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ON THE IRON LAW OF INTEREST RATE RESTRICTIONS : THE RATIONING BEHAVIOR OF FINANCIAL INSTITUTIONS MATTERS.

By

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When allocating credit among borrower classes, formal financial lenders behave in predictable ways. Transaction costs, risks of default, and financial constraints and policies influence lender behavior and have a significant impact, both on access to credit by different borrower types, and on the composition of the lender's portfolio. This paper examines the impact of interest rate restrictions on rationing behavior, access to credit and portfolio concentration. Its main conclusion, the iron law of interest rate restrictions, claims that constrained interest rates redistribute credit portfolios, favoring larger, safer, and older borrowers over smaller, more innovative and riskier, newer clients, and concentrate loan portfolios in fewer hands, thus worsening the distributive consequences of differential access to credit.

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INTRODUCTION

During the past three decades, the formal financial institutions (FFIs) of the low income countries have channeled significant amounts of credit to the agricultural sector. At the same time, through legal and financial constrols, governments in most of these countries have kept the rates of interest that FFIs can charge on their loans at low levels. Within these generally low interest-rate structures, the rates charged on loans to agriculture and, in particular, those charged to small farmers have usually been preferential rates; that is, they have been lowest among the low.

Recent financial reforms in some low income countries, particularly in Latin America, but also elsewhere, while significantly increasing most interest rates, have often failed to augment the preferential rates for agriculture. As a result of these partial reforms, therefore, in these countries rate differentials have actually increased. Unfortunately, these differentials have not reflected the costs and the risks for the FFIs of lending to different borrower classes. Rather, these differentials have reflected the political will to favor some groups at the expense of others.

This paper argues that FFIs carefully consider the costs and risks associated with lending to different farmer classes and that, if forced to charge differential interest rates, which limit their degrees of freedom when adjusting the terms of their loans to different borrowers, they will adopt predictable rationing mechanisms. These rationing decisions, in turn, often have a considerable impact on the final allocation of credit portfolios and, thereby, on resource use, employment, income growth and wealth distribution in the rural areas of the low income countries.

Many apparently correct arguments have been advanced to justify these interest rate controls and frequently these preferential rates have been mandated with the best of intentions. Often, these policies have been adopted in order to promote socially desirable activities or to benefit otherwise unattended marginal groups. Unfortunately, such policies not only have not reached their intended objectives but, most frequently, they have actually resulted in consequences opposite to those desired.

By repressing savings mobilization through the formal financial system, these interest rate policies have reduced the extent of formal financial intermediation and, thereby, have led to lower rates of growth of the economy. By reducing

the size of domestic formal financial markets, these policies have augmented the importance of foreign debt as a means of financing domestic capital formation, thus increasing the dependency of low income countries. By depriving interest rates of their credit allocation functions, these policies have channeled savings to investments which are not necessarily the most socially profitable, thus reducing economic efficiency. By contributing to a greater concentration of loan portfolios, in favor of a few large borrowers, these policies have worsened income distribution in the rural areas of the low income countries.

These, possibly unexpected and unwanted, consequences have resulted, in part, from a disregard of the determinants of the market behavior of the affected economic agents, whose decisions determine, in the last instance, the final outcomes. In some instances, this has reflected a dosis of ignorance, particularly about economic behavior under disequilibrium conditions which, in the case of credit markets, is specially complex. Frequently adopted assumptions, many of them variations of Keynesian arguments, applied at a microeconomic level, have not generated valid predictions about the actual behavior of borrowers and lenders.

In other cases, the interest rate policies adopted have not been changed, in spite of the unfavorable results obtained, due to the political strength of the actual beneficiaries of the restrictions. As Kane has argued, controls, regulations, and subsidies are a powerful tool to acquire and preserve economic power. The magnitude of the subsidy granted through the preferential interest rates, to small but outspoken groups of producers, and the economic and political power which is generated through priviledged access to cheap institutional credit, seem to be the main obstacles to the adoption of more rational interest rate policies in the low income countries.

This paper explores the determinants of the behavior of borrowers and, particularly, of lenders, in the presence of interest rate restrictions. It examines the impact, both on the demand and the supply of credit, of the imposition of such controls. It explores their consequences on the final composition of institutional loan portfolios. It argues that the most likely behavior of both borrowers and lenders will lead to a redistribution of loan portfolios in favor of fewer and larger borrowers and to the exclusion from these portfolios of the smaller, riskier and less accessible borrowers. This, in turn, leads to less efficient allocations of resources, less growth and employment, and more unequal wealth distributions in the rural areas of the low income countries.

THE IMPACT OF INTEREST RATE CEILINGS: LIMITATIONS OF THE TRADITIONAL ANALYSIS.

The conventional analysis of the impact of interest rate ceilings posits a market for credit, characterized by an aggregate demand for loans, inversely related to the loan rate of interest, and an aggregate supply of deposits, directly related to the deposit rate of interest. The rate of profit of the FFIs is simply the difference between the loan rate and the deposit rate. Under the assumption of perfect competition, this rate of profit is equal to zero.

In this traditional model, the imposition of a ceiling on the loan rate leads to a decline in the rate of interest paid to depositors. As a result, less resources will be mobilized by the FFIs and their total volume of lending will decline. At the ceiling loan rate of interest, however, there will be an excess demand for credit and, it is claimed, some non-price rationing mechanism will be required to clear the market. That is, the demands of all or of some of the potential borrowers will be totally or partially frustrated.

It has been increasingly recognized that, at least in the case of agricultural credit, these rationing processes have an unfavorable impact on most producers, and that this negative impact is even more pronounced in the case of the small farmers. This prediction has been intuitively linked

to the higher risks and costs associated with lending to small borrowers. The conventional analysis, however, cannot explain how these rationing processes actually clear the market. This paper attempts to explore the actual modus operandi of these rationing mechanisms.

In particular, although the conventional model shows that depositors will be clearly worse off as a consequence of the ceiling, it does not allow to determine if all borrowers, as a group, or if specific borrower classes are better off. That is, the conventional model cannot explain how the new, smaller amount of total credit will be allocated among various borrower classes. It cannot tell us if the amounts received by specific borrowers increase or decline. As a result, it is not possible to determine the extent to which the reduction in the loan rate of interest is less than or more than compensated by a decline in the amount of the loan received. Therefore, the conventional analysis sheds little light on the impact of interest rate ceilings on the allocation of resources and on the distribution of income.

The imposition of a ceiling on interest rates will, in general, have both aggregate and distributive effects on the portfolios of FFIs. These effects will include, at least:

a. A reduction in the size of the total portfolio of assets of the FFIs. A reduction in the rate of interest paid

on deposits, which is associated with the ceiling on the loan rate of interest, reduces the ability of the FFIs to attract savings and, in general, to mobilize various kinds of resources. The reduction in the rate of profit of the FFIs, also associated with the ceiling, reduces their ability to attract equity capital. These reductions in the deposits and capital mobilized by the FFIs, in turn, reduce their ability to borrow from other financial intermediaries, given prevailing leverage rules. The total volume of resources mobilized by the FFIs declines, therefore, on these three counts.

b. A reduction in the loan portfolio of the FFIs, as different from their other non-credit investments, such as government bonds, real estate, deposits in other financial institutions, etc. Since the ceiling on the loan rates of interest reduces the relative profitability of lending, the proportion of the total portfolio of assets of the FFIs devoted to loans declines.

c. A change in the composition of the loan portfolio of the FFIs. The imposition of loan rate ceilings alters the relative profitability of loans to different borrower classes. Depending on the rationing mechanisms adopted by the FFIs, the ceilings lead to changes in the

relative shares of their loan portfolios going to different borrower classes. These portfolio redistributions usually lead to a greater concentration of the amounts loaned in favor of a smaller group of borrowers.

