from street hawkers all the way up to corporations registered in the stock market), and if it is assumed that the financial market provides a complete continuum of lending technologies, from the most informal and primitive to the most formal and sophisticated, a client seeking a loan will be able to access certain providers, depending on her idiosyncratic characteristics. Matching thus characterizes the credit market (Joshi, 2005).

Figure 3.2 shows that there is a Region I, where the borrower’s characteristics are so informal and probably the loans requested so small that neither banks nor MFIs can reach these clients. In that region, transactions take place with informal and semi-formal lenders, like friends and relatives, rotating savings and credit associations (ROSCAS), pawnbrokers, moneylenders, self-help groups, and other informal mechanisms. As borrowers gain some formality, they enter Region II and potentially can be reached by microfinance lending technologies. MFIs can adopt diverse technologies, depending on their loan size requirements, going from village banking to the use of collateral substitutes.

After crossing some threshold, the borrower’s formality is such that she reaches Region III, where banks will also be willing to provide loans. As formality increases (audited financial statements, tax statements, and so on), clients reach Region I, and, at
some point, Region V, where only banks are capable to satisfy the increasingly sophisticated client’s demands. Finally, beyond certain threshold, banks have to compete for the clients at the top of the pyramid, with other competitors that are interested in those corporate clients, like international banks and the stock exchange market.

The important issue in Figure 3.2 is that one lending technology is superior to another only in certain ranges of $£_i$, that is in certain market niches. The MFI’s technology is superior (more profitable) in regions II and III, compared to banks, while the banks’ technology is superior in regions IV and V. This caveat should be kept in mind, in the discussion that follows.

### 3.2.1 Heterogeneous performance of lending technologies

The success of a lending technology relies in good measure on its ability to screen loan applications and on its ability to react to changes in the market segment. Despite incomplete and asymmetric information, good lending technologies should be capable of estimating the distribution of outcomes for their borrowers fairly accurately, consistently and efficiently. Evidently, some difference will inevitably exist with respect to the parameters of the true distribution (i.e., error of the estimation). However, the more efficient the estimation, the better the technology. Equally important, a good lending technology should be consistent in its evaluation of applicants. Borrowers with a similar set of characteristics should get similar evaluations. At the limit, the lender
would be capable of perfectly overcoming the asymmetric information problem and making decisions with complete information. At the other extreme, the screening process would be entirely random.

Figure 3.3: Differences between lending technologies when estimating the distribution of the clients’ Income

Figure 3.3 shows the difference between a financial institution with a clear vision of the market (i.e., a lending technology that is efficient, A) and another institution (B) that is only capable of perceiving a cloud of possible distributions of the outcomes of the productive activities of its clientele. Technology B has a hard time mapping values for \( Y \), because the vision that it has of the distribution is foggy and imprecise. In this scenario,
lending technology A has more consistency in accepting good applications and in rejecting bad applications, compared to technology B. Consequently, technology A builds a pool of borrowers with a more acceptable ex-ante credit risk. In addition, technology A is capable of offering loans of size $L$ that are more likely to be repaid, given the distribution of the borrower’s income and the size of the total obligations $(1 + r)L$. It should be noted that, in this example, technology A is biased [i.e. $E(Y')$ differs from the true value $\mu_Y$] but consistent.

### 3.2.2 Lending technologies and systemic shocks

Financial intermediaries and their clients are vulnerable to an array of systemic shocks, which may come from diverse sources (social, economic, and political disturbances as well as climate events and so on.) and which may change the economic environment in which their loan contracts were arranged.
Figure 3.4: Probability density function and cumulative density function of the clients’ income estimated by the lender before a shock.

By definition, these shocks affect the whole financial system, although their impact is not uniform across the market. Financial intermediaries and their clients will be heterogeneously affected, depending on the covariance of their activities with particular shocks and on their reaction to the new environment post-shock.
To illustrate this, consider Figure 3.4, which in the top quadrant shows the probability density function (pdf) of a given type of borrowers with an expected income $E(Y)$. A financial intermediary evaluates the characteristics of the borrower and her cash-flow and signs a loan contract for $(1 + r)L_0$. Given this size of loans, the lender is comfortable in assuming a probability of default equivalent to the shaded area below the pdf, which corresponds to all values of $Y$ that are insufficient to repay the obligation. This probability of default is also shown in the bottom quadrant by the corresponding cumulative density function.

Let us assume that the distribution of the borrower’s income that the lender observes (estimates) is close to the actual distribution. It might be imagined that the intermediary has achieved this accuracy by multiple cycles of interactions with this type of borrowers, which have allowed the refining, in each round, of the parameters of the estimation.

An adverse systemic shock implies a shift of the borrower’s distribution of income outcomes towards the origin, as shown in Figure 3.5. Under the new conditions, the lender does not have the same accuracy that it had before. This shortcoming is represented in the graph with a thicker line for the new pdf.
(1) The distribution function shifts towards the origin when the shock occurs and increases the probability of default.

(2) The lender reduces the size of the obligations that it is willing to offer under the new distribution.

Figure 3.5: Probability density function and cumulative density function of the clients’ income estimated by the lender before and after a systemic shock.
The shift in the distribution causes the lender, which signed loan contracts of size 
\((1 + r)L_0\), to face a higher default risk than before. This is shown by the area below the 
new pdf to the left of \((1 + r)L_0\), colored in light purple. Clearly, under the new 
distribution, credit risk increases because all loans of size \(L_0\) have a higher chance to be 
defaulted than before.

While outstanding loans cannot be renegotiated, (although rescheduling would 
be among the first options that the lender would consider to reduce credit risk), the 
lender can chose new loan conditions that is willing to offer to new loan applications. In 
particular, the lender can adjust the size of the loans offered and thereby reach levels of 
credit-risk that are acceptable. For simplicity, assuming that the interest rate remains 
constant, the lender could reduce the size of the loan to \(L_1\) and mitigate its credit risk-
exposure. Under the new conditions, the financial institution faces a delinquency 
equivalent to the area below the new pdf and to the left of \((1 + r)L_1\), colored in dark purple.

Then, the impact that a systemic shock has on the credit risk exposure of a 
financial intermediary is largely dependent, on the one hand, on the new conditions 
faced by its borrowers (in the graph, the magnitude of the distribution’s shift). On the 
other hand, it also depends on the ability of the lending technology in assessing the 
new environment (thickness of the new distribution) and in adjusting the loan contracts 
accordingly \((L_1 < L_0)\).
In other words, the heterogeneity in the impact of a systemic shock across financial intermediaries comes from a combination of the flexibility that the lender and the borrower have in adjusting to the new economic environment.

3.3 Capital adequacy ratio

A fundamental tool in prudential regulation is the use of capital adequacy requirements to constrain the intermediary’s leverage capability. The importance of this tool derives, among other things, from the role that equity plays in the intermediary’s: (1) soundness, (2) risk-taking incentives, (3) governance, and also (4) its influence on the competitiveness of the industry (Santos, 2001).

The international convergence of bank capital regulation started in 1988, with the accord on capital standards promoted by the Basel Committee on Banking Supervision. This committee is hosted by the Bank for International Settlements, in the broadest sense a “central bank of central banks” (Bank of International Settlements, 2007).

Since its introduction, the Basel Capital Accord has been acknowledged for its contribution to the widespread use of risk-based capital ratios, both as measures of the strength of banks and as trigger devices for the prudential supervisors’ intervention. The Basel Capital Accord has also been praised for the international convergence of capital standards and the improvement of these standards (Santos, 2001). Additionally, and despite the fact that the Accord was created for developed countries, its widespread
application in developing countries has strengthened their financial systems and has increased the quality of their prudential supervision (De Juan, 1996).

As a result, the authorities impose minimum capital adequacy ratios on all types of financial intermediaries. In fact, when intermediaries fail to comply with these limits, most regulatory frameworks allow the authorities to impose corrective actions through a sequence of intervention procedures. In the most extreme cases, these measures include the closing of the financial institution.

A minimum capital adequacy ratio is a regulation that requires equity to be equal to a certain proportion of the total assets of the bank, after applying risk-weighting coefficients to those assets (Dewatripont and Tirole, 1999).

The capital adequacy ratio can be expressed as:

\[ \alpha E = \sum \phi_i \cdot A_i \]

\[ \alpha > 0 \; ; \phi_i \geq 0 \; ; A_i \geq 0 \; ; i = \{1, \ldots, n\} \]

where \( \alpha \) is the limit set by authorities, \( E \) is the lender’s equity, \( n \) is the number of different assets held by the intermediary, \( \phi_i \) is the risk-weight of asset \( i \), and \( A_i \) is asset \( i \).

Formally, equity is the sum of Tier 1 capital, also known as “core capital” and which includes stocks and disclosed reserves, and Tier 2 capital or “supplementary capital”, which includes subordinated debt exceeding five years and shares redeemable
at the option of the issuer. The characteristic of equity is to be subordinated to deposits and other traditional bank liabilities and not to be due in the short-run (Dewatripont and Tirole, 1999).

The minimum capital adequacy ratio, according to the guidelines of the Basel Committee, is 8 percent. Most regulations impose this limit to all types of financial intermediaries.

Despite the improvements in financial supervision that the Basel Capital Accord achieved, it has been blamed for several distortions to financial intermediation. A better understanding of its conceptual shortcomings, concerning mainly its focus on credit risk, together with financial innovation, have created incentives and opportunities for regulatory equity arbitrage. This has led to a reduction in its effectiveness. Growing evidence both on these distortions and on a reduction in the Accord’s effectiveness led to proposals to redesign it associated with Basel II (Santos, 2001).

If, for simplicity, it is assumed that the financial intermediary only holds two assets: the loan portfolio \((L)\) and an alternative risk-free investment, for instance, government bonds \((B)\), then, the capital adequacy ratio is given by:

\[
\alpha E = \phi_L L + B \\
\alpha > 0 \; ; \; L \geq 0 \; ; \; B \geq 0 \; ; \; \phi_L \geq 0
\]

(3.2)

Given this constraint, the financial intermediary will choose a combination of \(L\) and \(B\) that maximizes its profits. If it is assumed that the loans interest rate is \(r\) and the
bonds interest rate is $b$, such that $b \leq r$, the intermediary will maximize its profits when the marginal profits of the loan portfolio (as a function of the default rate) and of the bond’s portfolio are equated, as will be shown in chapter 5.

Figure 3.6: Marginal profits earned on assets

Since the government bonds are risk-free, the marginal profits from bonds are constant and can be depicted as a horizontal line that intersects the vertical axis at $b_0$. In turn, loans are a risky activity and, given the risk of default, marginal profits decline
monotonically with the size of the loan portfolio. This is because, as the loan portfolio increases (ceteris paribus), the probability that the borrower will repay the obligation decreases and, therefore, the delinquency rate increases, reducing the profits adjusted for risk earned by the lender. This is shown in Figure 3.6.

As a result, the intermediary will choose a combination of loan portfolio and bonds along the gray kinked curve. If there is no minimum capital adequacy ratio that is binding, the financial intermediary will choose a loan portfolio equivalent to \( L^* \) and will invest as much in bonds as deposits it can mobilize. The consequences of introducing capital adequacy requirements as a regulatory constrained are further explored in chapter 5.
CHAPTER 4

BOLIVIAN MICROFINANCE:
PERFORMANCE UNDER SUCCESSIVE SYSTEMIC SHOCKS

Among academics, practitioners, and donors interested in the microfinance industry, the Bolivian case has been studied for its outstanding success. Over the past two decades, this case has been amply recognized as a source of best practices for the rest of the world. In particular, Bolivia has been a leader in innovations in lending technologies and in the creation of appropriate institutional and regulatory frameworks.

Actually, microfinance and Bolivia have been closely interlinked. Neither the history of the microfinance industry in the world could be written without referencing the exceptional achievements of the Bolivian microfinance institutions and their global contributions, nor the recent economic history of Bolivia could be written without mentioning the significant contributions of microfinance institutions to the development of the country's financial system (Gonzalez-Vega and Villafani-Ibarneagaray, 2007).
The emergence of microfinance in Bolivia, its development as a genuine financial sector, and its survival in the face of fierce competition (while balancing sustainability through profits with its social objectives) are achievements that have been earned in a harsh setting. In fact, the environment in which the financial system, in general, and the microfinance industry, in particular, have operated for the past two decades in Bolivia has been characterized by political, social, and economic distress.

Several systemic events, translated into numerous adverse shocks to the financial sector, have induced major runs on deposits and drastic and extended periods of credit crunches. These outcomes have been reflected in the evolution, in real terms, of the deposits mobilized from the public and of the performing loan portfolio. Figure 4.1 shows data about the performing portfolio rather than the total outstanding loan portfolio because the former indicator is more accurate for observing the fluctuations of credit between expansion and contraction periods, since it does not carry the inertia of the non-performing portfolio. Indeed, worsening portfolio quality has been one of the key accompanying dimensions of the credit crunches.

The evolution of the Bolivian financial system over the past 35 years, as shown in Figure 4.1, reveals that the performance, in real terms, of the volume of deposits mobilized from the public and of the performing loan portfolio can be characterized by ten episodes: five of expansion, one of stagnation, and four of contraction.
(a) All the amounts are in real terms and expressed in US Dollars. That is, nominal values were first deflated into June/1991 constant Bolivianos and then converted into US Dollars at the exchange rate of 3.56 Bs/USD as of that date.

(b) The shaded bars correspond to the following circumstances and dates:

1. Military dictatorships: Expansion I [Dec/70 - Feb/78]
2. Successive coups d’état: Stagnation I [Mar/78 - Sep/82]
3. Hyperinflation: Crisis I [Oct/82 - Ago/85]
4. Market liberalization: Expansion II [Sep/85 - Jul/87]
5. Closing mismanaged banks: Crisis II [Jul/87 - Sep/88]
7. Crony lending and off-shore: Crisis III [Nov/93 - Jan/96]
8. Lending boom: Expansion IV [Feb/96 - Nov/98]
9. Recession: Crisis IV [Dec/98 - Feb/04]

Source: Calculated using data from the Superintendence of Banks and Financial Entities (SBEF), Central Bank of Bolivia (BCB), and Association of Financial Institutions for Rural Development (FINRURAL).

Figure 4.1: Performance of the Bolivian financial system, deposits of the public and performing loan portfolio (December/1970 - December/2007)
While Figure 4.1 suggests that the financial system has experienced an overall positive trend in the real value of deposits and loan portfolio, the size of the financial system as a proportion of the Bolivian economy has decreased in recent years. This is reflected in the evolution of financial deepening, measured as the ratio of the performing loan portfolio with respect to the GDP (Shaw, 1973).

![Graph showing financial deepening over time](image)

Source: Computed using data from SBEF, BCB, FINRURAL and the National Institute of Statistics – Bolivia (INE).

Figure 4.2: Evolution of financial deepening (1980 - 2007).

Figure 4.2 shows that, at the end of the hyperinflation episode (crisis I), the ratio of the performing loan portfolio to the GDP reached its lowest level, at 2 percent, in December of 1985. Then, and despite two episodes of some decline (crises II and III), financial deepening steadily increased, until 1998. In fact, in December of 1998, the
ratio of the performing loan portfolio to the GDP reached 56 percent, the highest level observed so far. Some of these performing loans, at the peak of a likely overexpansion of the banks would fall in arrears in the following years.

Thus, following the latest recession (crisis IV), the credit to GDP ratio had declined to 27 percent by the end of 2004. Since then, the upward trend has been recovered, but very slowly, and by December of 2007 the ratio was only 31 percent. This level means that the relative size of the financial system today is still smaller than the size already achieved in 1992 (33 percent). This represents a setback of 15 years. As argued below, this contraction would have been even more dramatic if it had not been for the less cyclical evolution of microfinance, which has continued to rapidly grow in the midst of the crisis. Indeed, by December of 2007, the ratio of the performing loan portfolio of just the regulated microfinance organizations with respect to the GDP amounted to 7 percent, while by December of 1996 it had been just 0.9 percent.

To understand the recent retreating performance of the overall financial system, it is necessary to consider the sequence of shifts in political power, social turmoil, and macroeconomic shocks that the country has experienced. In turn, the puzzle addressed in this dissertation is the outstanding performance of microfinance, despite these adverse macroeconomic circumstances. The reasons for this differentiated performance have not been well understood. First, a historical review of this aggregate volatility is presented next.
4.1 Bolivia: a history of successive systemic shocks

This section describes some of the main events that have influenced the performance of the Bolivian financial system. While an exhaustive compilation of these political, social, and economic episodes would be a meaningful contribution in itself, here the enumeration is more restricted, designed to achieve a two-fold purpose. On the one hand, it offers a global perspective sufficient to describe the environment in which financial intermediaries have been operating in Bolivia. On the other hand, through trends and cycles, it shows that the most recent crisis, while severe, is not new. Nonetheless, this recent crisis has been different from those experienced in the past and meaningful lessons for prudential regulation emerge from this episode.

4.1.1 Political turmoil

Bolivia has endured severe political turbulence in its recent history, having installed seven Presidents since 2001. These frequent shifts in power are not, however, unusual for the country. In fact, since 1907 Bolivia has witnessed 53 presidential inaugurations, some of which emerged from 25 coup d’état, seven presidential resignations, and the death in office of three presidents (including one that was assassinated). Also, in the last 100 years, while 19 presidents were installed after winning an election, only eight of them were able to complete the entire period for their mandate. More dramatically, 25 presidents lasted less than a year and seven less than a month (Mesa Gisbert, 2003; De Mesa, Gisbert, and Mesa Gisbert, 2007).
Source: Top panel information calculated using data from SBEF, BCB, FINRURAL and De Mesa, Gisbert and Mesa Gisbert (2007). Bottom panel information constructed using data from CERES and UNIR.

Figure 4.3: Performance of the Bolivian financial system, presidential periods, and evolution of the number of social conflicts in Bolivia. December/1970 - December/2007.

The sequence of events that characterizes this political instability is shown in the top panel of Figure 4.3, where the vertical lines correspond to the months when a new president was installed. The solid lines represent those appointed by a constitutional
procedure (that is, via elections or following the line of succession after a resignation), while the dashed lines represent coups d’état. The shaded areas correspond to the periods explained in Figure 4.1. The bottom panel in the figure shows the number of social conflicts that occurred in each month, and they are explained in section 4.1.2.

The episodes of political distress are indeed correlated with the periods of stagnation and contraction in the financial system. Furthermore, the expansion of the financial system has coincided with periods of political stability. This result is not surprising, because the episodes of political stability were also characterized by economic prosperity and a comparatively low number of social conflicts.

The period of political stability experienced from 1986 to 1997 was crucial for the reconstruction of the financial system, which had almost completely vanished after the hyperinflation episode of the mid-1980s. It was also during this period that the microfinance institutional infrastructure was built from scratch. From the pioneer incursions in the mid-1980s as nongovernmental organizations specialized in finance, the system evolved toward the creation and transformation of the first regulated microfinance institutions, during the first half of the 1990s, and the achievement of considerable maturity towards the end of the decade (Table 4.1).

Finally, despite the recent political instability, in the last 25 years Bolivia has been capable of remaining a democracy. The successive shifts in power have been carried out by elected representatives, who have negotiated political arrangements in Congress, in observance of the procedures established in the Bolivian Constitution. In
this sense, since 1982 all Presidents have been appointed either by elections or by the presidential line of succession.

