Review of Development Economics 1(1), 34–56, 1997

Vertical Links Between Formal and Informal Financial Institutions

*Maria Sagrario Floro and Debraj Ray**

Abstract

The paper investigates vertical linkages between formal and informal financial institutions. Specifically, it studies a policy that expands formal credit to informal lenders, in the hope that this will improve loan terms for borrowers who are shut out of the formal sector. Special attention is paid to the Philippines. It is argued that the effects of stronger vertical links depend on the form of lender competition. In particular, if the relationship between lenders is one of strategic cooperation (sustained by threats of reprisal in a repeated setting), an expansion of formal credit may worsen the terms faced by informal borrowers.

1. Introduction

The issue of linkages between the formal and informal financial sectors has recently gained much attention in the literature on development finance. Policymakers in developing countries have considered these linkages seriously, and in some cases, have implemented schemes for promoting such linkages. An analysis of a particular linkage between trader-lenders and banking institutions, and its potential effects on allocative efficiency and welfare of small farmers, is the subject of this paper. Our study is set in the context of the Philippines.

Several considerations indicate that it is necessary to reexamine the role of the informal financial sector in promoting economic development.

First, the structure of the formal credit sector severely constrains its ability to respond effectively to the requirements of rural development, particularly in meeting the credit needs of small farmers. Perhaps the important constraint is the lack of information about borrower characteristics and actions, which critically limits the ability of banks to guarantee repayment. Consequently, loans (when forthcoming) require substantial collateral. Small farmers are simply not in a position to provide collateral, at least in a form acceptable to a formal financial intermediary.

Second, the common response of governments to the perceived inadequate supply of credit in rural areas has generally been in the form of subsidized credit programs, credit quotas and targeted loan policies at below-market rates of interest. No doubt these are politically attractive schemes. Nevertheless, such schemes do not directly address the related problems of information, incentives, enforcement and collateral. It is hardly surprising that the benefits of such programs and policies are concentrated on a small number of borrowers, mainly large farmers and other rural agents who can provide collateral (or at least inspire bank confidence through their reputation). In addition,

* Floro: The American University, Washington, DC 20016, USA. Email: mfloro@american.edu. Ray: Boston University, 270 Bay State Road, Boston, MA 02215, USA. Tel: 617-353-2417, Fax: 617-353-4143, Email: debraj@bu.edu). We thank Pamela Cox, Gershon Feder, Bob Feinberg, Robin Hahnel, Monika Huppi, Gilberto Llanto, Ghazala Mansuri, Chris Udry, Dina Umali, Andy Weiss, and Pan Yotopoulos for their comments and insights. We made use of data provided by the Philippine Institute of Development Studies and by Dina Umali, for which we are very grateful. The staff of the Agricultural Credit Policy Council, especially Cristina Lopez, Babes Orbeta and Marife Santos, and Lucy Lapar of the Philippine Institute of Development Studies deserve special mention for their technical assistance and support.

© Blackwell Publishers Ltd 1997, 108 Cowley Road, Oxford OX4 1JF, UK and 350 Main Street, Malden, MA 02148, USA.

these programs have unwanted side-effects, creating disincentives for financial intermediaries to mobilize their own resources through deposit expansion.

Third, informal financial intermediaries continue to operate vigorously in rural as well as urban areas. These intermediaries represent a principal source of credit for many borrowers. In fact, the formal and informal intermediaries cater to distinct groups of borrowers. They apply different sets of behavioral rules and incentive structures to deal with monitoring and enforcement problems. For instance, informal loans are frequently tied with other activities, such as the provision of labor or the sale of output. It is well understood that such interlinkage serves to reduce (or sidestep) informational asymmetries, or to keep certain relative prices "undistorted" within a given contract.

In recent years, several developing countries, including the Philippines, have attempted to co-opt the informal sector (or some segments of it) and promote its linkage with the formal sector. In particular, this strategy has often involved a deliberate expansion of formal funds to a group of informal financial intermediaries. The recognized importance of informal lenders in rural credit delivery provides, in a way, a new dimension to issues in financial development.[1]

Our goal is to examine the efficacy of such a policy from the viewpoint of the informal borrowers.

One can conceive of two kinds of interplay between formal and informal credit markets. The first is "horizontal:" formal sector banks might compete directly with village moneylenders in credit provision. Under this view, one might think of credit being sought in a two-step process: individuals first try the formal market, with excess demand spilling over into the informal market. Bell (1990) and Kochar (1992), among others, discuss this particular interaction. The second form of interaction is "vertical": informal lenders are viewed as having access to formal sources of lending, and the funds thus borrowed are then re-lent. The present study, along with recent work by Hoff and Stiglitz (1996) and Bose (1996), fits into this category.

The remainder of this section contains a description of our main findings.