This paper suggests how to extend the analysis of the impact of interest rate ceilings, in order to examine their distributive implications on loan portfolios and, therefore, in order to predict their impact on income distribution and on resource allocation. To do this, it first considers alternative types of rationing and it surveys several models of credit rationing found in the literature, which shed some light on the type of rationing behavior likely to occur in the low income countries. Finally, it develops a formal model of lender behavior, in order to illustrate the possible consequences of interest rate ceilings on the composition and on the concentration of the loan portfolios of the FFIs.

TYPES OF RATIONING

Any loan has three aspects:

a. its size,
b. the interest rate charged, and
c. the non-interest terms of the loan contract, including requirements concerning collateral, borrower's equity

or compensating balances; the maintenance of a stable customer relationship; the length of the loan period; the opportunity in which the loan is granted; the amortization schedule, etc.

FFIs adjust all three of these aspects of a loan to particular borrowers. Given the risks and the transaction and information costs associated with lending to different borrower classes, FFIs presumably adjust these three aspects of any loan in optimum manners. When the ceilings on loan interest rates become binding, the FFIs lose one degree of freedom. They cannot adjust the terms of the loans by increasing the interest rates charged above the ceiling level. As a consequence, this adjustment requires either a change in the non-interest terms of the loan contract, or a reduction in loan size. The end result is that the borrowers receive a less attractive combination of these three aspects of their loans, that is, a less attractive product. On the other hand, the profits of the FFIs decline. As a result, Pareto optimality is lost. The welfare of both borrowers and lenders could be improved by the elimination of the interest rate ceilings.

There are, therefore, three possible ways to clear a credit market:

a. through interest rates,

b. through changes in the non-interest terms of the loan contracts, and

c. through changes in loan sizes.

The first two ways are both examples of rationing-through-price, as different from rationing-through-quantities. That is, the non-interest terms of the loan contract may be considered as elements of the price vector of the loan, in addition to the interest rates charged. The third way to clear the market, however, is undoubtedly an example of non-price rationing.

As Baltensperger has pointed out, therefore, non-price rationing is a situation in which the borrower's demand for credit remains unfulfilled, even though he is both willing to pay the ruling interest rate and to cover all the other elements of the price vector of the loan. This is not the case when the FFIs make the non-interest terms of the loans more restrictive.

Thus, when the borrowers are rationed out of the market via increases in the non-interest price of the loans, it is them who decide that the price is too high. In the event of non-price rationing, on the other hand, the potential borrowers are willing to pay the full price, but the FFIs are not willing to grant them loans of the size demanded. The difference between these two types of rationing, therefore, is that in the case of non-price rationing, an unsatisfied excess demand for credit will prevail at the ruling interest rate.

In practice, when ceilings on loan interest rates are imposed, both types of rationing will usually take place; that is, rationing will occur both via changes in the non-interest terms of the loan contracts and via changes in loan sizes. Moreover, both types of rationing will frequently lead to a greater concentration of the loan portfolios of the FFIs and will, therefore, have an unfavorable impact on income distribution.

NON-PRICE CREDIT RATIONING : A SURVEY

Several models of lender behavior have been constructed which can be extended to explain rationing decisions. Some of these models have adapted the theory of the firm to explain the behavior of FFIs, given alternative objective functions and market structures. Others have been constructed on the basis of portfolio theory. Both approaches are useful. Because uncertainty and risk are important, portfolio theory provides fruitful insights. Because transactions costs as well as product heterogeneity and product differentiation are important, the theory of the multiproduct firm is particularly appropriate. In addition, it is possible to capture uncertainty and risk within the theory of the firm, by incorporating an *ex ante* premium for risk in the cost functions of the FFIs, as is done in the formal model developed in this paper.

Three lines of theoretical developments have produced important results applicable to this analysis:

a. The adaptation to financial markets of the general theories about price controls and black markets. Fruitful theoretical contributions and lots of empirical evidence have resulted, in particular, from the analysis of the impact of interest rate ceilings and other usury regulations on the markets for consumer credit and personal loans as well as on the markets for housing finance.

b. The analysis of the determinants of interest rates in the informal credit markets of the low income countries, pioneered by Bottomley, as well as the further attempts to measure the level of transactions costs, risks of default, and monopoly profits, as components of the rates of interest charged in these markets.

c. The theories about the practice of non-price credit rationing by lenders, particularly those associated with the controversy over the availability doctrine. This approach, in particular, can provide important insights about the behavior of FFIs in the presence of interest rate restrictions, as well as about the <u>modus operandi</u> of the rationing mechanisms adopted by them.

According to the availability doctrine, reductions in the money supply can have a significant restrictive impact on spending, even if they induce only small increases in interest

rates or if the interest-elasticity of the demand for investment is very low, because spending is basically constrained by the availability of credit. Credit, in turn, is partly allocated by FFIs through non-price rationing mechanisms. When the money supply is restricted, credit is rationed more strictly, and the reduced availability of credit influences spending.

In a statement to Congress in 1952, Samuelson argued that non-price credit rationing was entirely inconsistent with profit maximizing behavior. The theory of non-price credit rationing was subsequently developed, in order to show that, under certain circumstances, this behavior is rational and consistent with profit maximization. Most of the theoretical contributions have attempted to explain the existence of non-price credit rationing even in the absence of ceilings and other interest rate restrictions. This is not the place to determine if such rationing can be an equilibrium situation in the long run or if it can only occur as a temporary disequilibrium phenomenon. The fact is that these theoretical developments as well as the empirical evidence gathered shed much light in explaining the nature of the rationing processes that take place when interest rate restrictions are actually imposed.

Hodgman was the first one to seriously attempt a general explanation of non-price credit rationing. He concentrated his efforts in showing that, due to the existence of default risk,

any borrower will reach a loan size beyond which he will not be able to obtain additional funds by promissing to pay a higher interest rate. That is, he showed that a lender's supply of credit to an individual borrower becomes totally inelastic at some rate of interest. The main reason is that the borrower's final wealth, and thus his ability to repay the loan, is finite.

Numerous authors have produced refinements of Hodgman's model that have helped to better understand the nature of default risk. As Jaffee has pointed out, however, the existence of a loan suppply function which implies that a borrower cannot obtain more credit than some finite maximum, regardless of what interest rate he is willing to pay, is not a sufficient proof of a prevailing practice of non-price credit rationing.

To demonstrate the existence of non-price credit rationing, it must be shown that an excess demand for credit persists at the interest charged, under equilibrium conditions. This requires a discussion both of supply and demand. Jaffee, therefore, explored whether it can be optimal for a lender to set the interest rate at the level where demand exceeds supply, and leave it there in spite of this excess demand.

That is, strictly speaking, non-price credit rationing occurs when the lender is unwilling to extend the loan de-

manded by the borrower and supplies only a smaller amount, in order to maximize its profits. Jaffee set up a model of a lender which maximizes its expected profits, taking into account possible borrower default on the loan. He then formulated the lender's expected income from each loan as an explicit function of the parameters of the borrower's demand function, the probability of default, and the rate of interest charged on the loan. Within this framework, the proof of the rationality of rationing amounted to showing that the lender can increase its expected profits by rationing at least some clients.

Jaffee showed that credit rationing is not profitable for a lender acting as a discriminating monopolist, i.e., for a lender which maximizes its expected profits with respect to each borrower separately and is free to charge each borrower a different interest rate. Rationing, however, will be profitable if there are restrictions on interest rate discrimination. For example, if the FFIs are constrained to charge all borrowers the same interest rate, even if they can choose this rate freely, and if they can decide on the size of the loan to be granted to each borrower, then, at the commom optimal interest rate, for some borrowers the most profitable loan for the FFIs to supply may be less than the amount demanded. The same result is obtained when the FFIs

set up a number of borrower classes and charge all borrowers within each class the same interest rate.

Jaffee concentrated his efforts in showing that, due to the existence of default risk and of constraints on the differentials among interest rates that FFIs can charge to different borrowers, non-price credit rationing is profitable. That is, if for some reason FFIs engage in limited interest rate differentiation among borrowers, in the sense that they charge identical rates to nonidentical borrowers, at the common interest rate charged, the demand for credit of some borrowers will exceed the lender's optimum supply to them.