The most recent presidential inaugurations took place, however, in environments characterized by social convulsion and violent confrontations, which sometimes turned out awfully bloody for a society otherwise recognized as peaceful and non violent. The relative political tranquility was incubating, nevertheless, social conflicts that were gradually increasing and that exploded at the beginning of the current decade.

4.1.2 Social upheaval

While Bolivia has long been characterized as a country of political instability, with frequent coups d’état in the 1960s and 1970s, it rarely was noticed for high levels of political and social violence. This does not mean that the military dictatorships were not violent, but they did not reach the massive levels of human rights violations experienced in other countries in South America. This perception has recently changed, with the turbulence under democracy experienced after the turn of the current century, when the political and social struggles have resulted in a number of casualties, an outcome that had not been experienced since the National Revolution in 1952 (Gray Molina, 2006).
The shaded bars correspond to the duration of the presidential terms. The red shades represent presidents installed by a coup d’état while the blue bars refer to constitutional presidents:

(1) Alfredo Ovando  [Sep/69-Oct/70]  (12) Guido Vildoso  [Jul/82-Oct/82]
(10) Military Junta  [Aug/81-Sep/81]  (21) Eduardo Rodriguez  [Jun/05-Jan/06]
(11) Celso Torrello  [Sep/81-Jul/82]  (22) Evo Morales  [Jan/06-incumbent]

Source: Calculated using data from CERES and UNIR

Figure 4.4: Evolution of the number of conflicts in Bolivia and presidential terms (January/1970 – December/2007).
For the purposes of this dissertation, a social conflict is a collective action that aims at disrupting production, trade, transportation or the delivery of public services, including the proper functioning of institutions (Evia, Laserna, and Skaperdas, 2008). In this sense, social conflicts in Bolivia frequently translate into different types of mobilizations, such as: strikes, work stoppages, demonstrations, road blockades, hunger strikes, infrastructure take over, and even riots, among others. There have also been some incidents where authorities were kidnapped and retained until demands were settled.

The emergence of social conflicts and escalation of political instability have been closely interrelated. A review of the recent history of Bolivia confirms these connections (Mesa Gisbert, 2003; De Mesa, Gisbert, and Mesa Gisbert, 2007). To succinctly explore these relationships, Figure 4.4 shows the evolution of the number of conflicts for the different presidential terms.

On the one hand, under military regimes (red shaded in the graph), the number of conflicts was correlated with the degree of openness to political participation that each regime allowed. Consequently, in the early 1980s, the most repressive dictatorship experienced the least number of conflicts. On the other hand, under constitutional presidencies (blue shaded in the graph), the number of conflicts shows the weakening of institutions and governance. Not surprisingly, the presidents with the least political support in Congress were the ones who faced the highest number of conflicts. In any
case, a high frequency of conflicts is an indicator of a weak government, with a reduced capacity of implementing public policies (Evia, Laserna, and Skaperdas, 2008).

The mechanism used to deal with social and political conflict in Bolivia illustrates why social unrest never vanishes and only keeps resurfacing time and again. First comes the mobilization to support or reject “something” (policy, decree, resolution, and so on), whether it is proposed, approved, about to be enforced or so forth. Most of the time, the disruption is supposed to bring pressure on the authorities to respond to the demands of a particular constituency. Second, some level of government (whose importance depends on the power of the mobilization) juggles to reach an agreement under pressure, with as many social and political actors as needed. Third, an agreement is reached that involves certain resolutions, pledges, and processes (including, in the extreme, the resignation of presidents) and the mobilization ceases. Finally, most agreements signed by both the besieged government and an empowered social movement are not enforced or fulfilled and, at some point, the conflict emerges, again, starting a new cycle and creating a vicious circle (Gray Molina, 2006). Moreover, the willingness of the authorities to respond under pressure creates strong incentives for other groups to resort to similar tactics. The implicit moral hazard and opportunistic behavior exhibited in the political arena further weakens the institutional process of governance.

The persistence of social conflicts in Bolivia has adversely affected the financial system, at the very least sharply increasing the transaction costs of all participants in the
market. Frequently, the disruptions have reduced the economic opportunities of the clients and, as a consequence, their ability and willingness to repay. Clients and intermediaries have had to dodge road blockades, demonstrations and strikes to fulfill their contract obligations and other commitments. They also have to be quiet clever to keep their business operations running as normal as possible. For every player in the financial system, forecasting probable mobilizations is not an unusual practice. In recent times, some intermediaries have even developed quite elaborate contingency plans.

In fact, the need to take into account probable disruptions in their productive processes and the use of resources in preparedness forces financial intermediaries and their clients to produce inefficiently (inside their production frontier). This translates, for instance, into storing more inventories than needed, postponing investments (especially those that are only profitable in the long term) or avoiding them altogether, having to pay extra costs (like bribes, to go across road blockades), or simply producing for the smaller market that results from the fragmentation imposed by the social conflicts.

In addition, social conflicts levy another heavy cost on Bolivia, given its redistributive economy, where different segments of the population are permanently engaged in rent-seeking and other non-productive activities for the protection of the rents already enjoyed or the pursuit of new ones. These directly unproductive profit-seeking activities (DUP activities, following Bhagwati, 1983) substantially increase during periods of political instability and social turmoil, when major shifts in the size and distribution of rents occur. In fact, the political confrontation that characterizes Bolivia
these days has, precisely, resulted from the reaction to major shifts in the size of different rents, particularly the revenues from natural gas exports. As a result of the time and efforts spent in protecting the rents previously earned, productive activities suffer substantial losses and the economy produces below its potential.

For all of these reasons, the costs imposed by the social conflicts on the economy and, particularly, on the financial system are far greater than the correlation observed in Figure 4.4. In addition, while the number of mobilizations offers some sense about the frequency of the disturbances, this statistic is not weighed by the severity of the disruptions. There have been months with a relatively low number of conflicts but, when those have emerged, they have forced all financial intermediaries to stop their operations until the mobilization has been disbanded and the unrest has ceased.

4.1.3 Economic instability

Political instability and social distress have undeniably taken a heavy toll on the Bolivian economy along most of its history. The successive political struggles have frequently impeded an opportune identification by the authorities of the shocks suffered by the economy and have delayed the implementation of effective measures to mitigate their effects (Morales, 1988). Only after the social and political situation has settled, it has become possible to determine the suitability of the policies that have been implemented. Not surprisingly, again and again the policies adopted have been the result of an incomplete and poor diagnosis of the problems and of an inadequate
selection of policy tools, which have not matched the true nature of the problems (Gonzalez-Vega and Rodriguez-Meza, 2003). The resulting poor economic performance has fed new waves of social unrest and political struggle, creating a vicious circle. Thus, along its economic history, Bolivia has experienced an unusual dose of economic crises.

In particular, since 1950 Bolivia has suffered two major economic crises, characterized by very high levels of inflation, negative GDP growth rates, and significant contractions of the financial system. The first crisis occurred in a period of profound social transformations, labeled the National Revolution (1952). The second crisis occurred in the first part of the 1980s, after a long period of sustained growth, although still characterized by the accumulation of deep unsolved development problems.

For the most part of the following two decades, inflation had been constrained at one-digit levels. It was not until very recently that inflation has again become a discussion topic in Bolivia. In 2007, the 12-month rate of accumulated inflation was 11.7 percent, as a result of a sequence of poor economic decisions by a populist government, which has relaxed the tight fiscal discipline imposed by its predecessors, and of the worldwide increases in food prices. The most credible estimates forecast that the rate of inflation will reach levels above 17 percent in 2008.
Figure 4.5: Performance of the Bolivian financial system December/1970 - December/2007, closing of financial intermediaries, and evolution of the 12-month accumulated inflation in Bolivia.

In turn, since 1970 the financial system has experienced four crises, which are labeled with Roman numerals I through IV in Figure 4.5. The vertical lines in the top panel correspond to the months when a financial institution was closed by the authorities, was absorbed by another institution, or left the market voluntarily. The dashed red lines correspond to banks, the dashed black lines to credit unions, the dashed blue lines to

Source: Top panel calculated using data from SBEF, BCB, FINRURAL and De Mesa, Gisbert and Mesa Gisbert (2007). Bottom panel constructed using data from CERES and UNIR.
mutuales (savings and loan associations), and the dotted gray line to private financial funds (PFFs). Table 4.1 and Table 4.2 detail each of these closings. The periods corresponding to the shaded areas in the background were explained in Figure 4.1.

As the figure shows, in real terms, the financial system reached its first peak in March of 1982, when it mobilized deposits for 635 million US dollars and allocated 725 million in performing loans. At this point, the total loan portfolio was 1,059 million, but the deteriorating conditions of the economy were evident in the default rate, which reached 31.5 percent. In November of 1982, the government decreed the “de-dollarization” of the economy, a measure that converted all the obligations held in dollars by Bolivian residents into contracts in local currency (Pesos Bolivianos). Given the high inflation rates, this decree greatly favored debtors and severely penalized creditors. In the financial system, the policy produced a decline in bank deposits, which fell non-stop until the liberalization of the market in 1985. In addition, the measures increased country risk and contributed to the curtailment of foreign lending (Morales and Escobar, 1985).
### Table 4.1: Banks that exited the Bolivian financial market (1970-2007).

<table>
<thead>
<tr>
<th>STATE OWNED (n)</th>
<th>MIXED PROPERTY</th>
<th>PRIVATE</th>
<th>FOREIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>n BANCO</td>
<td>n BANCO</td>
<td>n BANCO</td>
<td>n BANCO</td>
</tr>
<tr>
<td><strong>1</strong> AGRICOLA DE BOUMA</td>
<td>1 DE LA VIVENDA</td>
<td>1 DE CREDITO ORURO</td>
<td>7 BIG BEN [BR]</td>
</tr>
<tr>
<td><strong>2</strong> MINERO DE BOUMA</td>
<td>2 DEL PROGRESO</td>
<td>2 POTOSI</td>
<td>8 DE INVERSIONES BOUMA [BR]</td>
</tr>
<tr>
<td><strong>3</strong> DEL ESTADO</td>
<td>3 LATINAMERICANO DE DESARROLLO</td>
<td>9 SUR</td>
<td>15 LA Paz</td>
</tr>
<tr>
<td><strong>4</strong> GERENCIA DE DESARROLLO [CB]</td>
<td>4 IUMAN</td>
<td>10 DE COCHABAMBA</td>
<td>16 BOLIVIANO AMERICANO [E]</td>
</tr>
<tr>
<td><strong>5</strong> NACIONAL FINANCIERA BOUMA [NATIF]</td>
<td>5 HOPITESCAR NACIONAL</td>
<td>11 INTERBANCO IN</td>
<td>17 SANTA CRUZ [RSC]</td>
</tr>
<tr>
<td><strong>6</strong> DE FINANCIAMIENTO INDUSTRIAL</td>
<td>6 DE FINANCIAMIENTO [DATE]</td>
<td>12 INDUSTRIAL</td>
<td>18 MERCANTIL [DATE]</td>
</tr>
</tbody>
</table>

Cells show the name of the bank, date when the bank ceased to operate in the market, and the modality of the exit.

(a) Including the second-tier banks: Gerencia de Desarrollo del Banco Central de Bolivia and Nacional Financiera Boliviana.
(b) In 1995 Banco Boliviano Americano was acquired by Interbanco, but strategically the latter was absorbed by the former.
(c) Improvements in regulation allowed the authorities to Intervene Banco Boliviano Americano and, in May of 1999, the partial transfer of its assets and liabilities to the winner of a bidding contest, Banco de Crédito de Bolivia.
(d) In 1998, Banco Santa Cruz (by then the biggest bank in Bolivia, in terms of the volume of loans and deposits) was acquired by the Spanish financial holding, called as of that date, Banco Central Hispano. In November of 2006, Banco Santa Cruz (then the 5th-biggest bank in Bolivia) was acquired by the Bolivian Banco Mercantil (3rd-biggest bank). From the merge a new bank named Banco Mercantil Santa Cruz, which became the biggest bank in the system.
(e) Banco Popular del Perú was closed by the Peruvian authorities in 1991. During the liquidation process, their Bolivian branch was sold to the Peruvian financial holding Grupo Credicorp, which in turn created Banco de Crédito de Bolivia in July of 1994.
(f) This Brazilian bank was acquired by ABN Amro Bank in July of 1998. Later, the bank initiated the formalities for its transformation in Bolivia.

Source: Constructed using data from SBEF and BCB.
### Table 4.2: Non-banking institutions that exited the Bolivian financial market (1980–2007)

<table>
<thead>
<tr>
<th>Credit Unions (a)</th>
<th>Mutuales (b)</th>
<th>Private Financial Funds (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>COOPERATIVA</td>
<td>n</td>
</tr>
<tr>
<td>1</td>
<td>SAN JOSE</td>
<td>6</td>
</tr>
<tr>
<td>(Closed)</td>
<td></td>
<td>(Transformed into non-depository credit union)</td>
</tr>
<tr>
<td>2</td>
<td>SAN LUIS</td>
<td>7</td>
</tr>
<tr>
<td>(Transformed into non-depository credit union)</td>
<td></td>
<td>(Transformed into non-depository credit union)</td>
</tr>
<tr>
<td>3</td>
<td>HOSPIGO</td>
<td>8</td>
</tr>
<tr>
<td>(Transformed into non-depository credit union)</td>
<td></td>
<td>(Closed)</td>
</tr>
<tr>
<td>4</td>
<td>EL CHURQUI</td>
<td>4</td>
</tr>
<tr>
<td>(09/2000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Transformed into non-depository credit union)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>JISUNU</td>
<td>5</td>
</tr>
<tr>
<td>(07/2001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Transformed into non-depository credit union)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cells show the name of the intermediary, date when it ceased to operate in the market, and the modality of the exit.

(a) This list includes only credit unions that exited the SBEF’s regulatory control. As a reference, in 2007, 436 credit unions were registered at the General Directorate of Cooperatives (DGOOCP); 23 of them were supervised by SBEF [Cooperativas Abiertas] and it is estimated that 106 were controlled by DGOOCP [Cooperativas Cerradas] (SBEF, 2007, p.83). Consequently, there were approximately 307 credit unions that went bankrupt or at that point were inactive, as of that date.

(b) Regulation issued in 2001 allows the authorities to intervene troubled mutuals and initiate a dissolution process, which includes transferring some liabilities (mainly deposits) and creating a trust fund to manage some assets (mostly the performing loan portfolio). The recipient of these assets and liabilities is the winner of a bidding contest among intermediaries.

(c) When Financiera Acceso was created, the charter of PPF did not exist in the financial regulation. Consequently, Acceso was created as a different type of financial institution (Cajas Departamentales) which were not allowed to operate nationally. Only three were created. Later when the norms to create PPFs were implemented, all three merged into a single PPF.

Source: Constructed using data from SBEF.
The crash of the financial system during the hyperinflation period (crisis I) was the result of the typical macroeconomic mismanagement. In fact, unsustainable increases in salaries, excessive fiscal spending, and the erosion of the tax base resulted in recurrent fiscal deficits, the total loss of access to external credit, distorted exchange rates, controlled interest rate which, additionally, were negative in real terms, high levels of legal reserve requirements, and compulsory credit allocations (Trigo Loubiere, 2003).

By September of 1985, the hyperinflation soared to 23.5 thousand percent and the financial system completely collapsed, reaching barely 60 million dollars in total intermediated assets. This implies that the one-billion-dollar contraction that occurred in the three-and-a-half years that the hyperinflation crisis lasted had resulted in the crunch of the financial system to a size less than one percent of the peak reached in March of 1982.

The hyperinflation was so devastating that all the policy measures implemented to stop it were rapidly accepted by the population. These actions produced a severe structural adjustment in the economy. Strict fiscal and monetary policies were adopted, the exchange rate was unified, and a series of reforms were implemented to liberalize the financial system (Morales, 1990).

The new financial policies allowed the emergence of the microfinance industry. Among them were: the liberalization of interest rates, the elimination of directed credit controls, a reduction of legal reserve requirements, the authorization to mobilize
deposits in foreign currency, and the strengthening of the regulation and supervision framework, both in its technical capacity and with increased autonomy from political pressure (Trigo Loubiere, Devaney, and Rhyne, 2004). In particular, without the liberalization of interest rates and elimination of directed credit controls, regulated microfinance would not have emerged and expanded the way it did in Bolivia.

The stabilization program tamed the hyperinflation in a few days and it later allowed the country to experience one-digit inflation rates for almost two decades. The success of these policies reinforced political stability, and successive governments were able to further liberalize the economy. Stable prices and rapid economic growth provided a fertile soil for the success of microfinance while, at the same time, the fiscal and privatization reforms fueled the growing informal sector, the natural market segment for microfinance.

The costly period of hyperinflation carried an important lesson for the monetary and financial authorities; namely, that it is in the best interest of the State to protect the financial system, in order to maintain its monetary and intermediation functions. Aware of this commitment, opportunistic bankers later on gambled against the State, during the 1990s.

When the hyperinflation ceased, the liberalization of the financial market allowed a rapid recuperation of the performing loan portfolio which, by February of 1987, surpassed the peak already reached in March of 1982. The recovery of the deposits mobilized from the public was slower, however, and their value did not exceed
the previous high until December of 1989. As depositors had lost any money illusion, they had become more cautious and had hesitated before returning to the market. In fact, by December of 1985, the banks’ equity was larger than the deposits of the public, showing how much the people had learned to distrust the system.

The fast recuperation of the loan portfolio can be mostly explained by the recovery of the economy as a whole. Since the financial system had been practically dismantled at the end of the hyperinflation period, the portfolio growth rates initially observed during the recovery were extremely high. In fact, the performing loan portfolio which, in real terms, was only 12 million dollars by September of 1985, grew to 532 million dollars a year later. This represented an increment of 4.3 thousand percent during the first year after the financial market was liberalized. In turn, by September of 1985, the deposits of the public were less than 16 million dollars and they increased during the first year to 174 million dollars; this is an increase of 1.7 thousand percent.

The new framework of regulation and supervision, which imposed prudential norms and ended lax accounting practices, eventually resulted in the closing of eleven banks: five weak private banks, four state-owned banks, and two mixed-property banks (see Crisis II in Figure 4.5; the banks that were closed are detailed in Table 4.1).

The bankruptcy of these intermediaries resulted from poor risk administration, financial mismanagement, negligence and corruption (Trigo Loubiere, 2003). Besides these bankruptcies, two international banks left the country during 1985. In the end, the number of banking institutions decreased from 30 that existed in 1982 to 15 by
December of 1991. In addition, two new private banks were created in early 1991, for a total of 18 by February of 1992, when BancoSol, the first regulated microfinance institution, got its banking license.

Figure 4.6 shows how the assets to equity ratio followed the performance shifts in the banking system, with three spikes (November/1974, September/1982, and August/1994), which coincided with the peak of lending (mostly opportunistic) expansions and then preceded contractions in the performing loan portfolio. The spike
in November of 1983 resulted, in contrast, from a more rapid contraction of equity than the reduction in total assets, during the hyperinflation. However, since the lending expansion of the mid-1990s (episode 8 in the graph), leverage has declined to levels below 10:1, more in agreement with international standards.

The high levels of leverage and their frequent shifts were the result of lenient regulation and of opportunistic banker behavior. In fact, prior to 1987, banks were allowed to leverage their equity up to 30 times in total assets. Some banks took advantage of this very permissive limit, particularly in the early 1980s, when there was a very rapid increase in bank assets. In fact, as shown in Figure 4.6, the leverage for the whole financial system reached levels as high as 23 times their equity. This peak was in part due to speculative transactions in the currency market during the hyperinflation crisis, given the enormous gap between the official exchange rate and the exchange rate in the black market. For instance, during 1982, individuals with political clout were able to buy dollars in the official market and sell them in the black market, with an average bonus of 160 percent of the purchasing value. In some months, the bonus was as high as 440 percent (November of 1982).