We evaluate one particular scheme of promoting formal-informal sector linkages between trader-lenders and banking institutions, and its implications for the terms of credit faced by small farmers. Our study is motivated by the Philippine case, and we present a brief overview of the informal credit sector in the Philippines (section 2), highlighting both market-determined and government-induced levels of interaction.

Our main question is whether an expansion in formal credit creates better terms of credit for informal borrowers, as informal lenders lend these funds at more competitive rates. Hoff and Stiglitz (1996) suggest that this may not be the case. Their argument rests on the rising costs of loan enforcement as more informal lenders enter the credit market. This monotonicity of lending costs as a function of the number of active lenders is assumed, however, and not derived from a more primitive framework of loan enforcement.[2] Bose (1996) extends the Hoff–Stiglitz argument by considering heterogeneity in lenders and borrowers. If some lenders recognize good borrowers, and other lenders do not, then the latter class of lenders must work with a mixed pool of borrowers. An expansion in the former class of lenders will then degrade the mixed pool further, causing the latter group to shrink their lending activities. The net effect *may* be a reduction in overall lending, though a Pareto-deterioration does not occur.

We consider an entirely different route to this outcome. We argue that an expansion of credit may not be beneficial because it might strengthen the ability of informal lenders to collude among themselves. Suppose that lenders are engaged in a repeated

© Blackwell Publishers Ltd 1997

relationship, in which each lender caters to a particular niche of borrowers (Floro and Yotopoulos, 1991; Ray and Sengupta, 1989). Each lender then has an incentive to undercut another lender's (locally monopolistic) activities in his niche. These incentives are counterbalanced by the threat of a "credit war," in which deviant lenders are punished by a retaliatory expansion of credit in their territory. But this retaliatory expansion requires that lenders not be constrained in their access to funds. The greater the access, the greater the potential threat of reprisal, and the easier it might be to sustain collusion. In this sense, an expansion of the formal sector credit line may not be actually used, but only held as a potential threat, facilitating collusion and thereby worsening the terms of credit to informal borrowers.

We simply do not have the data to test this hypothesis in any formal way. What we do, instead, is provide a descriptive coverage of Philippine rice-millers and traders, who are engaged in both trading and lending activity (section 3). Because we have lack of direct information regarding possible collusion in lending, we discuss their interrelationship in trading. The observations are suggestive of collusive behavior.

A theoretical framework then follows (sections 4 and 5). The model incorporates "vertical" layers of credit connecting the formal and the informal sectors. It allows for competition between the informal lenders as well as for the possibility of "strategic cooperation." This latter scenario presents some complex issues, which concern not only the *manner* in which collusion is sustained but also the efficiency and equity implications of collusive behavior. The results obtained in the theoretical model will perhaps provide a better understanding of the nature of formal–informal credit linkages, and their effects. A brief discussion of the policy implications and a summary (section 6) conclude the paper.

Although there are specifics of the model that are peculiar to the Philippine experience, the issues raised in this paper have broader relevance to developing countries. The study calls for a serious reexamination of the nature of market competition when horizontal networks of information-sharing are common between lenders. In particular, it is necessary to study carefully the consequent outcomes of vertical relationships encompassing both formal and informal financial institutions. As argued in this paper, the impact of any policy strategy promoting formal–informal sector linkages depends upon the market structure of the informal credit market. The structure of the market, in turn, cannot be naively based on the number of lenders operating in a given locale, nor on the rate of return on *financial* activities alone. Rather, one must examine the interplay between the horizontal and vertical interactions among the various financial institutions. Although this study focuses on the interaction among trader-lenders, the analytical framework developed in this paper can serve as an important tool for assessing the impact of financial reforms on market performance, both in terms of allocative efficiency as well as distributional outcomes.

2. Vertical Credit Linkages: The Philippines

The Informal Credit Sector

As in any developing country, the financial system of the Philippines has its formal and informal components. The formal financial system, under the direct supervision of the Central Bank of the Philippines, is made up of commercial banks, thrift banks, rural banks, certain specialized government banks and non-bank financial institutions such as investment houses, insurance companies, financing companies and securities markets. The informal sector includes relatives, friends, credit cooperatives, rotating sav-

© Blackwell Publishers Ltd 1997

ings and credit associations, and the array of landlords, millers, traders and other agents who use financial dealings as an important subsidiary activity.

The *quantitative* importance of the informal financial sector is not known.[3] The bulk of the financial statistics in the country reflect only the data from formal institutions. However, there is much to be learnt from various sources of micro-level evidence provided by numerous sample credit surveys and studies accompanying such surveys.

The informal sector is widely diverse. At one end of the spectrum is the highly personalistic system of reciprocity among relatives and friends, situated within a scheme of reciprocity in which loan transactions do not carry interest charges. They largely address day-to-day cash-flow problems in meeting the consumption and production needs of the household. Then there are cooperatives, credit unions, ROSCAS and other self-help organizations which are owned and operated by their members. These typically make use of pooled funds to make loans and sometimes provide other financial services to members.