Jaffee considered that, aside from usury ceilings, the pressure of legal restrictions and considerations of good will and social mores would make it inadvisable, if not impossible, for FFIs to charge widely different interest rates to different borrowers. Instead, FFIs would tend to limit the extent of the spread between the various interest rates and to justify the remaining differentials in terms of a few objective and verifiable criteria, such as industry class, asset size, and other standard financial measures. A classification scheme of this type is likely to be the result of tacit collusive agreement among oligopolistic FFIs, too. The entire structure of interest rates will tend to be compressed within narrower limits than would otherwise be

optimal and widespread non-price rationing will take place.

In addition, the constraints on interest rate differentiation may be the result also of the costs, specially information costs, of distinguishing among different borrowers and their risk characteristics; that is, of screening costs, as well as of the direct costs of a more complicated and detailed interest rate structure.

Keeton distinguished between two types of non-price credit rationing. In one case, rationing occurs whenever a borrower receives a smaller loan than he would desire at the interest rate charged by the lender. In the other case, the price of credit is defined as the complete set of loan terms confronting a class of borrowers with given characteristics, and the demand for credit is defined as the total number of loans which members of the class would like to receive at those terms. Non-price rationing occurs whenever the total number of loans demanded by the class at those terms exceeds the total number supplied by the FFIs.

Keeton showed that these two types of rationing may be observed in equilibrium situations, even in the absence of government-imposed interest rate constraints and under conditions of perfect competition. It may occur in the first sense, if there is a risk of default which increases with the

size of the loan. It may occur in the second sense, if there is a moral hazard problem, resulting from the inability of the FFIs to monitor all relevant characteristics of the borrower's investment project.

That is, when a borrower enjoys limited liability, he will have an incentive to increase the riskiness of his investment project. Because a fixed amount is due at the end of the period, the borrower receives all the gains from exceptionally high outcomes, but because he enjoys limited liability, he suffers none of the losses from exceptionally low outcomes. As a result, the borrower will benefit at the expense of the FFIs if he can alter the characteristics of his investment project, in such a way as to increase the probability of both very low and very high outcomes. In fact, the borrower may well prefer a project with greater risk to one with higher expected outcomes.

In some cases, FFIs may find it possible to specify all relevant characteristics of the borrower's investment project as part of the loan contract, and enforce such agreements by monitoring the borrower's behavior. However, if this cannot be done, the FFIs will want to take into account the effect that the erms of the loan have on the borrower's project choice. An increase in the interest rate of the loan may affect the borrrower's project choice in the same way that an

increase in insurance coverage will influence the policy-holder's level of care in avoiding accident. Keeton has shown that this moral hazard may perform essentially the same role as interest rate ceilings in inducing non-price credit rationing. In addition, if there is some indivisibility which makes it impossible to reduce loan size, the second type of rationing will take place.

The type of moral hazard examined by Keeton is, in fact, just one example of a broader class of imperfections which prevail in credit markets. When any one of these imperfections is present, an increase in the interest rate charged will have an adverse effect on the lender's expected returns, which in turn may outweight the favorable direct effect of the rate increase on the total amount due.

One such imperfection arises from the fact that FFIs may have to incur liquidation, collection and recovery costs, if the outcome of the investment project financed is insufficient to repay the loan and the borrower is forced to default. As observed by Barro, an increase in the interest rate raises the probability of default, and it increases the expected valur of these bankrupcy costs.

Another type of market imperfection arises when the outcome of the investment project depends both on some state of nature which is realized at a later date and on the

amount of additional resources that the borrower is willing to contribute to the project, after that state is realized, but before the loan becomes due. Since the borrower receives only that part of the outcome which remains after repaying the loan, he will either contribute the same amount of new resources as if he received the entire outcome and repay the loan in full, or he will contribute no new resources and default. Since the borrower will choose the latter course whenever the amount left over after paying back the loan would be less than the opportunity cost of the new resources, an increase in the interest rate will make it more likely that he will default. The analogy in this case is the insurance policyholder's incentive to order excessive repairs for damage if the accident occurs, because he pays only part of the cost.

Finally, Fried and Howitt have attempted to extend to credit markets some recent developments in the theory of labor contracts, which explain the closely analogous question of why firms lay workers off rather than adjust wages. Their answer is that credit rationing exists as part of an equilibrium risk-sharing arrangement between the FFIs and the borrowers. A borrower and lender can benefit not only from trading loan contracts now, but also from an understanding or implicit contract, concerning the amounts they will be willing to trade,

and at what prices, under various conditions in the future. This is the old "customer relationship". By means of such arrangements, borrowers and FFIs can share the risks associated with an uncertain future. These arrangements are similar to insurance contracts in which the less risk-averse party agrees for a fee to bear some of the risks to which the other party would otherwise be exposed.

If loans were always negotiated in spot auction markets, borrowers would be exposed to the risk of fluctuating interest rates on their loans. FFIs may be willing to insure borrowers against part of such risks, by a policy of keeping interest rates less variable than they would be in spot auction markets, in return for which the borrowers may be willing to pay a higher average interest rate. By dampening the movements in interest rates, these arrangements open up the possibility of non-price credit rationing.

The relationships between borrowers and lenders are involved and highly personal. The object being traded is heterogeneous, since it involves the trustworthiness of the borrower, and on either side of the market there are non-trivial costs involved in switching one's trading partner. Normal arrangements between borrowers and FFIs take into account the advantages to both sides of maintaining a

continuous relationship. Fried and Howitt have shown that, if there were no costs of switching trading partners, non-price credit rationing would not occur. Furthermore, this analysis explains the tendency of FFIs to ration least heavily those customers with the longest standing relationship.

Most of the imperfections and costs which explain non-price credit rationing, even in the absence of interest rate restrictions, are present in the agricultural credit markets of the low income countries. Uncertainty, default risks, transactions, information and collection costs are all particularly high in fragmented financial markets. Moral hazard and related problems are specially acute. In these markets, FFIs may find many reasons to practice one or more forms of non-price credit rationing. Various rules of thumb and other practices, like typical farm budgets, adopted by FFIs in these countries, have been reported by several authors and clearly constitute rationing mechanisms.

This paper attempts to develop a formal model of lender behavior, which combines the Jaffee and the Bottomley traditions, according to a suggestion by Eckaus, in order to examine the impact of interest rate restrictions, in an environment in which non-price credit rationing is widely practiced.

A MODEL OF LENDER BEHAVIOR

A very simple model of non-price credit rationing is developed in this section, in order to illustrate the differential impact of interest rate ceilings on access to credit by different borrower classes and on portfolio concentration. Assume that the lender (one of the FFIs) is a profit maximizing firm and that its only source of revenues are the interest payments on the loans that it receives. There are three components of its costs:

a. the opportunity cost of the funds,

b. the costs of administration of the loans, and

c. the losses due to default.

Assume that the opportunity cost of the funds is exogenously given to the lender, independently of loan size, and that it is identical for all borrower classes. (For some purposes this opportunity cost may be defined as the marginal rate of return on risk-free non-loan assets).

The costs of administration, in turn, include two different components:

a. the handling costs of the loan, and

b. the risk-reducing costs of the loan.

The handling costs are incurred in recording and disbursing the loan, in receiving payments, etc. These handling costs

tend to be independent of the size and degree of riskiness of the loan. As a function of loan size, therefore, they can be treated as a fixed cost. Average handling costs, therefore, will rapidly decline with loan size. The risk-reducing costs, on the other hand, are directed at reducing the probability of default in the loan portfolio, through the adquisition of information and its use in the decisions about borrower selection, as well as through the supervision and collection efforts of the lender. This costs, therefore, are not independent of loan size or of the expected losses due to default. If more resources are spent in loan evaluation and supervision, the lender can reduce its losses due to default. However, the lender cannot completely eliminate uncertainty about repayment. Therefore, it must always include, among its _ex ante_ costs, a premium for risk.