Such regulatory tolerance to high equity leveraging permitted the banks to opportunistically expand during the lending booms. Thus, one key improvement in prudential regulation was the ruling that the operating capital (equity) of financial intermediaries had to be determined as a function of their assets \emph{weighted by risk}. In addition, over time and following international best practices, the capital adequacy ratio
was reduced from 30 times in 1985, to 15 in 1987, then 12.5 in 1993, and finally to 8 times in 1995 (Trigo Loubiere, 2003). This rule was set at the same level for all types of financial intermediaries (pooling regulation).

The rapid growth the loan portfolio registered in the early 1990s was, at least in part, the result of an increased banker’s propensity to engage in opportunistic behavior (moral hazard). Bankers developed “too-big-to fail” expectations and encouraged this view among the authorities and the public, in the exercise of their political clout. Deficiencies in the regulatory framework, which eventually were detected and repaired over the following years, permitted bankers to behave opportunistically and allowed them great risk taking. Bank owners and managers, usually the same people, knew that if their risky actions failed, they were going to be bailed out, a forecast of what indeed occurred several times over the following years. Their “too-big-to-fail” expectations were indeed confirmed, as they were rescued by the government when things went wrong.

In November of 1994, a third banking crisis occurred in Bolivia, when three banks were intervened by the authorities and then liquidated (crisis III in Figure 4.5). These liquidations created a wave of panic in the system and a 75 million dollars run on deposits in one week, creating serious liquidity problems within the system. The international crises (e.g., Mexico’s tequila crisis) compounded the problem. Depositor confidence declined in five banks that already had some liquidity problems and that accounted for about one-half of the deposits in the system.
In addition, around the same time, the authorities discovered that some unscrupulous bankers, disdaining the prudential regulations, had mobilized deposits to offshore financial entities, based in the Cayman Islands, and had used these funds to clean up their balance sheets in Bolivia. This revelation further added to the distrust about the banking system. Since a systemic insolvency would have destroyed the hard-won economic stability of the country, the Bolivian Central Bank acting as a lender of last resort came to the rescue of the weak banks, initially with liquidity support and later on with lines of credit. Eventually, it uncover that the problem was just not illiquidity but rather systemic insolvency (Trigo Loubiere, 2003).

The crisis of 1994 was caused by a high concentration in the bank’s ownership and by loans to related parties, granted without sufficient collateral. To make things worse, inside crony lending was tied to an excessive expansion of loan portfolios and to inadequate reserves. In fact, as Figure 4.7 shows, from 1988 to 1994, the lending boom did not correspond to the growth of the economy.
Between December of 1987 and September of 1994, the performing loan portfolio grew at an average rate of 27.1 percent per year, while the GDP only grew at 3.2 percent. As international experience has shown, sudden increases in deposits, like those experienced in Bolivia once the hyperinflation was over, tend to trigger lending booms. If their lending technologies are inadequate, the banks allocate the sudden excess liquidity to doubtful loans, because -under the new circumstances- they cannot easily separate good borrowers from bad borrowers. That is, in the absence of information about the new dimensions of creditworthiness, they are at the start of a new learning curve. Moreover, repayment performance may simply come from the
funds from another loan that the borrowers may have received elsewhere, rather than signal genuine ability to repay.

Furthermore, borrowers that in the past may have demonstrated willingness and ability to repay may end up being overindebted, as both borrowers and lenders would have to learn about their “true” repayment capacity under the new circumstances. When the boom ends, moreover, the non-performing loans make the banks highly vulnerable even to small macroeconomic shocks, and a credit crunch inevitably follows (Gavin and Hausmann, 1996; Hausmann and Rojas-Suarez, 1996; Gonzalez-Vega, 2001).

Despite major improvements in banking regulation and supervision, after the hyperinflation episode the rules were still lax regarding the issuing of new bank licenses. This allowed equity investors of questionable character to enter the financial system (Trigo Loubiere, 2003).

Under this regulatory environment, the over-expansion in loans (Expansion III) allowed bankers to engage in opportunistic and morally hazardous behavior (McKinnon, 1989; Chaves and Gonzalez-Vega, 1994). In fact, the growth in loan portfolios was not followed by increases in equity according to the credit expansion. In this period, bankers fully exploited their political clout and prevented the financial authorities from demanding increases of the banks’ inadequate levels of capitalization and reductions of their high levels of leverage (Trigo Loubiere, 2003).
Following a “too-big-to-fail” logic, the expectation was that the Central Bank would not allow large banks to fail (Dewatripont and Tirole, 1999). Thus, with a major dose of good luck, the bankers were able to actually capture supra-normal profits during this period. Managerial competence was poor and the bankers’ lack of experience in the newly liberalized market was evident, while governance problems persisted (Gonzalez-Vega and Rodriguez-Meza, 2003).

In addition, lack of transparence in their financial information allowed bankers to behave opportunistically. They repeatedly employed crony lending practices and used the resources so obtained to expand other enterprises owned by the bank’s shareholders. Also, some bankers designed mechanisms to circumvent regulatory prohibitions that forbid banks from allocating loans for the purchase of the equity shares of the bank itself. In effect, these bankers managed to mobilize deposits from the public off-balance sheet, and then they used these funds to, in turn, make deposits in foreign banks. Next, the bankers offered these deposits as collateral, in order to get loans from the banks abroad. This procedure allowed bank owners to employ these loans as if they were fresh resources, in order to capitalize their own banks (Trigo Loubiere, 2003).

After these events, prudential regulation was reinforced in Bolivia. Related loans were prohibited, the capital adequacy ratio was reduced to eight times, and the loan portfolio risk grading (mandatory levels of loan-loss provisions) was aligned to international best practices. Figure 4.6 shows that, since the peak reached in August of
1994 (14.5 to 1), the assets-to-equity ratio declined steadily for over a decade. For the past couple of years, this index has remained stable at an average of 8.8 to 1. The leverage index calculated here shows levels above the legal limits of 8 to 1, because it is just a proxy of the capital adequacy ratio. For the calculation of the leverage index, the intermediaries’ assets were not weighted by their risk levels, as this was not possible because of the lack of information for periods prior to 1995.

Besides the reduction of the capital adequacy ratio to more prudent levels, the Superintendence of Banks and Financial Entities (SBEF) was empowered with authority, allowing it to conduct assessments about the suitability and solvency of managers and shareholders and to dictate changes in ownership and management in financial entities with inadequate equity structures.

These regulatory changes allowed the strengthening of the financial system by the second half of the 1990s. However, a new lending boom took place between 1996 and 1999 and, again, the loan portfolio grew at rates substantially higher than those for the economy (Figure 4.7). As argued below, by this time microfinance institutions and other new types of intermediaries were operating. MFIs showed a performance that differed from that of the banks, in terms of loan portfolio expansion, lower credit risk exposure, a reduction in loan interest rates, greater mobilization of deposits, and higher profitability, among others (Gonzalez-Vega and Villafani-Ibarnegaray, 2007). Given the fact that the banks concentrate the lion’s share of the financial system, this section focuses on the performance of banks.
When an economic recession started in the first quarter of 1999, the financial system was caught by surprise and a major credit crunch followed (Figure 4.5). The loan portfolio, which had been growing at an average of 17 percent per year during the lending boom, suddenly declined at an average of 24 percent, during 2004, with respect to the previous year. This severe crunch was followed by a reduction in the deposits mobilized from the public, at a rate of 9 percent per year.

In addition, the non-performing loan portfolio steadily increased during the same period, reaching over 21 percent of the total loan portfolio by 2001. The increase in default may have two explanations. On the one hand, the sequence of social conflicts, political turmoil, and economic recession may have suddenly and unexpectedly lowered the repayment capacity (both willingness and ability) of the borrowers, increasing the delinquency rate in the financial system (Gonzalez, 2008).

On the other hand, the adverse economic environment may have exposed the weakness of the lending technologies of some intermediaries, particularly the banks. In addition, the implementation of a more strict risk-grading regulation may have made the rescheduling of loans more difficult and exposed even more the deteriorated quality of the loan portfolios (Gonzalez-Vega and Rodriguez-Meza, 2002).

During the fourth crisis, macroeconomics, social conflicts, and politics have been the sources of (a) systemic risk, (b) moral hazard risk, and (c) regulatory risk. The moral hazard risk has reflected the expectations, corroborated in practice, that some intermediaries and their clients may have had that they would be rescued by the
authorities in case of difficulties (McKinnon, 1989). In addition, moral hazard risk has been tied to rent-seeking efforts that have undermined the efficiency with which the financial system allocates resources. In turn, regulatory risk has been manifested in the randomness and questionable sustainability of some of the interventions of the political authorities, carried out for the convenience of short-term electoral considerations (Gonzalez-Vega and Villafani-Ibarneagaray, 2007).

In turn, the crisis of the financial system was triggered by exogenous circumstances, linked to both macroeconomic problems and to the institutional weaknesses of the political system. Endogenous frailties in the financial system, which were reflected in the declining quality of the intermediaries’ loan portfolio (i.e. increasing delinquency rates), also contributed to the crisis.

In the financial system, the crisis coincided once again with a cycle of fast expansion, first, followed by an accentuated deceleration of the growth rates of major financial magnitudes and, finally, by a severe contraction. Besides the macroeconomic shocks, the sector also suffered the consequences of changes in the regulatory environment governing the activities of the clients. These changes included the enactment of customs reforms, the attempts to eradicate the production of coca leaves and, more recently, a tax on financial transactions. These regulatory changes weakened the repayment capacity of the clients of MFIs, in particular, a reason why the stability results reported below are even more amazing.
4.2 Microfinance: Differential performance

While the political, economic and social environment have produced systemic shocks that afflicted the financial system, the effect of these adverse shocks on the different types of intermediaries has not been homogeneous. The differential performance of various types of intermediaries has been reflected by key financial indicators. Indeed, there have been remarkable differences in loan portfolio performance in terms of growth, delinquency, and outreach. Also, deposit mobilization has shown differential patterns, particularly in terms of the volatility of deposits after political and social turmoil and the ability of various types of intermediaries to mitigate runs on deposits (Gomez-Soto and Gonzalez-Vega, 2007). As a result, profitability levels have also shown different trends among institutions.

These differences have reflected, on the one hand, different degrees of idiosyncratic vulnerability, in view of the incidence and non-uniform impact of the events on diverse intermediaries, depending on the sectors of economic activity that they finance, the population segments that they serve, and the regions where they operate (Gonzalez-Vega and Rodriguez-Meza, 2003). On the other hand, the differences have also reflected non-uniform institutional strengths, resulting from differences in the property and governance structures of the different organizations, their managerial styles, and the density of their administrative hierarchies.

These contrasts have reverberated on the institutional capacity for prognosis, forecast, and reaction. These differences have also reflected the different versatility and
robustness of the lending technologies (Gonzalez, 2008). In addition, some differences have originated in the asymmetric support offered by the State, which has not properly recognized institutional idiosyncrasies nor has it respected the comparative advantages of the different organizations that operate in the market (Gonzalez-Vega and Villafani-Ibarneñaray, 2007).

These asymmetries have also been evident, at least in part, in the financial regulation framework. The dilemma between the protection of the monetary function and the promotion of the intermediary function has led to a system that, while comparatively developed and exemplary in many regards, still restrains the growth of some prudent intermediaries. Thus Bolivia, may not be achieving the optimum level and composition of financial deepening, given its strong preference for financial stability.

This differential performance is explored next. The analysis starts with a brief description of the types of financial intermediaries found in Bolivia. When the loan portfolio, deposit mobilization, and profits are considered, microfinance institutions have shown the healthiest indicators. Given this performance, there is sufficient evidence to reexamine some of the myths and paradigms regarding the soundness of microfinance and its ability to sort turbulent times. At the end of the section, prevalent incorrect perceptions are contrasted with new hypotheses regarding the performance of microfinance institutions.
4.2.1 The Bolivian financial system

To describe the role that microfinance is playing in the market requires an overview of the Bolivian financial system. This implies the setting of some boundaries that make the concept meaningful and tractable. The risk spectrum that financial intermediaries face is multidimensional. These dimensions influence the financial markets where banking services (in a generic sense), securities, pensions and insurance are produced. In each of these markets formal and informal intermediaries, operate, some of which are of particular relevance for microfinance clients. The participants in this multidimensional environment are heterogeneously exposed to a risk spectrum with idiosyncratic and systemic roots. This dissertation is particularly concerned with the credit activities of financial intermediaries.

Five types of financial institutions operate in the Bolivian financial system: banks, savings and loans associations (mutuales de ahorro y préstamo), credit unions, private financial funds (PFFs), and development financial institutions (DFIs).

DFIs are nongovernmental organizations (NGOs) specialized in the provision of financial services, which are affiliated to the Association of Financial Institutions for Rural Development (FINRURAL). They are not authorized to mobilize deposits from the public and, as a result, their financial activity has so far not been subject to the regulation and supervision of the SBEF and the Central Bank of Bolivia (BCB). However, the DFIs role in microfinance has been important, and the financial authorities are about to include DFIs under the scope of their regulation.
Frequently, the terms DFI and NGO are used to designate these organizations. However, the former is the name preferred by these institutions in Bolivia, to differentiate themselves from the large number of NGOs whose beneficiaries overlap the microfinance clientele. According to official statistics, 667 NGOs operated in Bolivia in 2006, while FINRURAL had 13 affiliated DFIs at the end of 2007 (Registro Único Nacional de ONG, 2007; p.358). According to these records, 511 NGOs have developed activities closely related to microfinance (e.g., credit, small and micro enterprise development, agriculture, housing, and infrastructure and basic needs). Despite the large number of organizations, the size of these NGOs is very small. Indeed, 74 percent of the 667 NGOs had less than 10 employees, and 90 percent had less than 20 employees (Registro Único Nacional de ONG, 2007; p.366).

Microfinance Institutions (MFIs) are a set of regulated financial entities that differ from the rest of financial intermediaries because of lending technologies that contain the elements that define the very nature of microfinance. This set of MFIs clusters the PFFs with a microfinance vocation, namely FFP para el Fomento a las Iniciativas Económicas S.A. (FIE), FFP EcoFuturo S.A. (EcoFuturo), and FFP para la Promoción y Desarrollo de la Microempresa S.A. (PRODEM). This cluster also includes the pair of banks specialized in microfinance, Banco Solidario S.A. (BancoSol) and Banco Los Andes Procredit S.A. (Los Andes). As a consequence, from here onwards, the set of banks will not include these two microfinance banks.
The institutional evolution of the Bolivian MFIs has been documented extensively, particularly in the case of BancoSol, Los Andes, and PRODEM (Agafonoff, 1994; Glosser, 1994; Christen, Rhyne, Vogel et al., 1995; Mosley, 1996; Schmidt and Zeitinger, 1996; Gonzalez-Vega, Schreiner, Meyer et al., 1997; Navajas, 1999; Rhyne, 2001; Robinson, 2001; Navajas, Conning, and Gonzalez-Vega, 2003; Arriola, 2004). FIE and EcoFuturo are cited less frequently, but their performance has been equally rich in lessons (Puente, 2001; Ramirez, 2002; Villafani-Ibarnegaray, 2003). The history of DFIs has also been narrated in numerous occasions, especially the success of Pro Mujer and CRECER in village banking (Cohen, 2002; Gonzalez-Vega and Maldonado, 2003; Maldonado, 2003; Maldonado and Gonzalez-Vega, 2003; Velasco and Marconi, 2004).

A timeline of their incorporation is provided in Table 4.3 for the case of MFIs and in Table 4.4 for DFIs. The coexistence of these two separate groups of institutions serving the microfinance market in Bolivia has permitted an expansion of financial deepening that might not have been possible if either one of them would not have been allowed to operate. Despite major regulatory achievements in Bolivia, the potential and capability of both MFIs and DFIs might have allowed an even greater growth of the microfinance industry. Under-expansion may have been the result, however, of the combination of some artificial regulatory restrictions and the lack of a financial supervision technology capable of eliminating the regulatory asymmetries that now characterize the microfinance industry.
<table>
<thead>
<tr>
<th>Full name</th>
<th>Short name</th>
<th>Acronym</th>
<th>Type of Institution</th>
<th>Date</th>
<th>Starting operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundación para la Promoción y el Desarrollo de la Microempresa</td>
<td>PRODEM NGO</td>
<td>NGO</td>
<td>1985</td>
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<tr>
<td>Banco Los Andes ProCredit S.A.</td>
<td>Los Andes</td>
<td>BLA</td>
<td>Bank</td>
<td>Jan/1/2005</td>
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<tr>
<td>Asociación Pro-Crédito</td>
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<td>NGO</td>
<td>Jun/1991</td>
<td>Dic/1992</td>
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</tr>
<tr>
<td>Centro de Fomento a Iniciativas Económicas</td>
<td>FIE</td>
<td>NGO</td>
<td>Nov/13/1993</td>
<td></td>
<td></td>
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<tr>
<td>Centro de Investigación y Desarrollo Regional</td>
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<td>OCI</td>
<td>NGO</td>
<td>Dec/15/1981</td>
<td>Jan/1/1991</td>
</tr>
<tr>
<td>Fundación para la Promoción y el Desarrollo de la Microempresa</td>
<td>PRODEM NGO</td>
<td>NGO</td>
<td>1985</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.3: Bolivian microfinance institutions: Institutional evolution and dates of incorporation
<table>
<thead>
<tr>
<th>No.</th>
<th>Full name</th>
<th>Short name</th>
<th>Acronym</th>
<th>Date Incorporation</th>
<th>Starting operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asociación Nacional Ecuménica de Desarrollo</td>
<td>ANED</td>
<td>OAN</td>
<td>Jun/13/1978</td>
<td>Jun/17/1978</td>
</tr>
<tr>
<td>4</td>
<td>Fondo de Desarrollo Comunal</td>
<td>FONDECO</td>
<td>OFO</td>
<td>Jan/16/1995</td>
<td>Oct/12/1995</td>
</tr>
<tr>
<td>6</td>
<td>Centro de Investigación y Desarrollo Regional</td>
<td>CIDRE</td>
<td>OCI</td>
<td>Dec/15/1981</td>
<td>Jan/1/1991</td>
</tr>
<tr>
<td>7</td>
<td>Crédito con Educación Rural</td>
<td>CRECER</td>
<td>OCR</td>
<td>Oct/10/1999</td>
<td>Jul/1/2001</td>
</tr>
<tr>
<td>8</td>
<td>Diacronía Fondo Rotatorio De Inversión Y Fomento</td>
<td>FRIF DIACONIA</td>
<td>ODF</td>
<td>May/17/1991</td>
<td>May/17/1991</td>
</tr>
<tr>
<td>9</td>
<td>Fundación Boliviana para el Desarrollo de la Mujer</td>
<td>FUNBODEM</td>
<td>OFU</td>
<td>Jul/15/1987</td>
<td>May/21/1994</td>
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<tr>
<td>10</td>
<td>Fundación Boliviana para el Desarrollo</td>
<td>FUBODE</td>
<td>OFD</td>
<td>Apr/24/1997</td>
<td>Jan/1/2001</td>
</tr>
<tr>
<td>11</td>
<td>Fondo de Crédito Solidario</td>
<td>FONCRESOL</td>
<td>OFC</td>
<td>Jan/1/1987</td>
<td>Jan/1/1987</td>
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<tr>
<td>12</td>
<td>Incubadora de Microempresas Productivas</td>
<td>IMPRO</td>
<td>OIM</td>
<td>Feb/25/1995</td>
<td>May/11/1995</td>
</tr>
<tr>
<td></td>
<td>Fomento, Cooperacion, Desarrollo y Salud</td>
<td>FOCADES</td>
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</tbody>
</table>

Table 4.4: Bolivian development financial institutions: Dates of incorporation
There has been a debate for the last 20 years about whether financial NGOs should be regulated or not. There seems to be a consensus in the literature that the prudential limits, controls and standards imposed by regulation limit the space for innovation, particularly in the early stages of institutional development. The agreement blurs when the discussion moves to consider developed microfinance systems, where the prohibition to mobilize deposits from the public by mature and otherwise formal non-regulated organizations results in an under-expansion of these institutions. This reflects the dilemma of the authorities in trying to preserve the system’s monetary function, while expanding its intermediation function.

The regulation framework was designed by the authorities as an institutional road map similar to the one followed by Los Andes (Table 4.4). That is, NGOs would graduate to PFFs and eventually would graduate into banks. This implies an institutional hierarchy, where NGOs are at the bottom and banks at the top. As a result, a very restrictive set of financial activities are authorized at the bottom of the hierarchy. Apparently, recent changes in regulation, expected to be introduced in mid-2008, will allow DFIs to mobilize deposits from the public, while preserving non-financial activities in the portfolio of services offered to their clients.
4.2.1.1 Market shares and competition

Table 4.5 shows that, by December of 2007, ten banks split the largest market share both in the volume of loans (63 percent) and deposits (72 percent). In a distant second place, five MFIs held 19 percent of the loans and 13 percent of the deposits. This is, however, a significant market share for regulated microfinance, which has been growing rapidly in recent times in Bolivia and this share is higher than in most other countries. Credit unions were the most numerous (23 institutions), but they only held seven percent of loans and six percent of deposits, while *mutuales* held eight percent of the deposits and only six percent of the loans. Complying with regulatory restrictions, DFIs have only a participation in the market for loans, with 3 percent of the total. Finally, other PFFs, which became notorious during the consumption lending boom of the late 1990s, now are the smallest group and have a marginal participation, with less than two percent in loans and deposits. In recent years, this group of institutions has dropped its consumption credit technology and has reoriented its focus toward small and medium businesses.

Although banks concentrate the lion’s share of the financial market, the Bolivian financial system is highly competitive, as shown by the Herfindahl-Hirschman Index—a standardized measure of market concentration. The modified version of the index is considered here. That is, the index is normalized to range from 0 (perfect competition) to 1 (monopoly), while levels that are below 0.5 are associated with highly competitive markets. Table 4.5 shows that, by December of 2007, the Modified Herfindahl-
Hirschman Index (MHHI) was 0.28 for the market for loans, with 63 institutions competing in it. At the same time, there were 50 intermediaries mobilizing deposits and the MHHI was 0.34 for this side of the market.

<table>
<thead>
<tr>
<th>Type of Institution</th>
<th>Total Loan Portfolio</th>
<th>Performing Loan Portfolio</th>
<th>Deposits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Market Share (%)</td>
<td>MHHI Index</td>
</tr>
<tr>
<td>Banks</td>
<td>10</td>
<td>62.6</td>
<td>0.45</td>
</tr>
<tr>
<td>MFIs</td>
<td>5</td>
<td>19.3</td>
<td>0.54</td>
</tr>
<tr>
<td>Credit Unions</td>
<td>23</td>
<td>6.5</td>
<td>0.36</td>
</tr>
<tr>
<td>Mutuales</td>
<td>9</td>
<td>6.4</td>
<td>0.54</td>
</tr>
<tr>
<td>DFIs</td>
<td>13</td>
<td>3.2</td>
<td>0.39</td>
</tr>
<tr>
<td>Other PFFs</td>
<td>3</td>
<td>1.9</td>
<td>0.64</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>100.0</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Source: Calculated using data from SBEF, BCB and FINRURAL
MMH Index: Modified Herfindahl-Hirschman Index

Table 4.5: Bolivian financial system (December/2007)

4.2.1.2 Evolution of market shares

Traditionally, the financial market was a monolithic system dominated by the banks’ performance. The country’s level of outreach and financial deepening were defined by the banking system, from its origins in the late XIX century through almost all the XX century. This was the case even though, since the early 1960s, mutuales and credit unions have operated in Bolivia and have increased rapidly in number and size.

In fact, 13 mutuales have operated in the market since the first mutual opened in 1964. They made of housing finance their market niche and their savings accounts
became very popular among households eager to buy a home, particularly from the middle class. However, mismanagement and market regulations prevented them from diversifying their loan portfolios and they became highly exposed to local shocks and fluctuations in the real estate market. These problems, topped by increasing competition coming from other types of intermediaries, resulted in the closing of five mutuales (see Table 4.2). The most recent occurred in January of 2008, with the closing of a mutual based in Santa Cruz.

Credit unions grew quickly in number since the early 1960s. Their growth was mostly the result of a very active cooperative movement that sparked in the Catholic Church after the publication of the encyclical *Mater et Magistra* (1961), expanding a rich tradition in social teaching that started with *Rerum Novarum* (1891). This doctrine was implemented all over Latin America through organizational activities and seed equity for credit unions based on members of parishes (Barrera, 2001). Sponsorship from the international cooperation followed over the years (Balkenhol, 1999).

In Bolivia, in a 30-year span, 401 credit unions were created (Census of Credit Unions 1993, USAID/WOCCU/SBEF). However, like in several other countries throughout the region, their results were very disappointing, because their fundamental design was flawed (Chaves, 1994; Adams, 1999). Many had a short life, because their loan recovery rates were very poor; their loan interest rates were unrealistically low and set at levels incompatible with their very high administrative costs. Their management lacked professionalism and permanently echoed rumors of corruption. Furthermore, Inflation
and inflexible interest rates eroded the value of the deposits mobilized (Poyo, 1987). So, by 1993 there were 293 credit unions operating in Bolivia. Most of them were very small, financially weak and with chronic governance problems; some of them were in an irreversible moribund condition. As a result, just a dozen credit unions concentrated 85 percent of the total loan portfolio of the Bolivian cooperative system and 90 percent of the deposits mobilized (Census 1993). This concentration still holds today.

In synthesis, despite their more than 45 years of operation, the combined market shares of credit unions and mutuales has traditionally been very small (less than ten percent of the total financial system). They were not included in the official statistics until they were included in the regulation and supervision of the financial authorities in the very late 1980s. For this reason, the panel data used here does not capture their activities prior to the 1990s.

In contrast, microfinance institutions have steadily gained market share, particularly in the last seven years, building up from the ground. When the early microfinance experiments appeared in the 1980s (see Table 4.3), their loan portfolios started with just a few thousand dollars (Villafani-Ibarnegaray, 2003). As Table 4.6 shows, in 1990 their participation was still insignificant (two per thousand in the system’s loan portfolio). By the time most MFIs entered the regulated market in the late 1990s, their market share had grown to less than four percent. However, the new century has brought remarkable gains for the microfinance industry. At the end of 2007, MFIs controlled one fifth of the market and, if the trend and pace are sustained, by the
end of this decade almost one of every three dollars allocated in loans in Bolivia may come from microfinance institutions.

On the other side of the balance sheet, the growth in the deposits market share has been less but also a remarkable success. Once MFIs got under the scope of prudential supervision and regulation and were able to mobilize deposits, they gradually transformed themselves from microcredit to microfinance institutions. This happened just in time to successfully dodge a hostile environment —characterized by frequent runs in deposits— when they controlled their liquidity risk and mitigated the volatility of their deposits. MFIs have gained market share in deposits at a pace not seen in any other type of intermediary. As Table 4.6 shows, at the end of 2007 the MFIs controlled one eighth of the deposits of the public.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Loan Portfolio</th>
<th>Deposits of the Public</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MFIs</td>
<td>Banks</td>
</tr>
<tr>
<td>1985</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>1990</td>
<td>95.3</td>
<td>4.7</td>
</tr>
<tr>
<td>1995</td>
<td>91.5</td>
<td>1.5</td>
</tr>
<tr>
<td>2000</td>
<td>81.7</td>
<td>4.2</td>
</tr>
<tr>
<td>2001</td>
<td>78.4</td>
<td>5.5</td>
</tr>
<tr>
<td>2002</td>
<td>76.2</td>
<td>6.8</td>
</tr>
<tr>
<td>2003</td>
<td>74.4</td>
<td>8.7</td>
</tr>
<tr>
<td>2004</td>
<td>69.9</td>
<td>11.4</td>
</tr>
<tr>
<td>2005</td>
<td>67.5</td>
<td>12.9</td>
</tr>
<tr>
<td>2006</td>
<td>64.6</td>
<td>16.5</td>
</tr>
<tr>
<td>2007</td>
<td>62.6</td>
<td>19.3</td>
</tr>
</tbody>
</table>

Source: Calculated using data from SBEF and BCB

Table 4.6: Evolution of market shares: Banks and microfinance Institutions
4.2.2 Evolution of the loan portfolio

Banks concentrate the largest market shares in loans and deposits. As a result, when the evolution of the performing loan portfolio over the past 35 years is disaggregated by type of intermediary, the performance of the system as a whole echoes the evolution of bank credit (Figure 4.1). Figure 4.8 highlights the heterogeneous performance of the other financial institutions. Differences in scale are needed to show differences among institutions.

The episodes corresponding to the shaded bars are described in Figure 4.1

Source: Calculated using data from SBEF, BCB and FINRURAL

Figure 4.8 : Evolution of the performing loan portfolio by type of Institution (Dec/1970-Dec/2007)
Several issues are noteworthy in Figure 4.8. Most remarkable is the striking difference in performance over the last decade between MFIs and the rest of the intermediaries, particularly the banks. For the MFIs, the period of growth under the new regulatory framework (episode 6 in the graph) is led by the impressive expansion of BancoSol, following its creation in 1992. Then, during episode 7, both the banks and the MFIs experienced some stagnation and even contraction. However, the causes differ dramatically. The banks stopped growing mostly because of the crisis provoked by crony (inside) lending, followed by the more stringent regulatory framework when the authorities unveiled the operation of their off-shores. In contrast, the MFIs stopped growing because BancoSol, which up to this point had applied a group lending technology and had enjoyed a quasi-monopolistic position, saw its expansion abruptly interrupted when Los Andes (at that time a DFI), with its superior technology based on individual loans, entered the market and competition in the microfinance field increased. This episode has been extensively documented (Schmidt and Zeitinger, 1994; Gonzalez-Vega, Schreiner, Meyer et al., 1997 1997; Navajas, Conning, and Gonzalez-Vega, 2003).
Table 4.7: Bolivian financial system. Recent lending boom and crunch.

As Table 4.8 shows, the major drop in the banks’ performing loan portfolio occurred in January of 2004. The decline represented a drop of 760 million dollars with respect to December of 2003, and it was equivalent to 36 percent annually. As explained in section 4.1.3, in January of 2004, the SBFE dictated a change in accounting norms. To better appreciate the risk position of the intermediaries, loans that had been rescheduled had to be reclassified into accounts of the balance sheet separate from regular performing loans. Most of the bank crunch experienced in January of 2004 is explained by this regulatory change. However, the episode sheds light into an important issue. Table 4.8 shows that the resulting cleansing of the loan portfolio was less significant for the rest of the intermediaries. Microfinance institutions, in particular, only changed the classification of two percent of their portfolio, compared to 36 percent for the banks.
Table 4.8: Bolivian financial system. Credit crunch of January of 2004

This substantial divergence in the correction between banks and MFIs, among other factors, stresses the differences in opportunistic behavior behind the performance of both types of intermediaries during the lending boom of the 1990s. This deep correction reflected endogenous vulnerabilities of the Bolivian banking system and their clients, weaknesses that accentuated the adverse consequences of the exogenous shocks.

The portfolio of the other FFPs (consumption credit) experienced accelerated growth, from their creation up to 1998, followed by a resounding fall and a sluggish recovery. The latter has reflected changes in their credit technologies. In turn, the

<table>
<thead>
<tr>
<th>Type of Intermediary</th>
<th>Performing Loan Portfolio</th>
<th>Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan/2004</td>
<td>Dec/2003</td>
</tr>
<tr>
<td>Banks</td>
<td>1,333.0</td>
<td>2,092.5</td>
</tr>
<tr>
<td>Credit Unions</td>
<td>234.6</td>
<td>254.3</td>
</tr>
<tr>
<td>Other PFFs</td>
<td>166.3</td>
<td>185.8</td>
</tr>
<tr>
<td>Mutuals</td>
<td>275.0</td>
<td>281.2</td>
</tr>
<tr>
<td>DFIs</td>
<td>38.1</td>
<td>41.5</td>
</tr>
<tr>
<td>MFIs</td>
<td>29.4</td>
<td>31.7</td>
</tr>
<tr>
<td>Total</td>
<td>2,076.4</td>
<td>2,887.0</td>
</tr>
</tbody>
</table>

Source: Calculated using data from SBEF and BCB
mutuales showed a reduction of smaller proportions, partly because of their long-term loan portfolios, whereas the credit unions showed stagnation with volatility.

The performance of the microfinance loan portfolios is in sharp contrast with the results for the rest of the system. On the one hand, the performing portfolio of the regulated MFIs grew steadily, during all of the period and without any signs of fragility. This portfolio increased from 2.5 million dollars by December of 1990 to 638 million by December of 2007. On the other hand, the portfolio of the DFIs grew steadily, from a tiny performing portfolio of 20 thousand dollars by December of 1990 to 102 million by December of 2007. In both cases, rapid growth has not harmed the quality of the portfolio.

In fact, among the most exceptional contributions of microfinance to the evolution of the Bolivian financial system has been its stable performance. This has been an amazing accomplishment, mainly in light of the doubts that for a long time were held regarding the soundness of the MFIs and their capacity to face difficult situations. These exceptional achievements have become more evident with the greater frequency and magnitude of adverse macroeconomic events and other systemic shocks.

These adverse shocks have had systemic effects, in view of the covariance of their consequences on the customers, not only in the portfolio of each one of the intermediaries but also on all the customers of the financial system. As a consequence of these events, there have been generalized and major reductions in the ability and
willingness to repay of the customers of each financial intermediary (Gonzalez-Vega and Villafani-Ibarnegaray, 2007).

The remarkable differential performance of the Bolivian MFIs contradicts a broadly held belief; namely, that microfinance loan portfolios are specially fragile and vulnerable to the incidence of systemic risk. The Bolivian experience supports a new hypothesis: during systemic crises, the microfinance portfolios are not necessarily more fragile and are likely to be more robust. In particular, during these crises, microfinance portfolios do not necessarily shrink, at least not as much as bank portfolios shrink (Gonzalez-Vega and Villafani-Ibarnegaray, 2007).

Thus, in contrast to common beliefs that microfinance loan portfolios may play a pro-cyclical role, thereby accentuating the adverse effects of macroeconomic crises, in the Bolivian experience microfinance has been less pro-cyclical than the rest of the financial system. In effect, the reductions of the rates of growth of the gross domestic product of Bolivia during the recession were accompanied by negative rates of variation of the loan portfolios of the banks, but these rates stayed always positive for the portfolios of the regulated MFIs.

The robustness of the rates of growth of microfinance loan portfolios even in the presence of real sector difficulties possibly reflects influences in two directions. On the one hand, continued access to credit allows the clients of microfinance institutions to take advantage of productive opportunities that emerge in these circumstances. This preserves their ability to repay. In addition, access to emergency funding, like loans
from the internal account of village banks, facilitates their liquidity management and enhances both ability and willingness to repay.

On the other hand, the greater flexibility and versatility of the traditional customers of MFIs, due to their operations in informal markets and the close linkages between the household and the business, offer them greater degrees of freedom to look for and to take advantage of these opportunities. These informal characteristics and experience in seeking new opportunities allow microentrepreneurs to face the adverse events more easily and to conserve their repayment capacity.

Finally, for microfinance clients, the present value of their relationship with the organization is very high, which conserves their willingness to repay even under adverse circumstances. In fact, these clients are willing to make exceptional efforts to conserve their reputation and repay their loans, even when this implies much higher costs than anticipated at the time of the initial loan contract (Gonzalez and Gonzalez-Vega, 2003).

There had been a generalized belief that microfinance loan portfolios are specially risky, given the weak collateral or even the absence of traditional guarantees on the loans. This notion led to the view that microfinance should not be treated as a robust segment of the financial system and that regulators should be specially concerned when MFIs grow rapidly. In practice, however, microfinance loan portfolios, particularly when the lending technologies are appropriate and when the organizations seek their sustainability, have been less risky than other loan portfolios.
The episodes corresponding to the shaded bars are described in Figure 4.1

Source: Calculated using data from SBEF, BCB and FINRURAL

Figure 4.9: Evolution of the delinquency rate by type of Institution (Dec/1990-Dec/2007)

The Bolivian experience contradicts the earlier popular notion in two ways. On the one hand, the delinquency rates of regulated and non-regulated MFIs have been lower than the delinquency rates of other financial intermediaries. Except for 1998, the delinquency rates of the regulated MFIs have always been lower than the delinquency rates for other types of intermediaries, even the banks. On the other hand, as shown in Figure 4.9 during the systemic crisis, the delinquency rates of MFIs increased less and
for a much shorter period than the delinquency rates of banks. This superior performance was also shown by the non-regulated MFIs. For MFIs, delinquency rates diminished below traditional levels by 2001, whereas for the banks these rates continued to increase, even beyond 20 percent of their portfolio.

The weakening of loan portfolios during the crisis and the influence of pressure groups resulted in the rescheduling of loans, some of it voluntarily and in other cases by decree of the authorities. To measure the quality of the loan portfolio, therefore, it is necessary to take into account this circumstance. The index used here is the quotient of the non-performing portfolio plus the performing rescheduled portfolio over the total loan portfolio. Using this index, by June of 2006 the portfolio of bad quality loans held by the banks was still 31 percent of the total, whereas in the regulated MFIs this proportion was only 3.7 percent. The smaller MFI need to reschedule reflected an outstanding performance.

Several reasons explain the better response of microfinance to the crisis. Among them stand out the MFIs’ increasing efficiency, obtained thanks to innovations in lending technologies and the provision of other financial services that have characterized this sector. These innovations were designed taking into account the characteristics of versatility and flexibility of their customers. These client characteristics have also explained the performance of microfinance. Moreover, several reasons explain a smaller incidence of opportunistic behavior among these organizations. The MFIs, more modest in their size and with less political connections, and have had
smaller expectations of being rescued by the State in case of difficulties, at least in comparison to banks and even cooperatives.

In addition, the MFIs had faced, in the period that immediately preceded the crisis, ferocious competition, mainly from the fast expansion of consumption credit. This increase in competition strengthened MFIs. Finally, MFIs did not experience the pronounced cycle of fast expansion followed by contraction as other financial intermediaries. Rather, they have been able to sustain rapid growth.

The non-uniform performance, during the crisis, of the different types of intermediaries has caused major changes in the structure of the Bolivian financial system. The system has always been dominated by banks, but this dominant position has been eroded by the success of microfinance. Whereas, at the end of 1997, the performing portfolio of the banks represented 83 percent of the financial system’s total, including non-regulated MFIs, by December of 2007 this participation had declined to 59 percent.