Ex ante, FFIs do not know if a particular borrower will repay or default. Instead, they must estimate the probable losses due to default. This probability of default, and the corresponding premium for risk, depend both on:

a. the borrower's ability to repay, which is a function of the outcome of the productive activity financed with the loan, a random event, as well as of the value of the additional collateral offered, and
b. the borrower's willingness to repay.

In order to determine the probable losses due to default, FFIs usually distinguish among several borrower classes and estimate probability distributions of the random outcome of the productive activities associated with each borrower class. On the basis of these probability distributions, FFIs estimate that a certain proportion of the borrowers in a given class will default. In addition, FFIs estimate the expected losses related to this default.

It is in the interest of the FFIs to distinguish among as many borrower classes as possible. However, this requires information that is costly to acquire and to process, or that may not be available. In effect, in the absence of these costs, each borrower would be a class. Due to these costs, therefore, FFIs set up a limited number of borrower classes and estimate cost functions, including an _ex ante_ premium for risk, for each class.

Because of the nature of their productive activities and of the nature of the collateral offered, loans to borrowers in certain classes are riskier than loans to borrowers in other classes. Therefore, while FFIs will charge the same premium for risk, for a loan of a given size, within a given borrower class, they will want to charge a different premium to borrowers in different classes. All of this forces FFIs

to acquire information and to use it in their decisions about borrower selection.

Presumably, the more information possessed about a particular class of borrowers, the more accurate will be the estimate of the probable losses due to default for a borrower in that class. Better estimates, in turn, will lead to better selection decisions and, therefore, to a reduction in the *ex post* losses due to default. Given lower *ex post* losses, a lower *ex ante* premium for risk will be required. On the other hand, with relatively little information, FFIs will tend to charge a relatively high premium for risk.

While additional information reduces the premium for risk required, however, it increases administration costs. Information is not free. In order to estimate their cost functions, therefore, FFIs must determine the optimum (least cost) combination of information costs and the residual risk accepted. The sum of the premium for risk and the risk-reducing administration costs will be minimized when the marginal cost of additional information is equated to the marginal return, in terms of the reduction in the expected losses from default, of using additional information.

Unfortunately, interest rate restrictions and other financial regulations usually tend to restrict the use of information by FFIs. If FFIs operate with too narrow margins, the evaluation of mortgageable property may be the only risk-reducing activity which they can afford. As a result, the allocation of loans will be too heavily influenced by the type of security offered and small farmers, with few assets to offer, will be penalized.

In addition, the costs and returns to the use of information in borrower selection are a function of the degree of homogeneity among borrowers. Homogeneity makes it possible to have a few classes. Given the heterogeneity found among small farmers in low income countries, it would be optimal for FFIs to establish a relatively large number of classes. Interest rate ceilings restrict the number of borrower classes that FFIs can serve. As a result of these ceilings, many small producers are thrown into the class of non-borrowers, because the FFIs cannot afford the information costs implied in classifying them in one of the established classes. Since the premium for risk for this residual class of potential borrowers is too high, compared to the interest rate ceilings, these producers are excluded from the portfolios of the FFIs.

For a given lender, the average and marginal cost functions of lending, associated with a given borrower class, may be expressed as a function of loan size. Average cost includes the constant average opportunity cost of the funds, the declining average handling costs, and the (optimal) sum of the average risk-reducing costs and premium for risk.

Within a given borrower class, the premium for risk increases with loan size, as long as:

a. the project financed is of a fixed size,
b. the project financed, even of variable size, shows diminishing marginal returns,
c. the variance of marginal returns increases with loan size, or
d. the value of the collateral offered does not increase as rapidly as loan size.

Given diminishing marginal returns to the use of information, this implies that the (optimal) sum of risk-reducing costs and premium for risk increases monotonically with loan size. Since marginal cost changes depend exclusively on the behavior of this sum, marginal cost of lending is an increasing function of loan size, for a particular borrower class.

Loan contracts have many dimensions: length of the period, type of collateral, size of farm and area of activity of the

borrower, etc. Loans, therefore, must be trated as non-homogeneous products. In particular, loans to different classes of borrowers must be treated as different products if the lender distinguishes among them and estimates different cost functions for each borrower class. It is appropriate, therefore, to employ the theory of the multi-product firm to examine lender behavior.

PROFIT-MAXIMIZING RATIONING

With respect to a given borrower class, the lender's costs, as a function of loan size, have been defined as:

$$C = dL + H + xL \tag{1}$$

where: C : the total cost of the loan,

d : the constant average opportunity cost of the funds,

L : the size of the loan,

H : the fixed handling costs of the loan, and

x : the optimum sum of average risk-reducing costs and the premium for risk.

In turn, the lender's profit function can be defined as:

$$\pi = \sum^{n} R_i - \sum^{n} C_i \tag{2}$$

where: $R_i = r_i L_i$

π : the lender's total profits,

R_i : revenues from a loan to the i-th borrower (or class),

r_i : the interest rate charged to the i-th borrower (or class),

L_i : the size of the loan granted to the i-th borrower (or class), and

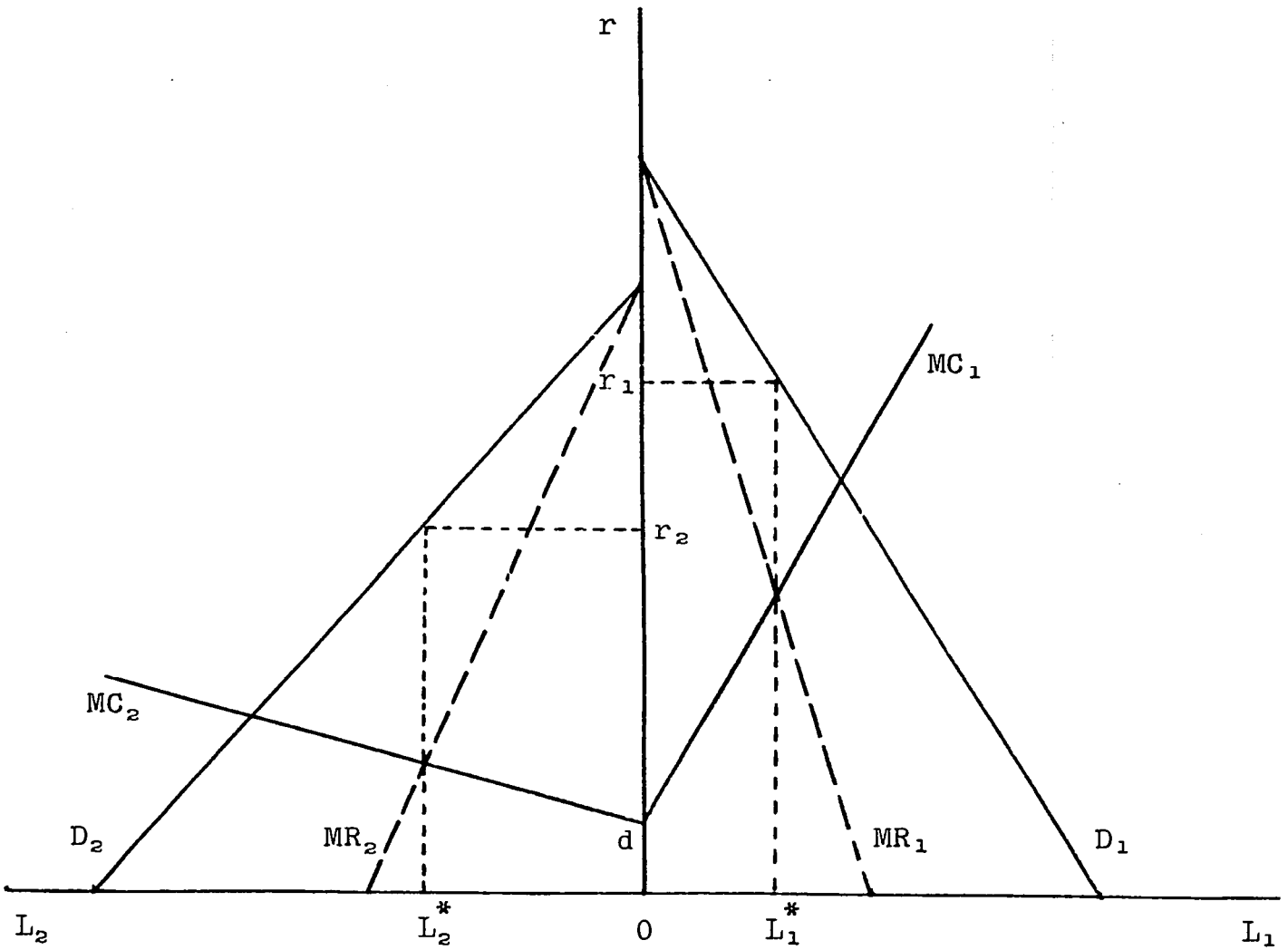
C_i : the total cost of the loan granted to the i-th borrower (or class).