In addition, microfinance institutions -both regulated and unregulated- have shown more resilience to the sequence of systemic shocks and have been able to adapt to the changing environment more rapidly. These have been the result of a fortunate combination of the flexibility of the microfinance lending technology and the clientele reached. For instance, the ratio loan portfolio to total has declined for the banks over the last decade, while microfinance has maintained that ratio relatively constant. In fact by December of 2007, the performing loan portfolio represented 46 percent for the
banks, while in December of 1998 it was 75 percent, a drop of almost 30 percent. In contrast, this ratio for the MFIs was 77 percent by December of 2007, and 78 percent a decade ago. This is shown in Figure 4.10.

The episodes corresponding to the shaded bars are described in Figure 4.1.

Source: Calculated using data from SBEF, BCB and FINRURAL

Figure 4.10: Total loan portfolio and performing loan portfolio as a proportion of total assets (Dec/1990-Dec/2007)
On the other hand, the share of the regulated MFIs has grown more rapidly than for any other intermediary, increasing from 3 percent of the total performing portfolio, in 1997, to 19 percent by December of 2007. If the loan portfolio of the non-regulated MFIs is added, in that same period, the share increased from 4 percent to 22 percent of the performing portfolio of the system. In less than one decade, the relative participation of microfinance in the financial market is five-and-a-half times greater.

This expansion of the regulated MFIs is highlighted when the banks are excluded and only the shares in the performing portfolio of the different types of nonbank intermediaries are observed. The MFI share went from 17 percent, in 1997, to 53 percent, in December of 2007. In addition, when the portfolios of non-regulated DFIs are added, the share grew from 22 percent to 59 percent. In this process, the drastic reduction of the importance of the FFP of consumption credit stands out, while the shares of mutuales and cooperatives have stagnated.

Typically, financial deepening is measured by the quotient of a financial variable, like credit, with respect to the GDP (Shaw, 1973). After years of gradual but sustained recovery, following the hyperinflation crisis of the 1980s, financial deepening (with respect to the performing portfolio of the extended financial system, to include the NGOs) reached 56 percent of the GDP at the end of 1998. By mid-2006, the index was 27 percent of the GDP. This level was similar in 2006 to that already reached in 1991. Thus, the crisis produced a loss of almost 15 years in the evolution of financial deepening.
Most of the loss was caused by the contraction of the banks. Their performing portfolio declined from 47 percent of the GDP, in 1998 (a level reached after some degree of over-indebtedness in the system), to 16 percent of the GDP (or 20 percent, if the rescheduled portfolio is added). These levels are inferior to those shown by Central American countries, for example, where the index is closer to the levels reached in 1998.

The contribution of MFIs to financial deepening, although modest, has shown an accelerated increase. Adding the NGOs to the regulated MFIs, their performing portfolio went from 2.2 percent of the GDP, in 1998, to 7.0 percent of the GDP by end of 2007.

In the Bolivian case, the sustained systemic crisis brought difficulties to the MFIs specialized in joint-liability group credit, particularly Bancosol and PRODEM. These MFIs revised their lending technology and moved towards individual clients but, in the process, lost market share. Actually, BancoSol, which had enjoyed a quasi-monopolistic position in the microfinance market (69 percent in 1992), saw its market share decline to 41 percent in 1997 and 22 percent by December of 2007. PRODEM’s market share substantially decreased between 1997 and 2000, but it recovered later, once this MFI drastically revised its lending technology, from group lending to individual lending. PRODEM’s market share in the performing portfolio of microfinance increased to 19 percent by December of 2007.
The episodes corresponding to the shaded bars are described in Figure 4.1

Source: Calculated using data from SBEF, BCB and FINRURAL

Figure 4.11: Evolution of the number of borrowers by type of institution

(Dec/1990-Dec/2007)

In contrast, the market share of Los Andes, a microfinance institution that always used an individual lending technology, increased from 13 percent in 1997 to 25 by December of 2007. During the same period, and despite its more conservative expansion policies, FIE’s market share, the other MFI that from the beginning used an individual lending technology, increased from 8 percent to 13 percent. Thus, individual
lending technologies are more robust than group lending technologies, when all the phases of the economic cycle are considered.

The episodes corresponding to the shaded bars are described in Figure 4.1

Source: Calculated using data from SBEF, BCB and FINRURAL

Figure 4.12: Microfinance: Performing loan portfolio by institution (Dec/1990-Dec/2007)

The growth of village banking has been explosive in recent years. The comparatively small size of the loans, which alleviates the joint-liability for the members of village banks, combined with the value for clients of the financial and non-financial
services provided by these organizations, may explain this. Between 1996 and 2006, CRECER increased its loan portfolio more than 22 times, while Pro Mujer increased it more than 71 times. Despite this impressive growth, the market share of the non-regulated MFIs has decreased, reflecting the less rapid growth of the size of their loans.

### 4.2.3 Microfinance and the mobilization of deposits

The popular perception has been that MFIs are less secure places to keep savings (i.e., there is less trust among their potential clients) and that, in any case, these organizations are not seriously interested in mobilizing deposits from the public. The Bolivian experience has shown, however, that deposits are more stable in the regulated MFIs that in other types of intermediaries (Gomez-Soto and Gonzalez-Vega, 2007). This has been a particularly surprising result.

One first surprise has been the accelerated growth in deposit mobilization by the regulated MFIs. It took the Bolivian microfinance system close to a decade before it could reach the necessary level of training to allow the provision of deposit services. Their deposits grew, however, from 70 thousand dollars in February of 1992 to 518 million dollars by December of 2007, at a more rapid pace than for any other type of regulated intermediary. These organizations had to pay a premium to compensate for an initial lack of trust among depositors. Nevertheless, the level of this premium, measured as the difference between the effective interest rates paid by the banks and those paid by the MFIs, has decreased rapidly (Gomez-Soto, 2003). The increase in
deposits, contrasted with the fast reduction of the premium, would reflect the increase in the confidence that the depositors have in these institutions.

These are exceptional achievements, particularly because they have taken place during a stage in Bolivia characterized by acute financial disintermediation and an environment charged with high political uncertainty. The MFIs have managed to benefit from their advantages in lending technology to increase and diversify their liabilities.

The most exceptional achievement has been the greater stability of the MFI deposits. Several shocks have triggered transitory deposit runs as a response to political uncertainty or social disturbances. In each one of these critical moments, the deposits of the traditional MFIs have shown greater stability than the deposits of all other intermediaries in the system (Gomez-Soto and Gonzalez-Vega, 2007).

4.3 Trends in the Bolivian microfinance industry

The Bolivian microfinance industry has been facing important challenges since the installation of President Evo Morales in January of 2006. Over the last two years, the government has resurrected financial policies that had resulted very costly for Bolivian taxpayers, when applied in the past, and had caused financial disintermediation. For instance, the government has extended and expanded the application of the tax over financial transactions, which was due to expire in June of 2006. The most threatening intervention, however, has been the reinstallation of the state-owned banking sector.
On the one hand, the government controls Banco Union, formerly a private bank, which was bailed out and capitalized, with ownership transferred to the State in the process. If the government would not have capitalized the bank with fiscal resources, Banco Union would have closed. The government has been interested in keeping this bank open because of its network of branches that reaches into regions of the country that are not served by other financial institutions. The government has used the network to disburse fiscal transfers to municipalities and to pay employees in those regions.

On the other hand, in May of 2007, with an initial investment of 60 million dollars, the government created a second-tier state-owned bank named Banco de Desarrollo Productivo (Bandepro). The objective is to support small producers and productive associations, with subsidized loans of up to 10 thousand dollars. The government feels that the private financial system, including MFIs, is charging high interest rates and requiring collateral beyond the reach of small producers. By December of 2007, the bank had disbursed 28 million dollars, distributed among 3,000 loans.

The second source of threats for the Bolivian microfinance industry comes from within the industry. In January of 2007, PRODEM was acquired by the Venezuelan Government through one of its development banks, although the transaction was formally concluded in May of 2008. The Venezuelan Banco de Desarrollo Económico y Social (BANDES), a dependency of the Ministry of Finance, is the bank that President
Hugo Chavez created to promote his influence in the region, financing the activities of governments and political groups that share his populist views. Accordingly, PRODEM’s new board chairman is the Venezuelan Minister of Finance, who has announced the transformation of PRODEM into a full-fledged bank that will continue working in the microfinance market niche but that will concentrate its funding in bigger operations (Forbes, May 28, 2008).

The expansion of the state-banking sector (either Bolivian or Venezuelan) is a threat for the Bolivian financial sector, because allocating cheap credit motivated by non-financial objectives will erode the culture of repayment. Subsidized credit will exercise a crowding-out effect on private competition and will dismantle the system of incentives that have allowed the industry to flourish and expand. It is known, from international experience, that practices of fiscal irresponsibility eventually come to an end, although in this case that end may not be near. In any case, when fiscal responsibility returns, the void left by compensatory fiscal policies creates social convulsion and economic distress. Moreover, the people who were supposed to benefit are precisely those who suffer the most (Gonzalez-Vega, 1976; Von Pischke and Adams, 1980; Adams, Graham, and Von Pischke, 1984; Chaves and Gonzalez-Vega, 1996; Gonzalez-Vega, 1998a; Christen and Rhyne, 1999; Navajas, Schreiner, Meyer et al., 2000; Robinson, 2001; Gonzalez-Vega and Villafani-Ibargaray, 2007).
CHAPTER 5

POOLING VERSUS SEPARATING REGULATION:
MINIMUM CAPITAL ADEQUACY RATIO

The purpose of this chapter is to develop a conceptual framework that would make it possible to identify the consequences of a pooling regulation (that is, a single uniform prudential rule, for all types of financial intermediaries and for all types of risk profiles) in contrast to the consequences of a separating regulation (that is, a set rules that differentiate according to intermediary types and risk profiles, with a special focus on differences in the lending technologies used by the intermediaries to match alternative clienteles).

A prudential regulator interested in both the stability of the financial system and in promoting financial deepening must assess the relative costs of the two potential regulation regimes. A pooling regulation would be easier to implement and, therefore, the regulator would incur comparatively lower operational costs. As this chapter will
show, however, a pooling regulation may induce significant efficiency costs for the economy.

These costs would be associated with the under-expansion of the financial system (i.e., less financial deepening) and the fragmentation and non-optimal composition of the financial system, as a result of the distortions introduced by regulatory asymmetries. In this case, financial intermediation would not contribute as much as it may be possible to the productivity of the endowment of resources of the economy. Moreover, if the asymmetry hurts the expansion of microfinance, the social goal of expanding the breadth of outreach would not be fully accomplished.

In order to avoid these efficiency losses, therefore, the regulator must create a framework that induces the separation of financial intermediaries and their operations according to distinguishable risk profiles. In a world of imperfect and asymmetric information, this requires a considerable effort by the regulator in the collection, interpretation and use of relevant information about the risk profiles of the alternative intermediaries. Thus, operation costs would significantly increase and the regulator would face the challenge of learning about the distinctions and about the optimum design of the separating rules. These separating rules should induce different types of intermediaries to develop portfolios with different risk profiles (that is, the intermediaries would self-select into the adoption of certain lending practices and outreach to certain borrower types). A model is built next, in order to explore how the regulation constraint influences the lending choices of different intermediaries.
With this purpose, the model developed here focuses on the lender’s behavior in the design of debt contracts and on the role played by lending technologies, especially those associated with microfinance, given certain regulatory constraints. In particular, given a market where banks and microfinance institutions compete in the same environment (regulation of structure), the focus is on how different degrees of authorization influence the behavior of financial intermediaries in the choice of activities (regulation of conduct) and on how these choices affect financial deepening.

While they differ according to several dimensions, for the present purposes traditional banks and microfinance institutions will differ in terms of the lending technology that they use to address credit risk and in terms of how well this technology matches the characteristics of the clientele in the market segments where they operate.

Several simplifying assumptions are made. In particular, the borrower’s behavior is modeled with the simplest of assumptions. Information in the borrower-lender transaction is asymmetric with respect only to the applicant’s type, creating the possibility of adverse selection. However, the possibility of moral hazard is ignored. There are no hidden actions from the borrower’s side, making monitoring costs irrelevant for the analysis.

In turn, depositor behavior is not considered. Their role is reduced to the provision of their savings at the deposits interest rate prevailing in the market. The role of government is limited to offering bonds, and the actions of the regulation and supervision authorities are assumed to be autonomous and politically independent.
5.1 Basic framework: one financial intermediary, one period

Consider a risk neutral financial intermediary (FI) that operates in a single period in a competitive market. At the beginning of the period, the FI can buy risk-free bonds issued by the government ($B$) or disburse loans that are promised to be repaid at the end of the period. This creates the total loan portfolio denoted by $L$. To simplify the analysis, it is assumed that there are no other assets beyond $B$ and $L$. The FI has a given equity ($E_0$), which will not change during the period, and its only concern is to maximize profits. To fund its operations beyond its equity, the FI can mobilize as much deposits ($D$) as desired, at a deposit interest rate ($d_o$) determined exogenously, within the limits of a regulatory constraint.

Then, at the beginning of the period, the FI has to determine the optimal combination of assets in its balance sheet:

$$L + B = D + E_0$$  \hspace{1cm} (5.1)

The financial intermediary generates profits ($\Pi$) from two sources. On the one hand, there are the profits generated by the lending activity ($\Pi_L$), while, on the other, there are the profits created by its bond investing activity ($\Pi_B$):

$$\Pi = \Pi_L + \Pi_B$$  \hspace{1cm} (5.2)

Given that the loan portfolio is the FI’s most important asset, the calculation of the expected profits from this source is presented next.
5.1.1 Profits from the lending activity

At the beginning of the period, the lender gets a pool of \( N \) loan applications, which are attracted by the prevailing loan interest rate \((r)\). It is assumed that this interest rate is the only term describing the loan contract. Applicants seek funds to invest in their individual projects, which generate an income distributed according to \( Y_i \sim (\mu, \sigma_i^2) \). Since information is incomplete, the FI cannot determine the mean and variance of the expected income of each loan applicant, but rather the mean and variance of the incomes of the borrowing population. However, from the information presented in the loan application and certain characteristics of the individual and its business, the FI can predict the income that may be generated by the project, if funded.

Defining the quality of a loan application as a function of the applicant’s ability and willingness to repay the loan, given the loan size and interest rate, it can be assumed that the pool of \( N \) loan applications \((N > 0)\) has \( Q \) qualified (or good) applications \((Q \leq N)\) and \( U \) unqualified (or bad) ones \((U = N - Q)\), such that the probability that an application comes from a qualified project is:

\[
\gamma = \frac{Q}{N} \tag{5.3}
\]

where: \( 0 \leq \gamma \leq 1 \); \( N > 0 \)

It is assumed that the applications are homogenous from the lender’s standpoint. That is, the lender cannot determine if the application comes from a qualified or an unqualified applicant. For the discussion of lending technologies, however, it will be
assumed that different types of intermediaries have different abilities in imperfectly distinguishing these applicants.

If information were complete, the FI would determine the application’s quality and would charge higher interest rates to riskier projects. Following the non-interest credit rationing literature, increases in the interest rate cannot clear the market, because the model assumes that the composition of the pool of loan applications is a function of the loan interest rate.

This assumption is important, because it introduces adverse selection. Thus, increases in \( r \) deteriorate the quality of the pool of applicants. This occurs because higher interest rates discourage the entry of qualified applicants, who foreseeing that their profits after financial expenses will not reach certain minimum level (i.e., their individual rationality constraint), drop from the pool of applicants (Stiglitz and Weiss, 1981).

More specifically, the model assumes that increases in the interest rate induce a reduction in the total number of applications (both qualified and unqualified), fulfilling the law of demand:

\[
N(r) = Q(r) + U(r) \tag{5.4}
\]

where:

\[
\frac{d}{dr} Q(r) < 0 ; \quad \frac{d}{dr} U(r) < 0 ; \quad \frac{d}{dr} N(r) < 0
\]
However, the decline in qualified applicants is proportionately higher than the decline in unqualified ones. Then, from Equation (5.3), where $Q$ and $N$ are functions of $r$, the adverse selection problem is formally introduced as:

$$\frac{d}{dr} \gamma(r) < 0$$

Equation (5.5)

The model assumes that, at the prevailing interest rate ($r_0$), the demand for loans exceeds supply, and there is credit rationing. Formally, in equilibrium credit rationing exists when some loan applications are turned down, even when the applicant is willing to pay all the price elements and all non-price elements of the loan contract (Baltensperger, 1978). Furthermore, the model assumes that within each application group ($Q$ and $U$) some individuals get a loan while others are rationed. That is, a Type II credit rationing à la Keeton is assumed (Keeton, 1979).

Consequently, rather than modeling the determinants of the interest rate, it is more relevant to model how the FI determines the optimal size of the loan portfolio, given certain characteristics of its loan application’s screening process and certain state of nature. The mechanism to deal with both issues is the lending technology.

For this purpose, the model assumes that the FI disburses $n$ loans ($L_i$), to $i$ different borrowers, where $i = \{1, \ldots, n\}$. These are assumed to be equally-sized, non-installment, one-period loans. Then, the size of each and every loan is just the average loan:
To simplify the analysis, the processes of screening and monitoring borrowers are assumed to be costless. In addition, since information is incomplete, it is assumed that the lender unknowingly rejects some qualified applications while it approves others that are unqualified and should have been rejected.

The probability of rejecting an application given that it is unqualified is denoted by \( \omega_u \) and the probability of granting a loan given that the application is qualified is \( \omega_q \). Consequently, the probability of accepting unqualified applications \( (1 - \omega_u) \) and of rejecting qualified applications \( (1 - \omega_q) \) may be viewed as Type I and Type II errors in statistical hypothesis testing (Aguilera, 1990).

As a result, the number of loans granted by the financial intermediary, \( n \), is the sum of two components: the proportion of qualified applications that get loans \( \left( \text{i.e., } \omega_q Q = \omega_q \frac{Q}{N} N = \omega_q q N \right) \), and the number of unqualified applications that are not rejected and get loans \( \left( (1 - \omega_u)U = (1 - \omega_u) \frac{N-q}{N} \right) N = (1 - \omega_u)(1 - \gamma)N \).

As a result, the number of loans is given by Equation (5.7):

\[
n = \omega_q \gamma N + (1 - \omega_u)(1 - \gamma)N
\]

where:

\[
n \leq N ; \quad 0 \leq \omega_q \leq 1 ; \quad 0 \leq \omega_u \leq 1
\]
Consequently, the efficiency of a lending technology will depend on the FI’s ability to discriminate between qualified and unqualified loan applications and on its ability to accept the former and reject the latter. Although, in this simple framework, the number of unqualified applications is given entirely by the interest rate, in reality a financial intermediary has the ability to build a reputation over time that deters unqualified applicants and some self-selection may be induced. The FI’s ability to influence \( \gamma \) beyond \( r \) is not modeled here.

To simplify the nomenclature, let’s define \( q \) as the number of loans granted to qualified applications and \( u \) as the loans disbursed to unqualified ones:

\[
q = \omega_q \gamma N \quad (5.8)
\]

\[
u = (1 - \omega_u)(1 - \gamma)N \quad (5.9)
\]

Then, from Equations (5.7) and (5.8):

\[
n = q + u \quad (5.10)
\]

The model assumes that all borrowers, regardless of their application quality, invest their loan \( L_i \) in a project that generates an income that is a random variable distributed according to \( Y_i \sim (\mu, \sigma_i^2) \) where \( i = \{1 \cdots n\} \) and \( j = \{q, u\} \). It is assumed that the borrowers do not use the funds in different uses than those agreed upon with the lender, leaving aside the possibility of the borrower’s moral hazard.

Since both random variables have the same mean, it is further assumed that the unqualified applicant’s income is second-order stochastic dominated by the income
distribution of the qualified ones. This is equivalent to assuming that the distribution function of the unqualified applicants’ income is a mean preserving spread of the qualified applicant’s income distribution (Rothschild and Stiglitz, 1970). This assumption makes it possible to unequivocally ascertain that the unqualified applicants are riskier than the qualified ones, since the income of the former has the same distribution as the latter plus conditional-mean-zero noise.

When the borrowers’ income realize, $y_i$, they repay the amount of the loan plus the interest charged at a fixed interest rate ($r$) in one single payment, keeping the remaining income, if any. The loan interest rate is set exogenously and it is given to the FI and the borrower ($r_0$). Then, the borrower’s surplus income after repaying the loan is given by $y_i - L_i(1 + r_0)$. In addition, it is assumed that borrowers receive their loan without having to pledge any collateral. Naturally, in this simple one-period model, the borrower cannot build a reputation over time. Borrowers are assumed “honest” and their repayment behavior depends only on ability to repay, given by the outcome of their productive activity, while willingness to repay is assumed.

If $R_i$ is the range of income that the project funded by loan $i$ can produce, given the applicant’s type $j$, then the probability density function (pdf) of $Y_i$ is defined by:

$$P(Y_i \in R_i) = \int_{R_i} f_j(y_i) dy_i$$  \hspace{1cm} (5.11)

Where: $i = \{1, \cdots, n\}; \ j = \{q, u\}$

Then the cdf is:
\[ F_j(y_i) = \int_{-\infty}^{y_i} f_j(v) dv \]  

(5.12)

The model assumes that borrower’s willingness to pay, both for qualified and unqualified applicants, depends entirely on the realized income (ability to repay), leaving aside the possibility of the borrower’s moral hazard.

Setting a reasonable environment for non-collateral-based lending technologies, the limited liability of the borrowers is assumed; that is, the borrowers are not forced to use personal assets to pay for the principal and interest owed. Moreover, if the income generated by the project is insufficient to repay the loan at the end of the period, the borrower defaults the entire loan without making any payment (i.e., an all-or-nothing repayment is assumed), and the borrower walks off from the transaction without further losses, since there is no collateral that can be seized.

Thus, a particular borrower either defaults her obligation if \( y_i < L_i(1 + r_0) \) or pays her loan if \( y_i \geq L_i(1 + r_0) \), independently of her type. This implies that the probability of a particular loan being in default is equivalent to the probability of the borrower’s income not being sufficient to repay the loan’s principal plus interest.

Given that a project can make money or lose money, the range of \( Y \) is assumed to be any real number \( (R_{ij} = \mathbb{R}) \). Then, the probability of default can be written as:
\[
P\{ y_i < (1 + r_0) L_i \} = \int_{-\infty}^{(1 + r_0) L_i} f_j(v) dv = \int_{-\infty}^{(1 + r_0) L_i} dF_j(y_i) = F_j[(1 + r_0) L_i]
\]

where \( j = \{q, u\} \)

Equation (5.13) indicates that the probability of a loan being in default is measured by the area under the borrower’s income pdf, given her type. This is equivalent to the borrower’s income cdf evaluated at the size of the obligation, given by principal plus interest on the loan. Since there are two types of borrowers, each type will have a different probability of default for a given loan size, given their income’s pdf and corresponding cdf. Given the assumption of second stochastic dominance for good borrowers over bad borrowers, for any value of \( L_i \):

\[
\int_{-\infty}^{(1 + r_0) L_i} F_u(v) dv \geq \int_{-\infty}^{(1 + r_0) L_i} F_q(v) dv
\]

(5.14)

Intuitively, Equation (5.14) just says that the probability of things going wrong is higher for an unqualified applicant; as a consequence, her cdf accumulates more rapidly than in the case of a qualified applicant. Then, although on average both qualified and unqualified applications get the same level of income, funding unqualified applicants is riskier for the lender.
Figure 5.1: Borrower’s income probability and cumulative density functions.

Probability of default given loan size and interest rate.
However, imperfect and asymmetric information prevents the lender to directly observe the quality $j$ of the applications, and it can only make estimations about the project’s capacity to repay the loan. As a consequence, the FI makes funding decisions based on an estimated distribution that results from the combination of qualified and unqualified applications.

The intuition behind Equations (5.13) and (5.14) is represented graphically in Figure 5.1. It is assumed that the qualified applicant’s income $Y_{i_q}$ is a random variable distributed normally with mean $\mu$. Then, the greater riskiness of the unqualified applicants is reflected in a higher variance of their income distribution $Y_{i_u}$ compared to $Y_{i_q}$, with the former being equally symmetric around $\mu$ but platykurtic.

The inability to observe the applicant’s corresponding distribution makes the FI to estimate the dotted distribution, which combines qualified and unqualified applications, and to make decisions based upon it. In the graph, it is assumed that the proportion of qualified and unqualified applications is equal, resulting in an estimated distribution that lies at the middle of the particular distributions. However, the degree of efficiency of a lending technology can be measured by its ability to better discriminate between qualified and unqualified applications. Then, an efficient lending technology will produce a loan portfolio with a greater proportion of qualified applicants, resulting in an estimated distribution that is closer to the qualified applicants’ distribution.
Figure 5.1 also shows that there is a proportion of qualified borrowers that cannot fulfill their obligations as well as a proportion of unqualified borrowers that are able to repay. As a consequence, the quality of the application (qualified/unqualified) and the quality of the loan (performing/non performing), while correlated, are not equivalent.

The financial intermediary’s revenue \( R_i \) depends entirely on the borrower’s realized income. Then, if the borrower’s project generates sufficient income to repay the obligation (i.e., \( y_i \geq (1 + r_0)L_i \)), the FI’s profits come form the interest generated by the loan \( r_0L_i \). Conversely, if the borrower’s income is insufficient to pay the obligation, the FI’s losses are equal to the loan’s principal \( -L_i \). Thus, the financial intermediary has a ceiling on the profits that it can make in a loan \( r_0L_i \) and a floor on its losses \( -L_i \). In contrast, the borrower does not have a ceiling on the income that she could earn after repaying the loan \( y_i - (1 + r_0)L_i \) and also can walk off the obligation without losses.

Then, the financial intermediary’s profits \( R_i \) can be expressed as:

\[
R_i = \begin{cases} 
  r_0L_i & \text{if } y_i \geq (1 + r_0)L_i \\
  -L_i & \text{if } y_i < (1 + r_0)L_i
\end{cases}
\]  

(5.15)

The expected revenue for each loan would depend on the probability of default and also on the type of borrower:
\[ E(R_i) = (r_0L_i \left[ P\{Y_i \geq (1 + r_0)L_i\} \right] - L_i \left[ P\{0 \leq Y_i < (1 + r_0)L_i\} \right]) \]
\[ \cdot P\{i \in q\} \]
\[ + \left( r_0L_i \left[ P\{Y_i \geq (1 + r_0)L_i\} \right] - L_i \left[ P\{0 \leq Y_i < (1 + r_0)L_i\} \right] \right) \]
\[ \cdot P\{i \in u\} \]  
(5.16)

From Equation (5.10), the probability of a particular loan coming from a qualified application is:

\[ P\{i \in q\} = \frac{q}{n} \]  
(5.17)

Likewise:

\[ P\{i \in u\} = \frac{u}{n} \]  
(5.18)

Then, plugging Equations (5.17) and (5.18) in Equation (5.16), and calculating the probability of each outcome:

\[ E(R_i) = \left\{ r_0L_i \left[ \int_{(1+r_0)L_i}^{\infty} f_q(v)dv \right] - L_i \left[ \int_{-\infty}^{(1+r_0)L_i} f_q(v)dv \right] \right\} \cdot \frac{q}{n} \]
\[ + \left\{ r_0L_i \left[ \int_{(1+r_0)L_i}^{\infty} f_u(u)du \right] - L_i \left[ \int_{-\infty}^{(1+r_0)L_i} f_u(u)du \right] \right\} \cdot \frac{u}{n} \]  
(5.19)
This is equivalent to:

\[
E(R_i) = \left\{ r_0 L_i \left(1 - F_q((1 + r_0) L_i)\right) - L_i \left(F_q((1 + r_0) L_i)\right)\right\} \cdot \frac{q}{n}
\]

\[
+ \left\{ r_0 L_i (1 - F_u((1 + r_0) L_i)) - L_i (F_u((1 + r_0) L_i))\right\} \cdot \frac{u}{n}
\]

\[
(5.20)
\]

\[
E(R_i) = \left\{ r_0 L_i - r_0 L_i \cdot F_q((1 + r_0) L_i) - L_i \cdot F_q((1 + r_0) L_i)\right\} \cdot \frac{q}{n}
\]

\[
+ \left\{ r_0 L_i - r_0 L_i \cdot F_u((1 + r_0) L_i) - L_i \cdot F_u((1 + r_0) L_i)\right\} \cdot \frac{u}{n}
\]

\[
(5.21)
\]

\[
E(R_i) = \left\{ r_0 L_i - (1 + r_0) L_i \cdot F_q((1 + r_0) L_i)\right\} \cdot \frac{q}{n}
\]

\[
+ \left\{ r_0 L_i - (1 + r_0) L_i \cdot F_u((1 + r_0) L_i)\right\} \cdot \frac{u}{n}
\]

\[
(5.22)
\]

\[
E(R_i) = \left(\frac{q + u}{n}\right) r_0 L_i
\]

\[
- [1 + r_0] L_i \left\{ \frac{q}{n} F_q((1 + r_0) L_i) + \frac{u}{n} F_u((1 + r_0) L_i)\right\}
\]

\[
(5.23)
\]

From Equation (5.10), it is immediate that \( \frac{q + u}{n} = 1 \). Also, the model assumes that all loans are of equal size. Then, each loan is just the average loan:

\[
L_i = \frac{L}{n} = \bar{L}
\]

\[
(5.24)
\]

Thus, to simplify the notation define:

\[
\theta = (1 + r_0) \bar{L}
\]

\[
(5.25)
\]
Then, plugging Equation (5.25) in Equation (5.23) results in:

\[ E(R_i) = r_0 \bar{L} - \theta \left\{ \frac{q}{n} F_q(\theta) + \frac{u}{n} F_u(\theta) \right\} \]  

(5.26)

Since the only expense incurred by the intermediary is the cost of funds, the FI’s costs per loan are given by the cost of funds. Since the expected value of this cost neither depends on the borrower’s income nor on the borrower’s type:

\[ E(C_i) = d_o \bar{L} \]  

(5.27)

Then, the total profits that the intermediary makes on a given loan are:

\[ E(\pi_i) = E(R_i) - E(C_i) \]  

(5.28)

Replacing values from Equations (5.26) and (5.27):

\[ E(\pi_i) = r_0 \bar{L} - \theta \left\{ \frac{q}{n} F_q(\theta) + \frac{u}{n} F_u(\theta) \right\} - d_o \bar{L} \]  

(5.29)

\[ E(\pi_i) = (r_0 - d_o) \bar{L} - \theta \left\{ \frac{q}{n} F_q(\theta) + \frac{u}{n} F_u(\theta) \right\} \]  

(5.30)
The FI’s expected profits generated by the total loan portfolio \( E(\Pi_L) \) are calculated by adding the expected profits for the \( n \) different loans in (5.30):

\[
E(\Pi_L) = \sum_{i=1}^{n} E(\pi_i) \quad (5.31)
\]

\[
E(\Pi_L) = \sum_{i=1}^{n} [ (r_0 - d_o)\bar{L} - \theta \left( \frac{q}{n} F_q(\theta) + \frac{u}{n} F_u(\theta) \right) ] \quad (5.32)
\]

\[
E(\Pi_L) = n \left[ (r_0 - d_o)\bar{L} - \theta \left( \frac{q}{n} F_q(\theta) + \frac{u}{n} F_u(\theta) \right) \right] \quad (5.33)
\]

Then, plugging back the values of \( \bar{L} \) and \( \theta \), Equation (5.33) can be written as:

\[
E(\Pi_L) = n \cdot (r_0 - d_o) \frac{L}{n} - n \cdot (1 + r_0) \frac{L}{n} \left\{ \frac{q}{n} F_q(\cdot) + \frac{u}{n} F_u(\cdot) \right\} \quad (5.34)
\]

Reducing and plugging back Equation (5.25):

\[
E(\Pi_L) = (r_0 - d_o)L - (1 + r_0)L \left\{ \frac{q}{n} F_q \left( 1 + r_0 \frac{L}{n} \right) + \frac{u}{n} F_u \left( 1 + r_0 \frac{L}{n} \right) \right\} \quad (5.35)
\]

The expression inside the curved brackets in the second term of the right-hand side defines the delinquency rate in the model. Naming this term as \( \rho \):

\[
\rho = \frac{q}{n} F_q \left( 1 + r_0 \frac{L}{n} \right) + \frac{u}{n} F_u \left( 1 + r_0 \frac{L}{n} \right) \quad (5.36)
\]
Then, plugging Equation (5.36) into (5.35) allows a simpler expression:

\[ E(\Pi_L) = (r_0 - d_o)L - (1 + r_0)L \cdot \rho \quad (5.37) \]

First, \((r_0 - d_o)\) is the lender’s margin or interest rate spread. Reductions in the cost of funds increase loan portfolio profits linearly. This results from the assumption that the administrative costs of mobilizing deposits and managing the loan portfolio are zero.

The effect of the delinquency rate on profits is two-fold, as shown in Equation (5.37). On the one hand, \(\rho\) deducts the financial revenue that is not earned because of defaulting loans. On the other hand, this delinquency rate determines the proportion of the loan portfolio whose principal is not repaid and consequently lost.

As Equation (5.37) shows, the FI’s expected profits from lending are not a monotonic function of the loan interest rate. Increases in the loan interest rate have an ambiguous effect because, in the presence of adverse selection, a higher interest rate simultaneously increases the FI’s revenues and costs. The net effect depends on the marginal increase in the delinquency rate. As discussed in Chapter 2, for a given volume of total loan portfolio \((L)\), increases on the interest rate will have a positive effect on profits only when the interest rate is set at levels located in the ascending section of the Stiglitz-Weiss curve. Also, there will be an optimal interest rate that maximizes profits. Increases beyond this threshold will reduce profits.
Additionally, given \( r_0 \) and \( d_o \) in Equation (5.37), if \( \rho = 0 \) all loans are repaid and the performing loan portfolio is equal to the total portfolio. Under this scenario, the financial intermediary gets the highest possible level of profits. Otherwise, if \( \rho = 1 \), not a single loan is repaid and the FI not only loses all the money disbursed as principal \( (L) \) but also has to pay the costs of mobilizing deposits. Moreover, the balance sheet defined in Equation (5.1) implies that only the proportion of deposits and equity invested in government bonds \( (B) \) is saved when all \( L \) is lost. Then, the proportion \( \frac{L}{B+L} \), which is the share of the loan portfolio in total assets, is a good indicator about the trust that the financial intermediary has in its own lending technology, given the state of nature \( (r_0, d_o, b_o, N, \gamma) \).

Now, let us turn the attention to the determinants of the delinquency rate, to show how this simple framework allows the introduction of another important information problem: the opportunistic behavior of the lender. Plugging the definition of \( n \) from Equation (5.7) (i.e., \( n = q + u \)) in Equation (5.36):

\[
\rho = \frac{q}{q + u} F_q \left[ (1 + r_0) \frac{L}{q + u} \right] + \frac{u}{q + u} F_u \left[ (1 + r_0) \frac{L}{q + u} \right]
\]

Equation (5.38) tells that the delinquency rate of the total loan portfolio (ex-post quality) is given by a linear combination of the default rate of the loans classified by type of application (ex-ante quality). If the delinquency rate of either type \( F_j[\cdot] \) increases,
then $\rho$ increases. The assumption that $f_u \left[ \frac{\psi}{q+u} \right]$ is second-order stochastic dominated by $f_q \left[ \frac{\psi}{q+u} \right]$ implies, as Equation (5.14), that $\int_{-\infty}^{\psi} F_u(v) dv > \int_{-\infty}^{\psi} F_q(v) dv$. This means that the probability of default of the unqualified loans accumulates more rapidly and that, consequently, these loans are riskier. But, in order for $f_u \left[ \frac{\psi}{q+u} \right]$ to be a mean-preserving spread of $f_q \left[ \frac{\psi}{q+u} \right]$, the level of $F_u[\cdot]$ has to be at some values lower than $F_q[\cdot]$. This is shown in Figure 5.1 when $y_i > \mu$, where a normal distribution is assumed.

If that family of distributions would represent the income distribution of applications, then the delinquency rate would be expected to be higher for the unqualified than for qualified applications ($F_u[\cdot] > F_q[\cdot]$). As a consequence, increasing the number of unqualified borrowers increases the FI’s credit risk. However, if the FI would be giving out loans that are bigger than the expected mean income, namely when $(1 + r_0)L > \mu$, then the expected delinquency rate would be lower for the unqualified than for the qualified applications ($F_u[\cdot] < F_q[\cdot]$). However, this size of loans implies that the lender would be over-indebting its clients, while the credit risk accepted would be beyond prudent limits.

This environment opens the possibility for the opportunistic behavior of the lender. Moreover, the financial intermediary would be prone to this type of gambling when it knows that if things go right it can pocket very high profits, and if things go
wrong it will be bailed out by the financial authorities (McKinnon, 1989). This implies the lender’s moral hazard against the taxpayers.

From Equation (5.8), the number of loans that come from qualified and unqualified applications \((q\text{ and } u)\) are a function of the parameters of the lending technology \(\omega_q\) and \(\omega_u\) and the market conditions \(N\) and \(\gamma\). Then, Equation (5.36) can be written as:

\[
\rho = \rho(L; \omega_q, \omega_u, r_0, N, \gamma)
\]  

(5.39)

The fact that all five parameters are given at the beginning of the period implies that \(\rho\) is a function of one choice variable \(L\), two parameters that define the lending technology, \(\omega_q\) and \(\omega_u\), and three parameters that define the market conditions, \(r_0\).

The intuition behind the influence of these determinants is straightforward. The efficiency of a lending technology is largely given by its screening capacity \((\omega_q, \omega_u)\). If the probability of qualified applications getting a loan \((\omega_q)\) increases, then \(\rho\) (ex-ante) decreases. In turn, if the probability of granting loans to unqualified applications \((1 - \omega_u)\) increases, then \(\rho\) increases. In addition, given a number of applications \((N)\) and a probability of getting an application from a qualified project \((\gamma)\), the lending technology \((\omega_q, \omega_u)\) defines the number of loans granted and the average loan size.

When the conditions of the economy deteriorate, it may be ambiguous if the total number of applications \((N)\) increases or decreases but, from the adverse selection
problem, it is certain that the probability of getting an application coming from a qualified project ($\gamma$) decreases.

While in the model all five parameters are given, in reality, the lender has the ability to influence these parameters over time. Consequently, improvements of the lending technology would mean that the financial institution is reducing the probability of committing Type I and Type II errors in the screening process (i.e., the probability of rejecting qualified applications and accepting unqualified ones).