In the case of the perfectly discriminating monopolist, the lender is free to charge different interest rates, for a loan of the same size, to borrowers of different classes, as well as different interest rates, for loans of different sizes, within a given borrower class. In this case, the first order conditions for profit maximization are:

$$(3) \qquad \frac{\partial \pi}{\partial L_i} = \frac{\partial R_i}{\partial L_i} - \frac{\partial C_i}{\partial L_i} = 0$$

That is, if the lender is a perfectly discriminating monopolist, profit maximization requires that the marginal revenue and the marginal cost of the loan be equated, for the size of loan granted to each particular borrower. In these circumstances, therefore, the rates of interest charged to different borrowers will differ, reflecting both the different elasticities of the demand for credit from different borrowers and the different marginal costs of lending to them. Obviously, there can be no non-price rationing in this case. This situation is represented, for the two borrower case, in Figure 1.

FIGURE 1



In Figure 1, positive loan amounts (L_1 and L_2) are measured in both directions from the origen. The demand functions for each borrower (D_1 and D_2) are inversely related to the rate of interest charged. Associated with these demand functions, there are decreasing marginal revenue functions (MR_1 and MR_2) for the lender. In turn, the lender's marginal cost functions (MC_1 and MC_2) increase with the size of loan. Profit maximization requires that marginal revenue be equated to marginal cost for each borrower. To do this, the lender must grant loans of size L_1^* and L_2^* and charge different interest rates, r_1 and r_2, to the two borrowers.

The simplest restriction that can be imposed on the rates of interest charged by FFIs is the requirement that they charge the same, uniform, interest rate to all borrowers. The FFIs are otherwise assumed to be free to set this uniform rate at their most profitable level. This model can be used to confirm the result obtained by Jaffee and by Eckaus, that in this case profit maximization may require non-price credit rationing.

Given the possibility of rationing, that is, of the existence of individual excess demands for credit at the equilibrium uniform interest rate charged by the lender, the profit maximizing loan sizes for different borrowers can be obtained from the solution of a programming problem, in which the demand functions are introduced as inequality constraints.

If there is no rationing, loan size will equal the amount of credit demanded at the uniform interest rate charged; but if there is rationing, the inequality constraint will be binding, and an excess demand for credit will prevail.

The programming problem, therefore, consists in the maximization of the lender's profits, with respect to the uniform interest rate and with respect to the size of the loans granted to different borrowers, subject to the constraints that the rates of interest charged be the same for all borrowers and that the size of each loan be equal or less than the amount demanded at the profit maximizing rate.

The lender's total profits can be defined as:

$$(4) \qquad \pi = r \sum^{n} L_i - \sum^{n} C_i$$

Total profits must be maximized, subject to :

$$(5) \qquad L_i - D_i \leq 0$$

$$0 \leq r$$

$$0 \leq L_i$$

The corresponding Lagrangean function is:

$$(6) \qquad K = r \sum^{n} L_i - \sum^{n} C_i - \sum^{n} \lambda_i \, (L_i - D_i)$$

The Kuhn-Tucker conditions for maximum profits are:

$$(7) \qquad \frac{\partial K}{\partial r} = \sum^{n} L_i + \sum^{n} \lambda_i \frac{\partial D_i}{\partial r} \leq 0$$

$$\frac{\partial K}{\partial L_i} = r - \frac{\partial C_i}{\partial L_i} - \lambda_i \leq 0$$

$$r \left[L_i + \lambda_i \frac{\partial D_i}{\partial r} \right] + \sum^{n} L_i \left[r - \frac{\partial C_i}{\partial L_i} - \lambda_i \right] = 0$$

$$0 \leq L_i$$

$$0 \leq r$$

$$L_i - D_i \leq 0$$

$$\lambda_i \ (L_i - D_i) \leq 0$$

$$0 \leq \lambda_i$$

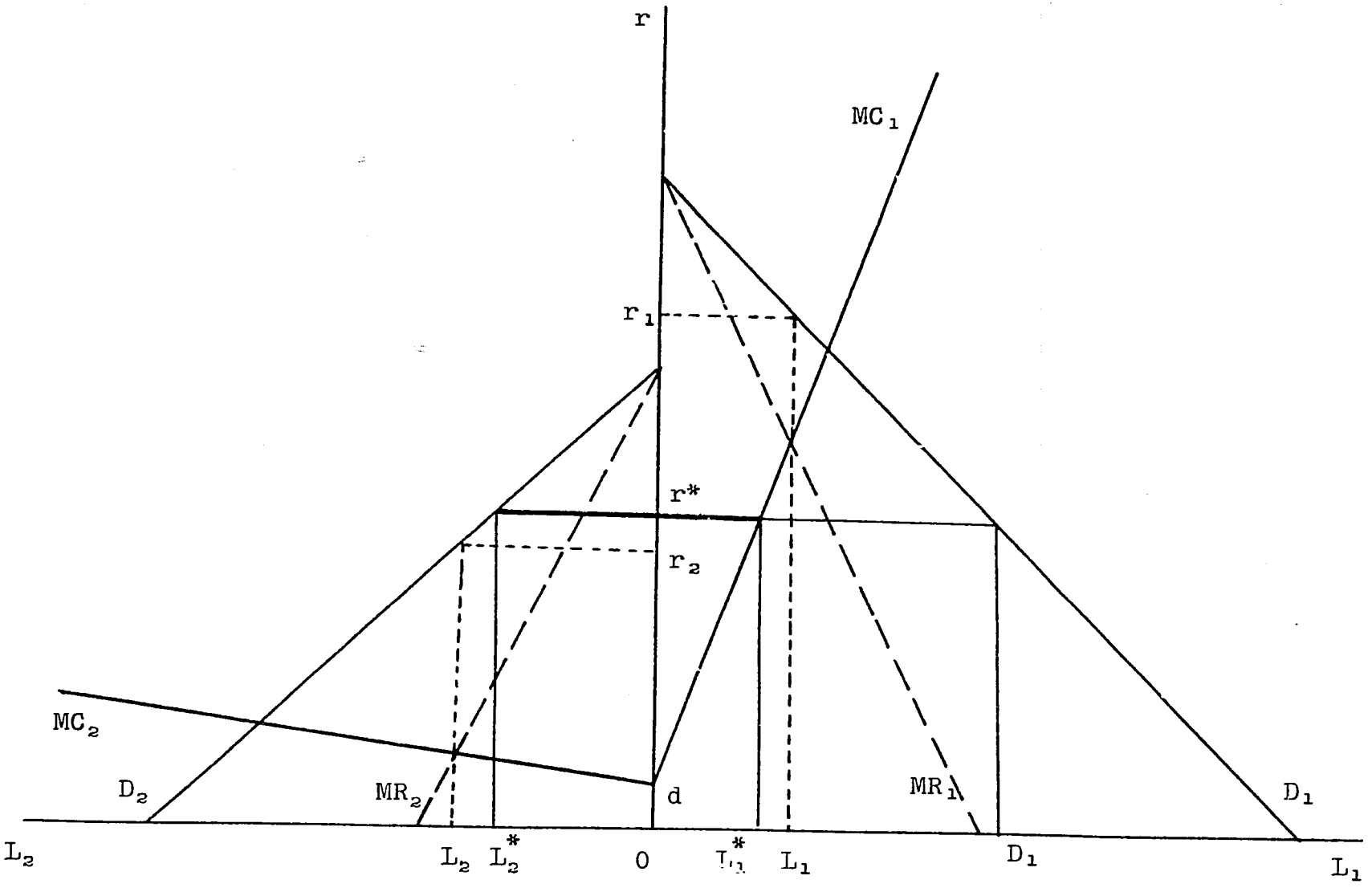
These conditions imply that, when non-price credit rationing does not take place, the Lagrangean multipliers must be strictly positive. That is, if the borrowers receive the size of the loan demanded, $L_i = D_i$, these conditions imply that $\lambda_i > 0$. On the other hand, credit rationing occurs when $L_i - D_i < 0$. In this case, the Lagrangean multipliers must be equal to zero; i.e., $\lambda_i = 0$. Therefore, when in the programming exercise one of the Lagrangean multipliers becomes equal to zero, the corresponding borrower (or class) is rationed.

The Kuhn-Tucker conditions imply that, for the Lagrangean multipliers to become equal to zero, $r - \partial C_i / \partial L_i = 0$. That is, for rationing to occur, the rate of interest charged

has to become equal to the marginal cost of granting the loan. If there is no rationing, on the other hand, these conditions imply that the rate of interest charged has to be higher, for the size of loan granted, than the corresponding marginal cost.

In summary, when a uniform but free interest rate is enforced, if the profit maximizing rate for the lender is higher than any one of the marginal costs of granting loans to all classes of borrowers, then no borrower will be rationed. However, when for the size of loan demanded, the uniform rate of interest charged is less than the marginal cost of lending to a particular borrower, the lender will limit the size of the loan granted and an excess demand for credit will prevail at the interest rate charged. If, in these circumstances, the lender granted a larger loan, as demanded, the addition to its costs would be higher than the addition to its revenues, and its expected profits would decline. Moreover, the Kuhn-Tucker conditions imply that, in this case, at least one class of borrowers will not be rationed. That is, the optimum uniform interest rate must be bounded by the optimal rates that a discriminating monopolist would charge to the various borrowers (that is, it must be between the minimum and maximum rates for the discriminating monopolist). This situation is represented in Figure 2.

FIGURE 2



As in Figure 1, Figure 2 presents a two-borrower situation, where L_1 and L_2 are the profit maximizing size of loans that would be granted by an unconstrained perfectly discriminating monopolist, while r_1 and r_2 are the interest rates that would be charged in such a situation. On the other hand, r^* is the freely set, profit maximizing, interest rate set by a lender constrained to charge a uniform rate to all borrowers, while L_1^* and L_2^* are the size of loans granted in this case. Given the levels of the marginal cost curves and of the uniform interest rate, one borrower is not rationed ($L_2^* = D_2$), while the other one is ($L_1^* < D_1$).

Non-price credit rationing will be practiced, a fortiori, when a binding ceiling on interest rates is enforced. Assume that a ceiling r^* is imposed on the rates of interest charged on all kinds of loans. In this case, the lender's profit function will be:

$$\pi = r^* \sum^{n} L_i - \sum^{n} C_i \tag{8}$$

This function has to be maximized subject to:

$$L_i - D_i \leq 0 \tag{9}$$

$$0 \leq L_i$$

$0 \leq r^* < r_i$, that is, the ceiling is binding for all borrowers.

The corresponding Lagrangean function is :

$$K = r^* \sum^{n} L_i - \sum^{n} C_i - \sum^{n} \lambda_i (L_i - D_i) \tag{10}$$

The Kuhn-Tucker conditions for maximum profits are:

$$\frac{\partial K}{\partial L_i} = r^* - \frac{\partial C_i}{\partial L_i} - \lambda_i \leq 0 \tag{11}$$

$$\sum^{n} (r^* - \frac{\partial C_i}{\partial L_i} - \lambda_i) L_i = 0$$

$$\lambda_i (L_i - D_i) \leq 0$$

$$L_i - D_i \leq 0$$

$$0 \leq L_i$$

$$0 \leq \lambda_i$$

Again, these conditions imply that, in the absence of rationing, the Lagrangean multipliers λ_i will be strictly positive. This, in turn, implies that, for the given interest rate ceiling, r*, marginal cost is lower, for the size of loan granted. On the other hand, non-price credit rationing implies that $\lambda_i = 0$. Thus, when rationing is taking place, the marginal cost of the loan is being equated to the ceiling interest rate. Depending on the relative level of the ceiling, with respect to the marginal cost curves of lending, some or all of the borrowers may be subjected to non-price credit rationing.

ON THE IRON LAW OF INTEREST RATE RESTRICTIONS

Non-price credit rationing seems to be widely practiced by the FFIs in the low income countries. That is, many rules of thumb and varied devices are employed by the FFIs to restrict the size of the loans granted to certain borrower classes, below the amounts demanded at the, frequently too low, interest rates charged.

Among the most popular mechanisms for credit rationing is the establishment of limits on the amounts of credit to be granted, per hectare of land to be cultivated. These limits vary from crop to crop, presumably reflecting the different costs of production in each case. Frequently, however, the proportion of the total costs represented by these limits varies significantly from crop to crop. These differences tend to reflect the perceptions of the FFIs about the risks and costs associated with loans for the production of different crops. That is, the proportion of the total costs that is financed is usually higher in the case of the safer and more profitable commercial crops, usually for exports, than in the case of the riskier crops cultivated by small farmers. These, therefore, are forced to complement the loans received from the FFIs with loans obtained in informal credit markets, at much higher interest rates. The extent of this additional financing reflects the extent of exccess demand for credit from the FFIs.

The establishment of these limits of credit per hectare to be cultivated has also been very vulnerable to the political pressures from interest groups, such as growers associations, particularly in the case of public FFIs. As a result, the "estimation" of costs has been more liberal in the case of powerful classes of borrowers than in the case of less politically organized classes. Since a substantial subsidy is implicit in the underpriced loans, the higher the estimation of the costs per hectare, the greater the subsidy to be received. When the subsidy gets larger, as interest rate ceilings become more restrictive, the political pressures demanding a preferential treatment get stronger.