Improvements in the lending technology are acquired through knowledge gained in practice. Some types of institutions enhance this learning process by the very nature of the lending technology and their institutional culture. In fact, loan officers in general learn how to assess better the applications over time. However, learning associated with repetition of essentially the same problem is subject to sharply diminishing returns. To have superior performance implies that the sources of learning “must themselves be steadily evolving rather than merely repeating” (Arrow, 1962).

A loan officer of a bank, who applies a lending technology based exclusively on fixed proportions of collateral to debt, will exhaust his learning more rapidly than a loan officer of an institution that applies a microfinance lending technology. This occurs because the information opaqueness that characterizes the microfinance screening process constantly forces the loan officer to adopt new improvements and enhances the learning process. Paradoxically, more transparent information wanes the learning process. In fact, the lack of hard data forces the acquisition of a sense to make
successful business assessments, which is cumbersome to do in an environment that constantly changes. In fact, it has been said that microfinance is an extreme case of learning by doing (Villafani-Ibarneagaray and Gonzalez-Vega, 2007).

Recalling equation (5.35):

$$E(\Pi_L) = (r_0 - d_o) L - (1 + r_0) L \left\{ \frac{q}{n} F_q \left[ \frac{(1 + r_0) L}{n} \right] + \frac{u}{n} F_u \left[ \frac{(1 + r_0) L}{n} \right] \right\}$$  \hspace{1cm} (5.40)

Summarizing, the lending activity is assumed to be risky. The fulfillment of the borrower’s repayment promise depends on the state of nature, which will define the realized level of the borrower’s income ($y_i$). It also depends on the lender’s ability to screen loan applications successfully ($\omega_q, \omega_u$) and the disbursement of loans that are adequate in size $\left( \frac{L}{n} \right)$, given the prevailing interest rate ($r_0$). That is, the FI’s capacity of generating profits from its lending relies on its technology and, then, on the role of nature.
5.1.2 Profits from investing in government bonds

As stated in Equation (5.1), the model assumes that the intermediary has to choose the optimal asset combination of government bonds and total loan portfolio. Government bonds are assumed to be risk-free. The combination of expected profits and levels of risk in the intermediary’s objective function is ignored, for the sake of simplicity and without loss of generality.

Specifically, at the beginning of the period, the FI buys a single, non-installment bond with a maturity of one period, for an amount $B$. At the end of the period, the government pays the principal invested plus interests at a bond interest rate, $b$, which is determined exogenously. Then, the FI’s revenue for buying government bonds is $bB$ while its costs are given by the interest rate paid on deposits, $d_0B$.

That is, the FI’s expected profits for buying government bonds is:

$$\Pi_B = bB - d_0B$$

$$E(\Pi_B) = (b - d_0)B$$

It is assumed that the bond interest rate is lower or equal to the loan interest rate, making the lending activity worthwhile. In turn, the bond interest rate is higher or equal to the deposit interest rate. As a consequence:

$$d_0 \leq b_0 \leq r_0$$
5.1.3 The financial regulator’s objective

There is a financial regulator, whose main objective is to protect the intermediation and monetary functions performed by the financial system. The financial authority tries to maximize the financial deepening achieved in the system, represented here by the size of the loan portfolio \( L \), while protecting the deposits of the public \( D \).

The model assumes that the financial authority has only one instrument to induce the prudent behavior of the intermediary: the capital adequacy ratio \( \alpha \).

This instrument represents a ceiling on the volume of risk-weighted assets that the FI’s equity is permitted to leverage. Given the balance-sheet identity shown in (5.1), \( L + B = D + E_0 \), this \( \alpha \) measures the proportion of deposits that the intermediary can mobilize for a given level of its equity. This implies that:

\[
\alpha E_0 = D + E_0 \tag{5.44}
\]
\[
D = (\alpha - 1)E_0 \tag{5.45}
\]

Since government bonds are assumed to be risk-free, the risk weight for this type of asset is one. In turn, the riskiness of the lending activity is captured by the delinquency rate. This rate is a weighted average of the default rate on the loans, classified by their loan application quality. If the risk weight for the total loan portfolio is denoted by \( \phi \):

\[
\phi = \frac{\sum_{i} f_i \phi_i}{\sum_{i} f_i}
\]
\[
\phi = (1 - \rho)
\]  
(5.46)

Then, from the definition of \( \rho \) in Equation (5.36), \( \phi \) is:

\[
\phi = 1 - \left\{ \frac{q}{n} F_q \left[ (1 + r_0) \frac{L}{n} \right] + \frac{u}{n} F_u \left[ (1 + r_0) \frac{L}{n} \right] \right\}
\]  
(5.47)

As a consequence, the capital adequacy ratio is given by:

\[
\alpha \geq \frac{\phi L + B}{E_0}
\]  
(5.48)

where:

\[
E_0 > 0 \ ; \ \alpha \geq 1 \ ; \ 0 \leq \phi \leq 1
\]

A less efficient lending technology rejects a greater proportion of qualified loan applications, while granting more loans to unqualified applications, and in the process disburses an inadequately larger size of loans (that is, it induces the overindebtedness of the borrowers) to a smaller number of clients (with a higher risk concentration in the loan portfolio). In the end, it produces a riskier loan portfolio, which is penalized by the capital adequacy ratio with a lower leverage of the FI’s equity.

Thus, the model introduces a scheme of incentives that align the objectives of the regulator and the intermediary. However, when there are several intermediaries in the system, it will be shown that the regulator should use different capital adequacy requirements if it wants to avoid unnecessary restrictions on financial deepening. Indeed, if the regulator does not establish a set of \( \alpha \) that respond to the differences in
the lending technologies and the associated risk profiles, it will introduce a distortion against the more efficient lending technologies.

The intermediaries that are implementing the more efficient lending technologies will generate a portfolio that will be under-expanded in comparison to a social optimum, while the pooling regulation would favor the institutions that are implementing the less efficient technology (that is, a technology that is not an appropriate match for the market segment where they operate), thereby allowing an over-expansion of their loan portfolio.

5.1.4 The lender’s optimization problem

Given the sources of profits for the financial intermediary, represented by the functions $E(\Pi_L)$ and $E(\Pi_B)$ in Equations (5.40) and (5.42), the FI’s total expected profits are:

$$E(\Pi) = E(\Pi_B) + E(\Pi_L)$$

$$E(\Pi) = (b_0 - d_o)B + (r_0 - d_o)L$$

$$- (1 + r_0)L \left\{ \frac{q}{n} F_q \left[ (1 + r_0) \frac{L}{n} \right] + \frac{u}{n} F_u \left[ (1 + r_0) \frac{L}{n} \right] \right\}$$

Since the interest rates on loans and deposits are parameters determined exogenously, the financial intermediary follows the criterion of maximization of the
expected profit function by choosing the size of the total loan portfolio. Formally, the
FI’s decision, given a regulatory environment, can be represented as:

\[
\max_{L,B} E(\Pi) = (b_0 - d_o)B + (r_0 - d_o)L \\
- (1 + r_0)L \left\{ \frac{q}{n} F_q \left[ (1 + r_0) \frac{L}{n} \right] + \frac{u}{n} F_u \left[ (1 + r_0) \frac{L}{n} \right] \right\}
\]

Subject to:

\[
\phi L + B \leq \alpha E_0 \\
L \geq 0 ; B \geq 0
\]

Where:

\[
E_0 > 0 ; D > 0 \\
N > 0; 0 \leq \gamma \leq 1 \\
0 \leq \omega_q \leq 1 ; 0 \leq \omega_u \leq 1 \\
r_0 \geq 0 ; 0 < d_o < b_o < r_0
\]

Then, assuming that \( L^*, B^*, \lambda^* \) is an optimal solution to the optimization problem, the Karush-Kuhn-Tucker Lagrangean is given by:

\[
\mathcal{L}(L, B, \lambda) \equiv (b_0 - d_o)B + (r_0 - d_o)L \\
- (1 + r_0)L \left\{ \frac{q}{n} F_q \left[ (1 + r_0) \frac{L}{n} \right] + \frac{u}{n} F_u \left[ (1 + r_0) \frac{L}{n} \right] \right\} \\
- \lambda(\phi L + B - \alpha E_0)
\]

The first-order condition for an optimum (f.o.c.) with respect to \( L \) is:

\[
\frac{\partial \mathcal{L}}{\partial L} = (r_0 - d_o) - (1 + r_0) \left\{ \frac{q}{n} F_q [] + \frac{u}{n} F_u [] \right\}
\]
\[-(1 + r_0)L \left\{ \frac{q}{n} F'_q \cdot (1 + r_0) \frac{1}{n} + \frac{u}{n} F'_u \cdot (1 + r_0) \frac{1}{n} \right\} - \lambda \phi \leq 0 \]

From Equation (5.36), this is equivalent to:

\[
\frac{\partial L}{\partial L} = (r_0 - d_o) - (1 + r_0)\rho - (1 + r_0)L \frac{\partial \rho}{\partial L} - \lambda \phi \leq 0 \quad (5.54)
\]

\[
\frac{\partial L}{\partial L} = (r_0 - d_o) - (1 + r_0) \left[ \rho + L \frac{\partial \rho}{\partial L} \right] - \lambda \phi \leq 0 \quad (5.55)
\]

The f.o.c. require that:

\[
L \cdot \frac{\partial L}{\partial L} = L \cdot \left\{ (r_0 - d_o) - (1 + r_0) \left[ \rho + L \frac{\partial \rho}{\partial L} \right] - \lambda \phi \right\} = 0 \quad (5.56)
\]

The f.o.c. with respect to B are:

\[
\frac{\partial L}{\partial B} = b_0 - d_o - \lambda \leq 0 \quad (5.57)
\]

\[
B \cdot \left( \frac{\partial L}{\partial B} \right) = B \cdot (b_0 - d_o - \lambda) = 0 \quad (5.58)
\]

Finally:

\[
\frac{\partial L}{\partial \lambda} = \phi L + B - \alpha E_o \leq 0 \quad (5.59)
\]
\[
\lambda \cdot \frac{\partial L}{\partial \lambda} = \lambda (\phi L + B - \alpha E_0) = 0 \quad (5.60)
\]

In Equation (5.60), if \( \lambda > 0 \), it implies that:

\[
\phi L + B = \alpha E_0 \quad (5.61)
\]

Or equivalently, by Equation (5.44), it implies that:

\[
\phi L + B = L + B \quad (5.62)
\]

This only holds if \( \phi = 1 \), or equivalently, if the delinquency rate is zero (\( \rho = 0 \)).

Such scenario is unrealistic for modeling the lending activity, which by nature is risky.

Then, \( \lambda > 0 \) is not a feasible solution.

In contrast, assuming that \( \lambda^* = 0 \) implies that:

\[
\phi L^* + B^* < \alpha E_0 \quad (5.63)
\]

This implies that, for an optimum:

\[
\phi L^* + B^* < L^* + B^* \quad (5.64)
\]

If \( \phi < 1 \), then there is some portfolio in default (\( \rho > 0 \)). Moreover, if \( \lambda^* = 0 \), from Equation (5.58):

\[
B \cdot (b_0 - d_0) = 0 \quad (5.65)
\]

If \( B = 0 \), it implies that the financial intermediary does not carry government bonds, because the marginal revenue of buying bonds is less than the marginal cost:

\[
b_0 < d_0 \quad (5.66)
\]
This possibility is ruled out by Equation (5.43), making such a value of \( B \) unfeasible.

Then, condition \( B^* > 0 \) must hold.

Now, let’s turn the attention to Equation (5.56). If \( \lambda^* = 0 \), this equation can be written as:

\[
\begin{align*}
    r_0 - d_o - (1 + r_0) \left[ \rho + L \frac{\partial \rho}{\partial L} \right] &= 0 \\
    d_o &= r_0 - (1 + r_0) \left[ \rho + L \frac{\partial \rho}{\partial L} \right] 
\end{align*}
\]  

(5.67)  

(5.68)

From Equation, for maximum expected profits:

\[
\begin{align*}
    b_o &= r_0 - (1 + r_0) \left[ \rho + L \frac{\partial \rho}{\partial L} \right] \\
    b_o &= r_0 - (1 + r_0) \left[ \frac{\rho + L \frac{\partial \rho}{\partial L}}{\rho} \right] \rho \\
    b_o &= r_0 - (1 + r_0) \left[ 1 + \frac{\partial \rho}{\rho L} \right] \rho
\end{align*}
\]  

(5.69)  

(5.70)  

(5.71)

For the case when \( L^* > 0 \) and \( \rho(L^*) > 0 \) it is possible to write the second term in the square brackets in Equation (5.71) as the logarithmic derivative:
\[ b_o = r_o - (1 + r_o) \left[ 1 + \frac{\partial \ln \rho}{\partial \ln L} \right] \rho \]  

(5.72)

The logarithmic derivative can be defined as the elasticity of \( \rho \) with respect to \( L \), denoted here as \( \epsilon_{\rho,L} \), to refer to the percentage change in the delinquency rate induced by a (small) percentage change in the loan portfolio. Then:

\[ \epsilon_{\rho,L} = \frac{\partial \ln \rho}{\partial \ln L} \]  

(5.73)

Substitutions lead to:

\[ b_o = r_o - (1 + r_o) [1 + \epsilon_{\rho,L}] \rho \]  

(5.74)

Finally, this is equivalent to the following expression, which represents the condition for profit maximization when the parameters are allowed to vary:

\[ b = r - (1 + r) [1 + \epsilon_{\rho,L}] \rho \]  

(5.75)

5.2 Lender’s investment rule

Equation (5.75) provides an investment rule to determine the proportion of assets that are allocated into loans and bonds, given the state of nature and the lending technology implemented by the intermediary. According to this rule, the intermediary should hold bonds and a loan portfolio in the proportion that equates the marginal profits from bonds with the marginal profits from loans. These two functions can be
drawn in a quadrant that has risk-weighted assets in the horizontal axis and marginal profits in the vertical axis.

The assumption that the government bonds are risk-free makes their marginal profits constant. This is depicted in Figure 5.2 as the red horizontal line that intersects the vertical axis at the bond interest rate, $b_0$.

![Figure 5.2: Marginal profits](image)

Figure 5.2: Marginal profits
In contrast, the delinquency rate makes the marginal profits on the loan portfolio to decline monotonically as the size of the loan portfolio expands. This occurs because lending is a risky activity, based on future repayment promises that are contracted with imperfect, incomplete and asymmetric information. Consequently, as the loan portfolio increases (ceteris paribus), the ex-ante probability that all borrowers will fulfill their repayment promise decreases, since the lender will inevitably disburse loans to unqualified borrowers that should have rejected.

Even if the number of borrowers does not change with the increasing loan portfolio, then average loan size will have to increase. This will reduce the probability that the income results for the borrower will be sufficient to cover the obligation. Therefore, the delinquency rate increases, reducing the profits adjusted for risk earned by the lender. This is shown by the decreasing blue curve in Figure 5.2.

Since $L$ is strictly positive, the curve does not intercept the vertical axis, but it approaches $r$ when the loan portfolio gets close to zero ($L \to 0$). The slope of the curve is given by the combination of the lending technology and the conditions existing in the market; that is, it is determined by the characteristics of the pool of applicants and by the lender’s ability to identify them. In essence, this slope is determined by the elasticity of the rate of default with respect to the size of the loan portfolio.
Equation 5.75 describes the resulting kinked marginal profits curve depicted in gray in Figure 5.2. Thus, the investment rule produces a curve with two segments, associated to the marginal profitability of each asset. In the first segment, the marginal profits on the loan portfolio are higher than those from the bond portfolio. This results in the downward-sloping portion of the curve. In the second segment, the marginal profits of the bond portfolio are higher than the marginal profits generated by the loan portfolio, resulting in a kink in the curve.

Consequently, if the regulation allows it, the lender will hold a loan portfolio that, after delinquency, results in a performing loan portfolio of size $\phi L$. The marginal profits from the two types of assets are equated for this size of the loan portfolio. From that point onwards, the lender will prefer to hold bonds.

The actual size of the bond portfolio will depend, however, on the regulation constraint and the lender’s level of equity. For a given amount of equity $E_0$, if the minimum capital adequacy ratio is set at $\alpha$ by the regulator, the total assets weighted by risk will be of size $\alpha E_0$, and the size of the bond portfolio will be of size $\alpha E_0 - \phi L$.

The asset allocation will vary if the conditions of the market change. For instance, when the interest rate increases, ceteris paribus, adverse selection makes the slope of the marginal profits curve become steeper. This indicates that the additional profits made by carrying loans instead of bonds are exhausted quicker, because of the reduction in the quality of the pool of borrowers. In turn, if the interest rate declines, the gap between $r$ and $b$ declines, but the slope of the first segment of the curve also
declines. In this case, the kink shifts to the right (away from the origin), reflecting the additional profits that the loan portfolio can make because of a better quality of the pool of applications and a reduction in the riskiness of the loan portfolio.

Similar changes are produced in the slope of the first segment of the curve when the elasticity of the delinquency rate with respect to the loan portfolio varies or when the delinquency rate increases. This effect is particularly relevant in analyzing when systemic shocks occur in the economy, which is described in the next section.

5.3 Effect of systemic shocks on asset allocation

When a systemic shock hits the economy, the distribution of possible incomes for both qualified and unqualified applicants shifts towards the origin. The size of the shift will depend on the severity of the shock, as described previously in Figure 3.5. The systemic shock changes the conditions upon which the existing portfolio was allocated, such that the borrower is exposed to a level of credit risk that is unacceptable and it changes the loan contract conditions for future applicants.

The speed at which these changes occur depends on the lender’s ability to recognize the shock, which is linked to the managerial ability of the institution and the flexibility that characterize the lending technology and the market niche where the clients operate.

After a systemic shock, credit risk increases for all intermediaries. Those that have a greater ability to adjust to the new market conditions will experience less change
in the slope of the curve. The shift will reflect the resilience of the specific borrowers and lending technology to the shock. Large changes in the slope will reflect lending technologies and borrowers that are very rigid and slow in their reactions to systemic shocks.

5.4 **Lending Technology: two financial intermediaries – one period**

In this section, the model is enriched by considering two intermediaries working with different lending technologies. The diversity on lending technologies is rooted in the fact that information acquisition and contract design are costly and various types of lenders use different options to deal with these problems (Gonzalez-Vega, 1998b).

The marginal profits curve for the loan portfolio will vary according to the characteristics of each lending technology. In the model, the lending technology is determined by the combination of the screening skills of the lender \((\omega_q, \omega_u)\). Thus, different intermediaries will have different curves depending on the values of these parameters, given the same pool of applicants. A rapidly descending curve will correspond with an inferior (less efficient) lending technology, which exhausts the gap between the loan’s marginal profits and the bond’s marginal profits rapidly. In turn, a superior lending technology is capable of screening more efficiently its pool of loan applications. In this case, the superior lending technology will be reflected in a loan’s marginal profits curve that descends less rapidly and that intersects the bond’s marginal profits at a higher size of the loan portfolio.
Figure 5.3 shows the MFI marginal profit curve (depicted in green) and the bank marginal profit curve (in blue). The empirical evidence presented in Chapter 4 for Bolivia suggests that microfinance institutions have better screening procedures (higher values of $\omega_q$ and $\omega_u$) and a lower credit risk exposure (lower $\rho$) and that they have, therefore, the potential to allocate a higher proportion of their total assets into a loan portfolio.