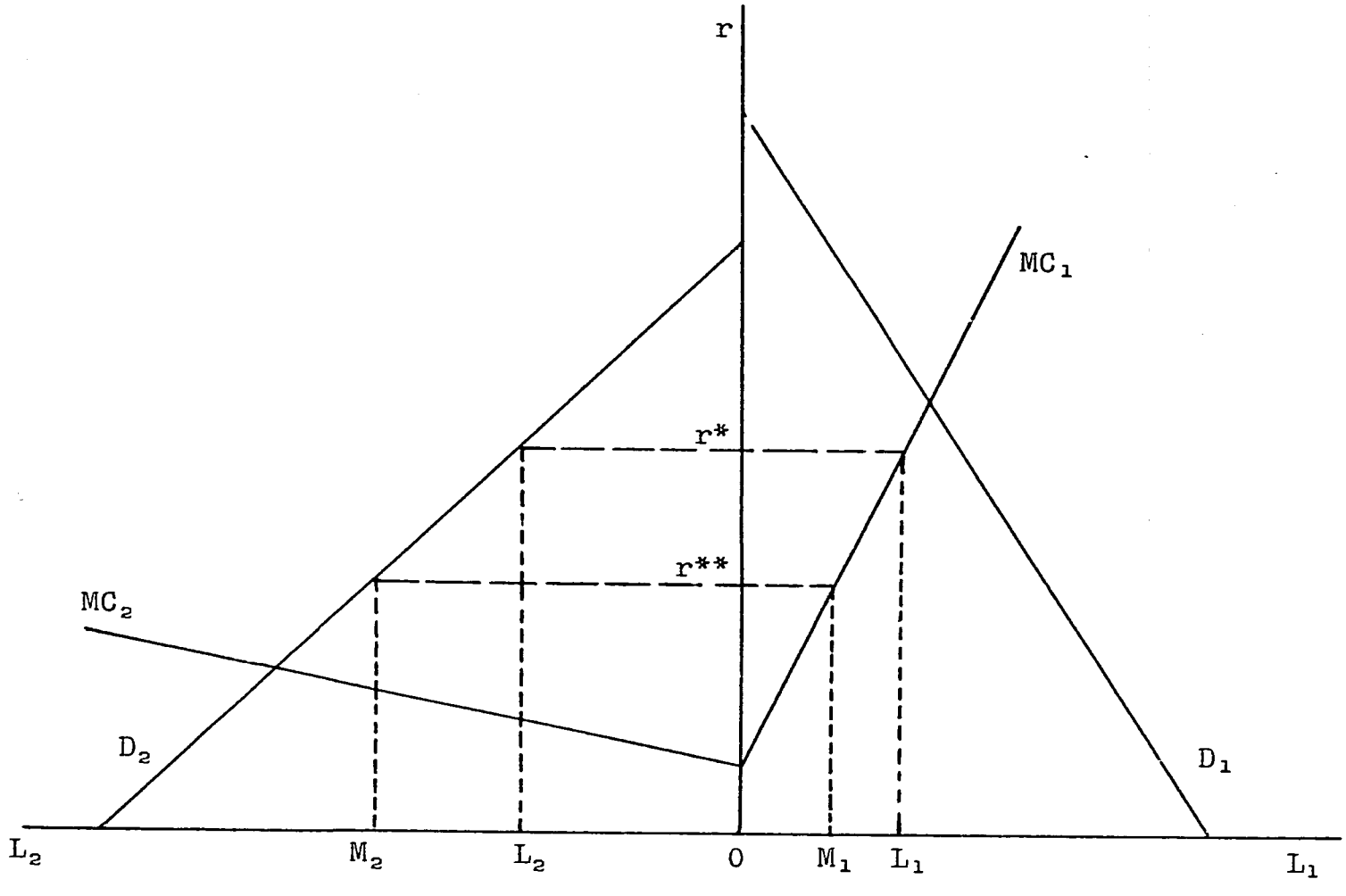
During inflationary periods, for example, not all of these credit limits are corrected at the same pace. While the limits of credit to some borrower classes are frequently and fully adjusted for inflation, this is not the case for other borrower classes. As a consequence, some classes of producers continue to receive the same, or even larger amounts of credit, in real terms, as the inflationary process proceeds, while other classes of producers receive loans of a smaller size, in real terms, every time they get a new loan. The latter are then forced to reduce their level of activity, unless they can find additional loans in the informal credit markets, in order to complement the institutional loans received.

In summary, the loan portfolios of the FFIs in the low income countries usually include both rationed and non-rationed classes of borrowers. Non-rationed borrowers are those that receive all the credit that they demand at the rate of interest charged by the FFIs. They are the equivalent of the prime-rate borrowers. Rationed borrowers, on the other hand, are those who are granted loans that do not satisfy their demands for credit, at the going rate of interest, so that an excess demand for credit prevails.

When, due to the impact of inflation, the legislation of preferential rates, or some other reason, the interest rate ceilings become more restrictive, the size of the loans granted to the non-rationed borrower classes increases, while the size of the loans granted to the rationed borrower classes diminishes. This is the <u>iron law of interest rate restrictions</u>. This situation is represented in Figure 3, for the two borrower case.

In Figure 3, at the given interest rate ceiling, r^*, the rationed borrower, represented in the right-hand quadrant, receives a loan of size L_1, which equates the interest rate charged with the marginal cost of lending, and which leaves him with an unsatisfied demand for credit. On the other hand, the non-rationed borrower, represented in the left hand quadrant, receives the size of loan that he demands, L_2, at the interest rate charged.

FIGURE 3



As the interest rate ceiling is lowered from r* to r**, the size of the loan granted to the non-rationed borrower increases, from L_2 to M_2, as he demands a larger loan at the lower interest rate. At the same time, the size of the loan granted to the rationed borrower declines, from L_1 to M_1, along the upward-sloping marginal cost curve for the FFIs of lending to his borrower class.

These changes in loan sizes implied by the <u>iron law of interest rate restrictions</u> lead towards a redistribution of the loan portfolios of the FFIs, as the non-rationed borrowers get larger shares of these portfolios, while the rationed borrowers get smaller and smaller shares. Finally, when the interest rate ceiling becomes too low and it does not cover the average variable costs of lending to certain borrower classes, these classes are excluded altogether from the loan portfolios of the FFIs. That is, these borrower classes lose their access to institutional credit. The largest proportion of the rural producers of the low income countries are in these categories.

Since the non-rationed borrowers tend to be the large, wealthy, and influential producers, who are already receiving the largest loans, the behavior of the FFIs implied by the <u>iron law of interest rate restrictions</u> leads to a further concentration of the distribution by size of loans in their portfolios. This process of increasing concentration is ac-

celerated by the exclusion of potential borrower classes from the credit portfolios, as the FFIs are precluded from covering their average variable costs of lending in these cases. This progressive concentration of loan portfolios and the exclusion of marginal producers from access to institutional credit significantly worsens the distribution of wealth in the rural areas of the low income countries.

RATIONING AND THE LENDER'S OBJECTIVE FUNCTION

The models of lender behavior presented in this paper, in order to explain the nature of non-price credit rationing and its impact on the concentration of the loan portfolios of the FFIs, have been based on the assumption of profit maximization as the lender's objective. This assumption, however, is not necessary, and the results obtained are not dependent on it.

This paper claims that the composition of the credit portfolios of the FFIs is not a random or unconscious result, but that it is the consequence of the attempts by the FFIs to optimize a given objective function, within the constraints that they face. That is, FFI can be treated as rational optimizers, that behave as if they possessed an explicitly or implicitly defined objective function and attempted to get the optimum result from their operations, in terms of those objectives.

Different types of FFIs, of course, may have different objective functions. Some of them are small private banks maximizing profits, while others are large bureaucratic banks attempting to maximize market shares; some of them are public development banks attempting to maximize their political influence, while others are public or private institutions maximizing staff expenditures, managerial emoluments, or discretionary profits, under different sets of constraints. Given these constraints, all of them are attempting, in general, to maximize some utility function, in terms of their managers' set of preferences, through the pursuit of either profit maximizing or non-profit maximizing strategies or of some combination of both. While the actual impact of interest rate restrictions on their behavior depends on the nature of their particular objective functions, some general considerations can be made.

For our purposes, the FFIs can be classified into two classes:

a. those FFIs whose objective function includes financial viability and institutional survival among the objectives pursued, and
b. those FFIs whose objective function does not include financial viability.

This second group of lenders includes one-shot pilot projects,

credit programs interested in a small scale experiment, for a few years only, which are not interested in a permanent presence as a lender in the rural areas. This group also includes agencies set up to temporarily disburse emergency or political grants, like a flood relief credit program. The first group includes, on the other hand, all FFIs that, independently of the kinds of goals that they are attempting to achieve, do it under the constraint that they must remain financially viable.

For FFIs to remain financially viable:

a. they must be able to preserve, and hopefully increase, their loan portfolio, in real terms; that is, they must preserve the purchasing power of the total amount of credit that they can grant; and
b. their revenues must cover a significant portion at least, if not all, of their lending costs.

To remain financially viable, therefore, FFIs must take into account their revenues and costs; that is, they must have a profits strategy (to maximize profits, not to fall below a minimum level of profits, etc.), and they must guide the allocation of their credit portfolio among borrower classes according to this strategy. The models presented in this paper are applicable to this whole class of FFIs. The institutions that do not behave in this fashion simply do not survive.