This happens because the superiority of their lending technology allows MFIs to exhaust their loan marginal profits more slowly than banks. As a consequence, the curve of the MFI’s loan portfolio marginal profit reaches the bond’s marginal profits at a higher level of the loan portfolio adjusted by risk ($Q^M_L > Q^B_L$). In Figure 5.3, the MFI’s kink in their asset allocation occurs to the right of the bank’s kink.

![Image of marginal profits curve](image)

Figure 5.3 Curve of marginal profits of two different lending technologies
Consequently, the MFI will allocate a higher proportion of its assets in loans (that is, $\phi^{MF}L^{MF} > \phi^{B}L^{B}$) or, equivalently, the bank will allocate a higher proportion of its assets in government bonds ($[\alpha E_0 - \phi^{B}L^{B}] > [\alpha E_0 - \phi^{MF}L^{MF}]$). This result is consistent with the evidence observed in Bolivia, where the MFIs’ loan portfolio represents a higher proportion of their assets, relative to banks.

5.5 Pooling versus separating regulatory regimes

The financial authorities must achieve two goals with one instrument. Prudential regulators want, on the one hand, to minimize the probability that the financial system will become insolvent (and this typically involves reducing the volatility of its results), while on the other hand, the authorities want to expand financial deepening, order to promote economic growth and achieve other objectives, such as the breadth of outreach of the system. Achieving this balance is difficult with just one instrument, and major trade-offs are involved in the exercise. Indeed, optimum intervention theory suggests that for an outcome to be efficient, the number of instruments has to equate the number of goals.

However, given a level of safety for the system, the authorities want the maximum degree of financial deepening that is possible. The regulatory norms should induce a behavior of the different types of intermediaries conducive to this result. The
question is if a separating regulation will have the power to induce behavior that comes closer to this optimum than the behavior that results from a pooling regulation.

This already problematic dilemma is accentuated by the fact that the regulator is attempting to achieve these goals while working with imperfect information about the intermediaries that it regulates and whose behavior it wants to modify. In particular, the authorities do not know the true riskiness of the portfolio of each intermediary or the riskiness of a portfolio regulated when using different lending technologies. Lenders willing to behave opportunistically have enough incentives not to truthfully reveal their riskiness and actions.

Collecting information to improve its decisions and the design of regulation is costly for the regulator. For instance, developing a body of financial supervisors capable of monitoring the risk of different types of intermediaries, assessing the transparency and accuracy of the financial information reported, and conducting inspections in-situ and extra-situ are expensive activities that can only operate efficiently in a specialized institutional framework.

As a consequence of these costs, the regulator has to make decisions base on an incomplete set of information. The amount of information that the authorities are willing and able to collect will define the set of regulatory norms that they can impose on the system. Usually this implies that the regulator only manages to define and enforce one set of rules and that all institutions have to comply with the uniform norms, despite differences in the risk profile of their portfolios. Imposing a unique set of rules is
not efficient, however, as it introduces an artificial fragmentation in the market, increasing credit rationing and reducing social welfare.

The riskiness that characterizes the intermediation functions of banking, in the broadest sense, makes it difficult for the authorities to promote the expansion of the financial system as much as possible, while inducing prudence. The authorities have no choice but to decree limits on acceptable risk exposure that, at least in the short run, constrain the development of a portfolio.

Setting one-for-all rules is sometimes regarded as a sign of regulatory fairness, because no intermediary receives special treatment. This would indeed be the case if all financial institutions were equal and, consequently, a unique set of rules would treat them symmetrically. However, when the authorities impose equal limits to a heterogeneous pool of financial intermediaries, they impose an asymmetric regulation.

The implementation of a unique rule may reflect the difficulty for the regulator in distinguishing among institutions. A one-for-all regime emerges even when the regulator is aware of the differences among institutions, but it decides to adopt a unique rule because it is too expensive to implement differentiated regimes. This could also be the case when the regulator does not have the supervision technology to enforce separated regimes. Further, the regulator may observe heterogeneous performance but may not be able to determine the sources of the heterogeneity or to establish parameters to implement separate regulatory regimes.
In any case, regulators should recognize that financial institutions are heterogeneous and that dissimilar financial performance comes largely from differences in several dimensions: (1) risk propensity, (2) types of clients reached (urban versus rural, formal versus informal and so on), (3) types of collateral accepted, (4) sources of incentive compatibility to enforce the loan contract, and (5) value of the relationship with the intermediary for the clients, among others. Each one of these factors has complex effects on the performance of intermediaries. In summary, the regulation should aim at inducing the lender to achieve an optimal match between lending technologies and risk profiles. However, the implementation of a one-for-all set of rules for all financial institutions inevitably produces regulatory asymmetries.

For instance, when the requirements about loan-loss provisions are unnecessary high, borrowers will be charged interest rates that are unnecessarily high. This not only will constrain investment but, as a consequence of adverse selection particularly the less risky applicants will leave the credit market, reducing the quality of the pool.

Financial intermediaries that possess an adequate lending technology will recognize the lower quality of the pool of applications and will engage in more strict non-interest credit rationing. This will limit the degree of financial deepening. In turn, institutions that do not have an adequate lending technology will erroneously accept higher proportions of riskier clients and end up holding loan portfolios with a higher probability of default. Thus, in one case the authority’s objective of financial deepening
is compromised. In the other, their stability objective, based on the quality of the loan portfolio, is compromised.

In turn, if the capital adequacy ratio is unnecessarily restrictive, financial intermediaries will be forced to settle for a loan portfolio that is smaller than the conditions of the economy would have permitted otherwise and financial deepening suffers. In contrast, if the capital adequacy ratio is too lax, then financial intermediaries with political clout or too-big-to-fail expectations will find themselves encouraged to expand their portfolios, raising their gamble against the State.

The effect that the minimum capital adequacy ratio will have on the market will depend on the level set by the financial authorities. There are three possible cases.

5.5.1 Case I: Regulation binding for both lending technologies

A first case occurs when $a_0E$ lies to the left of the kink for both marginal profits curves, as shown in Figure 5.4. In this case, the financial authorities are conservative (that is, the stability of the system and the prevention of insolvency carry a high weight in their objective function). As a result, they set a restrictive capital adequacy ratio, such that both banks and microfinance institutions are induced to chose loan portfolios at levels below what they would be willing to have, given the capacity of their lending technologies and market conditions. Under this scenario, financial deepening is strongly affected, particularly because of the limit set on microfinance institutions.
Figure 5.4 Case I: Minimum capital adequacy ratio limits both intermediaries

If the behavior of the authorities were explained, however, by the possibility of the opportunistic behavior on the part of the lenders, the more strict capital adequacy ratio may be an attempt to bring about a socially optimum size of the loan portfolios, which would be lower than the size that private opportunistic bankers would like to develop. In Figure 5.4 it is assumed, nevertheless, that such discrepancies between private and social costs do not exist and that the marginal profit curves represent both private profits and an indication of the social surpluses generated by the lending activity. These surpluses would reflect, in this model, the potential incomes adjusted for
risk that the productive opportunities of the borrowers can generate. A reduction of the portfolios induced by the prudential norm would imply that some borrower projects with marginal rates of return above the interest rate on bonds will not be funded.

The strong prudence exercised by the financial authorities in this case may produce, therefore, efficiency losses, which are measured by the area bounded below the marginal profits curve, above the bond’s marginal profits line and to the right of the capital adequacy ratio line.

Given the double objective of stability and financial deepening, some losses of efficiency are the price to be paid for a given level of stability. The problem with the pooling regulation depicted in Figure 5.4 is that the price of stability is too high and the regulation may even be counterproductive. The reason is that the restrictive capital adequacy ratio opens a wedge between the marginal profits of banks compared with the marginal profits of MFIs. Thus, a reduction in the capital adequacy ratio would increase surpluses to a larger extent in the institutions that implement a microfinance technology than in those with a traditional banking technology. This means that a less stringent regulation for microfinance than for banks (lower the capital adequacy ratio for the former and increasing it for the latter) would increase social surpluses, for a given level of financial stability. The efficiency losses levied on microfinance are greater than those levied on the banks.
5.5.2 Case II: Non-binding regulation

The opposite case occurs when the capital adequacy ratio is very lax and the restriction $\alpha_0 E$ lies to the right of the kink of both intermediaries’ curves, as shown in Figure 5.5. In this case, the market for bonds is sufficient for disciplining the intermediaries. Both lenders would be capable of exhausting the profits from their loan portfolios, choosing levels $L^B*$ and $L^{MF*}$. The remaining deposits mobilized will determine the amount of bonds bought ($B^* = D - \phi L^*$). Under this scenario, the minimum capital adequacy ratio set by the authorities is not binding and it does not artificially limit financial deepening.

Figure 5.5: Case II: Market of bonds sufficient to discipline the credit market
5.5.3 Case III: Regulation is binding only for intermediaries with a superior lending technology

A third possible case will occur when the financial authorities set the maximum equity leverage $\alpha E$ between the asset holdings corresponding to the kink of the bank’s marginal profits curve and the MFI’s marginal profits curve. This may be the case when the authorities believe that there is a unique curve characterizing both types of intermediaries; that is, when the authorities cannot distinguish the risk profiles generated by the two technologies.

The “intermediate" curve estimated by the authorities is depicted in purple and denoted by $\tilde{f}(\cdot)$ in Figure 5.6. Under these conditions, the banks are allowed to carry as much loan portfolio as they want and the remaining deposits mobilized are allocated into government bonds. The microfinance institutions, however, are cut short in the expansion of their loan portfolio. The MFIs have to settle for a loan portfolio of size $\alpha E$, where the marginal profits coming from their lending activity are still above the interest rate on bonds. In this case, the minimum capital adequacy ratio set by the authorities is suboptimal. Again, it opens a wedge between the marginal profit rate of the banks, allowing them to expand, and the marginal profit rate for microfinance, inducing them to carry a smaller portfolio, given the lending technologies and market conditions. This creates efficiency costs and distortions in the composition of the financial system.
5.6 Separating regulation

Financial authorities that understand that pooling regulations produce losses in efficiency will be interested in adopting a separating regulatory framework. The key element that has to be considered in distinguishing the risk profiles among intermediaries is the lending technology implemented.
The model developed in this dissertation suggests that setting capital adequacy ratios that aim to match the true riskiness of the portfolios of the intermediaries will improve social welfare and, in particular, will allow microfinance institutions to exhaust the lending opportunities provided by the market. This matters, in particular, when the breadth of outreach of the system (access) is a concern.

Figure 5.7: Separating regulation: minimum capital adequacy ratio according to risk profile for normal times
Figure 5.7 shows one case when the prudential authorities design a set of lax rules that allow banks and microfinance institutions to exhaust their lending opportunities, at different levels of equity leverage ($\alpha^{MF} > \alpha^B$), such that banks can achieve a loan portfolio $\phi^B L^B$ and MFIs $\phi^{MF} L^{MF}$. Because the marginal profit rates of the two types of lenders are equated, the regulator does not introduce artificial fragmentation in the system. The regulatory environment presented in Figure 5.7 may reflect the case of a financial market operating in normal times. However, if a systemic shock hits the market, the regulator may be more concerned with financial stability rather than with the expansion of financial deepening.

After a systemic shock, the authorities may decide to become more conservative and make the capital adequacy ratio to be binding for both intermediaries. When they use a single level of the capital adequacy ratio (pooling regulation), they should be aware that they would be introducing artificial fragmentation in the market. Thus, the regulator should design a separating regulation and aim at inducing the choice of a loan portfolio for which marginal profits are the same for both types of intermediary. This is shown in Figure 5.8.
Figure 5.8: Separating regulation: minimum capital adequacy ratio according to risk profile after a systemic shock
CHAPTER 6

CONCLUSIONS AND POLICY RECOMMENDATIONS

There is a strong social interest in the development of an efficient and stable financial system. The efficient delivery of financial services performs a number of functions, critical for the integration and smooth operation of all other markets, the reduction of transaction costs and improved allocation of available resources, the less costly management of risk, the distribution of income, and economic growth.

While the reverse causality, through the influence of economic growth on the evolution of the financial system itself, has also been explored, numerous empirical studies have identified a strong influence of financial deepening on economic growth. While financial deepening may also contribute to macroeconomic stability, the empirical evidence about this positive influence has been less abundant (Roa, Cermeno, and Gonzalez-Vega, 2006).

Thus, the authorities have a strong interest in designing and implementing an appropriate framework of regulation and supervision, given the strong positive and negative externalities associated with the performance of the financial system. The
design of this framework is not, however, an easy task. Because of the potentially threatening spillover of financial crises on the performance of the real sector of the economy, the prudential authorities have been particularly concerned with the soundness and safety of financial intermediaries, mostly the stable performance of the banks but, as the recent mortgage crisis in the United States suggests, also with the behavior of other types of financial intermediaries.

At the same time, particularly in developing countries, financial deepening is a critical component of strategies for the acceleration of economic growth. Moreover, given the traditional exclusion of marginal clienteles from access to formal financial services, improvements in outreach, such as through microfinance, are critical for a more broad-based process of economic development.

In pursuing these multiple objectives, the financial authorities face the challenge of balancing, on the one hand, the goal of promoting financial deepening, through competition, the multiplication of innovation, and growth-enhancing combinations of risk and returns, with, on the other hand, the goal of protecting the stability of the core functions of the system (in particular the payments system) and avoiding systemic crises. The choice of the appropriate combination of instruments of regulation and supervision to achieve this dual purpose is particularly challenging in environments characterized by major and sustained systemic shocks to the economy and active innovation in financial markets. Further, an appropriate framework may be needed for
the regulation of non-bank activities, such as microfinance, when the associated profile of risk differs from traditional bank client profiles. This dissertation offers a theoretical framework and some empirical evidence useful in addressing these policy trade-offs. The practice of prudential regulation and supervision in many developing countries may be improved if the results of this dissertation are considered.

In particular, a framework of prudential regulation and supervision strongly concerned with stability may create barriers to competition and it may inhibit innovation. Moreover, a framework that adopts a technology of regulation and supervision based on the monitoring of traditional banking technologies may not be appropriate for the regulation of innovative approaches, such as microfinance. The challenge for the authorities, therefore, is how to minimize these inhibiting dimensions of their efforts in avoiding systemic instability. Financial innovations, indeed, are central for the achievement of the efficiency-cum-equity outcomes that developing countries expect from the performance of their financial systems. In general, the encouragement of innovation is amply justified by their ability to ignite a cascade of positive externalities in an economy. In particular, these innovations matter if they can contribute to the alleviation of poverty and the promotion of social change, goals highly regarded in each and every society, despite cultural, social and political differences that may exist.
In addressing these questions, microfinance is a fascinating case of study, because the set of lending technologies associated with microfinance have made it possible to expand the financial frontier and reach the most vulnerable segments of the population, on the basis of innovation and ingenuity to overcome the most intimidating obstacles. This alone is an amazing achievement, which has just recently started to get mainstream recognition. The incredible expansion of this industry in countries like Bolivia and the quality of its financial indicators has recently earned the attention of an important body of literature.

Microfinance still has obstacles to overcome. By its own nature, financial intermediation is a risky activity and, in managing these risks, intermediaries must overcome the limitations of incomplete information and complex structures of incentives. This challenge demands, in the case of microfinance, improvements in efficiency on daily basis. Moreover, by working with poor clienteles who operate in the informal sector of developing countries, microfinance has to overcome additional obstacles and it must accomplish this, in environments characterized by insufficient institutional infrastructure. The key to assess microfinance’s success as a component of the financial system is to understand the lending technology that supports MFI performance.

Despite all these achievements, microfinance is a financial industry that is still not sufficiently understood by the financial authorities. The differential performance,
particularly in environments characterized by multiple, successive and cumulative systemic shocks, has puzzled the authorities and has raised questions about their regulation paradigms. The lack of understanding of the industry may translate into regulations that limit the expansion of microfinance. In effect, the incorporation of microfinance institutions into regulatory schemes designed for traditional financial institutions usually produces regulatory asymmetries that may limit the growth of their loan portfolio.

Moreover, some financial authorities used to consider microfinance institutions as a second-class type of financial intermediary, less important than commercial banks and other more traditional intermediaries. This seems to have been the case even in countries with a mature microfinance industry.

This perception seems to be changing, however, and the regulators are becoming increasingly interested in promoting microfinance. In addressing this task, the key question is if a uniform (pooling) regulation, which treated banks and microfinance institutions as if they carried the same risk profile, would actually contribute enough to the stability of the financial system or if, given significant differences between the two types of intermediaries (reflected, mostly, by key differences in their lending technologies and by their ability to recognize and address different risks), a differentiated (separating) set of prudential norms would contribute more to the goals
of financial deepening and breadth and depth of outreach in the supply of financial services.

Theoretical considerations about the welfare shortcomings of pooling equilibria, compared to separating equilibria, suggest that, if the risk profiles of bank and microfinance portfolios are different, different prudential norms should be applied. Otherwise, welfare costs would emerge from insufficient financial deepening (and, in particular, from the inhibition of innovation) and from a non-optimal structure of the financial system (where banks would be over-expanded and microfinance organizations would be under-expanded, from a social optimum perspective).

The actual experience of Bolivia indicates that the differences can be important enough for the authorities to seriously address the potential costs of the segregation. This dissertation suggests dimensions of the different risk profiles that should be taken into account by the prudential authorities in order to accomplish the best possible balance between the double goals of efficiency and stability.

Important policy implications emerge from this dissertation. First, prudential authorities interested in the development and stability of the financial system must learn to recognize differences among financial intermediaries, particularly those regarding the credit risks that each type of intermediary faces.
In this regard, the authorities must focus their attention on differences in (1) the market segment reached, (2) the loan contract terms and conditions and (3) the lending technology applied by the intermediary. While the market segment has captured some of the authorities’ attention (without a full understanding of the importance of institution-client relationships), the design of contracts and the differential comparative advantages of alternative lending technologies are equally important and have not been sufficiently understood.

Prudential regulation and supervision agencies must develop appropriate tools to assess diverse lending technologies. They have to go beyond the debt versus collateral assessment ratios and deeply understand the differences in the screening and monitoring processes associated with each lending technologies. Also, the authorities have to strength their procedures to protect the consumers of financial services. In the past, much of this protection has been concentrated on the depositors but, today, borrowers have to enjoy equal protection, particularly from predatory lenders and over-indebting practices.

Second, the financial authorities have to understand the implications of different regulatory regimes. Particularly, they have to pay attention to regulation frameworks that allow the over-expansion of inefficient lenders, while at the same time they provoke the under-expansion of more efficient ones. This dissertation develops theoretical considerations about the welfare shortcomings of pooling regulating
schemes, compared to separating regulating schemes and suggests that, if the risk profiles of their portfolios are different, different prudential norms should be applied. Otherwise, welfare costs would emerge from insufficient financial deepening and from a non-optimal structure of the financial system.

Third, the financial authorities must understand that regulatory frameworks that treat in a uniform fashion institutions that are heterogeneous, paradoxically become discriminatory interventions, which perversely segment the market. These pooling interventions create, on the one hand, a fragment that expands beyond the socially optimum size while, on the other hand, they inhibit another fragment, which cannot reach what is socially desired. Having an average instead of an optimum balance of these fragments is socially inefficient.

Finally, the topic of this dissertation should be enriched with an econometric exercise. Ideally, this effort should be replicated with panel data at the borrowers’ level for several countries and periods. Future research using this information would allow further insights into the regulatory issues presented in this dissertation. However, the exceptional richness of the panel data at financial intermediary level used here unequivocally supported the conclusions of this study, and it has allowed the derivation of important implications for those interested in exploring these issues in Bolivia and other countries with similar characteristics.
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