That is, in order to survive or to maintain their relative importance within the financial sector, the FFIs must preserve the purchasing power of the resources that they movilize. Otherwise, they will be increasingly less able to serve their clients, their market shares will decline, and the political support that they need for their survival will diminish. FFIs are able to preserve and to increase the real size of their portfolios to the extent that they protect them from the eroding impact of inflation, to the extent that they collect the loans granted and to the extent that they are able to generate sufficiently high profits.

Consider, for example, two identical FFIs, each one supplying 50 percent of the local credit market. One of them generates profits of two percent per year, while the other one generates annual profits of twelve percent. After ten years, ceteris paribus, the most profitable institution will be serving 72 percent of the market, while the less profitable one will be serving only 28 percent of the credit market.

Some FFIs may have continued access to the government budget, Central Bank rediscounting, or cheap credit from the international financial institutions, that allows them to remain temporarily viable, despite their losses. However:

a. Some measure of profitability is almost always included

in the evaluations of the performance of the FFIs.

b. International agencies and fiscal sources may be willing to continue with their support only as long as the losses of the FFIs are not too high. After all, the international agencies are also judged by the success and financial strength of the FFIs that they have supported. If losses are very high, therefore, these international agencies will demand a change of management or will request institutional reforms and program reorientations, before they continue with their support.

c. When the losses of the FFIs are too substantial, on the other hand, even if the fiscal sources wanted to keep the bankrupt institutions financially viable, they may not possess sufficient resources to continually provide the significant transfers that this implies. This is more acutely the case nowadays, when the governments of most low income countries are facing severe budgetary problems, due to the inelasticity of tax structures and their increasing expenditures.

d. While inflationary financing from the Central Bank could make large transfers in nominal terms possible, the ensuing inflation will erode the real value of the portfolio of the FFIs even faster.

e. In any case, FFIs will be able to receive large fiscal transfers only to the extent that they accept a political

guidance with respect to credit allocation. In this way, FFIs lose their independence and become mere disbursing agents for other institutions: they become huge cashiers for other government agencies.

f. When banking and economic criteria are replaced by administrative and political criteria for credit allocation, the rationing processes become more vulnerable to the demands of pressure groups and their loan portfolios tend to become even more concentrated. In these circumstances, moreover, it is hard to resist the temptation to transform the FFIs into powerful mechanisms for the disbursement of political grants.

g. The reluctance of politicians to take into account creditworthiness, as well as their reluctance to enforce vigorous collection policies, soon leads to high rates of default. Once an important group of borrowers are not paying back their loans, and are not penalized, others will seriously doubt that the institution will remain financially viable and will not pay back their loans, either. Theirs, therefore, becomes a self-fulfilling prophecy and, unless hughe fiscal transfers are forthcoming, the institution will not survive. At the end, these FFIs become merely costly and arbitrary mechanisms for income transfers to a few priviledged borrowers. When the resources kept by the delinquent

borrowers are added to the subsidies implicit in the interest rates charged, huge amounts of funds are redistributed in favor of a few producers.

BORROWER TRANSACTION COSTS AND RATIONING

High transaction costs for both lenders and borrowers limit the size of rural financial markets in the low income countries. When ceilings are imposed on interest rates, FFIs may find themselves unable to cover these costs. In addition, due to the reduction in their scale of operations, these costs may be higher, on the average, at the new levels of lending. In either case, FFIs will tend to practice both non-price credit rationing, as described, and a restriction of the non-interest terms of the loan contract. These more strict terms of the loan contract, in turn, may shift some transaction costs from the FFIs to the borrowers. This shift does not affect all classes of borrowers uniformly. Rather, it tends to restrict the access of marginal borrowers to institutional credit more than proportionately, in the fashion of the <u>iron law of interest rate restrictions</u>, and to further contribute to a higher concentration of the loan portfolios of the FFIs.

In order to set up a certain number of borrower classes, which would allow them to deal more efficiently with differential risks, FFIs must acquire information about credit-

worthiness, and use it in the selection of borrowers and in the determination of loan sizes. Interest rate restrictions constrain the profitable use of information by the FFIs. They restrict the number of borrower classes that the FFIs can set up. When, due to the ceilings, these FFIs cannot afford the information required to classify a borrower in a given class, they will exclude him, ad portas, from their loan portfolios.

High costs of borrowing, on the other hand, restrict many demands for credit. The total costs of transactions for the borrower, except the interest rates, tend to be independent of loan size. Average transaction costs, therefore, are a diminishing function of loan size. For example, the transportation and lodging costs involved in a trip to a town with a bank branch, as well as the opportunity cost of the producer's time spent in negotiating the loan, are independent of loan size. These costs, however, may be too high in the case of a small loan. Therefore, these costs restrict the demand for credit in the case of the smaller producers proportionately more than in the case of the larger ones.

Moreover, it has been shown that, particularly in the case of small loans, non-interest transactions costs are several times higher than the interest payments charged by the FFIs. A producer, therefore, will be willing to incur in these transactions costs only if he expects to receive a large

enough loan. When FFIs practice non-price credit rationing, thus reducing loan sizes, they discourage many potential borrowers from applying for loans. In fact, faced with these circumstances, the officers of many FFIs claim that there is not a demand for credit. The fact is that there is a potential demand, actually in excess, that is not exercised because it would not be satisfied by the FFIs. The potential borrowers simply do not bother to apply for the loans; transactions costs are too high for an expected rejection. Since the smaller and marginal producers are more acutely affected by these reductions in loan size, they voluntarily exclude themselves from the credit portfolios of the FFIs. In this case, rationing and exclusion take an indirect route.

When they are constrained by interest rate restrictions, the FFIs will tend to shift some of their transactions costs over to the borrowers. A profitable lender, for example, can afford to open many rural branches, thus absorbing much of the costs of getting borrowers and lender together. Because of economies of scale, these costs for the FFIs are lower than the summation of the costs for the borrowers of having to travel to a more distant branch. When interest rate ceilings are imposed, however, these rural branches may cease to be profitable. When the lender eliminates these branches, therefore, it shifts these transaction costs back to the borrowers.

These, in turn, may find that these costs are too high and may not demand loans any longer. The informal sources of credit actually acquire a comparative advantage over the FFIs, as a result of the interest rate restrictions. The total cost of the loans from the informal sources (interest rates plus transactions costs) will be lower than the total cost of loans from the FFIs and the potential borrowers will prefer the former.

CONCLUSIONS

In most of the low income countries, the interest rates charged by the FFIs on agricultural loans have been administratively set or constrained by several regulations. As a result, these rates have been too rigid in nominal terms, but too erratic and unpredictable in real terms; too low, from several perspectives; and too differentiated, in an inverted fashion. That is, the FFIs have been forced to charge the lowest rates when they would have liked to charge the highest rates. This inverted structure of interest rates has accentuated the differential impact of the costs of lending on the relative profitability of loans to different borrower classes and, thereby, has influenced the distribution of the loan portfolios of the FFIs among borrower classes.

The conventional model, on the basis of an aggregate demand and supply of credit, cannot explain the distributive

consequences of interest rate restrictions. This paper has explored models of non-price credit rationing and of rationing through the non-interest terms of the loan contracts, and it has shown how interest rate ceilings restrict the access of small farmers to institutional credit and how they contribute to a high degree of concentration of the loan portfolios of the FFIs, in favor of a few large borrowers.

In particular, the paper has shown that, according to the iron law of interest rate restrictions, as interest rate ceilings become more restrictive, the size of the loans granted to non-rationed large producers increases, while the size of loans granted to rationed small producers decreases. This behavior of loan sizes leads towards a redistribution of loan portfolios in favor of the larger borrowers. Through these mechanisms, therefore, the interest rate ceilings enforced in most of the low income countries have been among the most important determinants of the limited access to institutional credit and the high degree of concentration of loan portfolios that characterize rural financial markets.

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