At the other end is the complex structure of trade and production credit provided by input suppliers and output buyers to their client-producers. Other examples of linked transactions, such as those between a landlord and a laborer or tenant, are also common.

Our study focuses on a major group of informal lenders in the rural areas, namely *marketing agents*. Their prominence in the last three decades, especially in rice-growing areas, results from the rapid commercialization and intensified trading activity in these areas. Much of the marketed rice procurement is done by the private marketing agents consisting of paddy traders or commission agents, ricemillers, wholesalers and retailers. These agents usually are engaged in moneylending as a means of having a claim over the produced output and of securing the trader's share in the output (paddy rice) market. What is therefore often involved is a cascading, series of credit transactions, often referred to as *credit layering* (Floro and Yotopoulos, 1991), that parallel the distribution chain in marketing.

Figure 1 traces a typical marketing channel and its accompanying credit channel. It should be noted that the various tiers of these marketing activities are not assigned to distinct agents. Traders often assume a combination of tasks.

The dominance of marketing-agent credit lies in the substantial advantage that these agents possess in the access to information, and in enforcing repayment. They provide loans to the vast majority of small farmers who are rationed out by formal financial institutions under the perception that they are risky, non-creditworthy prospects. They obtain very high repayment rates in the process.

In our study, we focus on this subgroup of informal lenders and their interaction with the formal financial institutions, whether market-determined or government-induced.

Formal–Informal Linkages

There is evidence that illustrates the considerable interaction between the formal and informal financial institutions even in the absence of government intervention. There linkages typically take the form of a significant flow of funds between the two sectors. Informal lenders often *borrow* from their formal counterparts, banks being an important source of funds.[4]

Several studies document the evidence of fund flows from the formal to the informal credit sector. Geron (1989) studied 125 rural lenders operating in rice and coconut producing villages. Some 70% of the respondents obtained loans from banks. Umali's

© Blackwell Publishers Ltd 1997

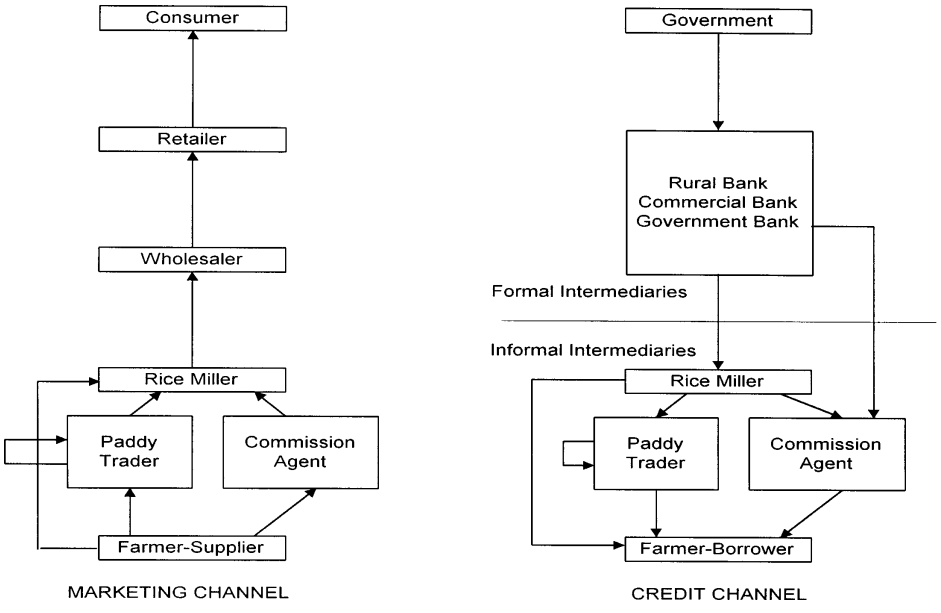

Figure 1. Marketing and Credit Channels in Philippine Rice Production

(1990) survey of traders, commission agents and ricemillers involved in rice marketing in the Philippines provide further evidence of banks as important sources of trader's loanable funds. Ricemillers in this study borrowed as much as 80% of their funds from formal banking institutions. In Larson's (1988) study for the Philippines, 70% of the sample traders obtained 60% of their funds from formal sector banks. A 1978 TBAC informal lenders survey of 163 rural informal lenders in three Philippine provinces shows that significantly more than half of the informal lenders surveyed were savers in or borrowers from formal banks. Indeed, three informal lenders were at the same time *owners* of local banks (Agabin, 1988). Eighty-four or 52% of rural informal lenders were, in particular, borrowers from the formal sector. Bank loans comprised close to half of their total operational fund. The bulk (four-fifths) of such loans came from commercial banks.

The above findings are further supported by a recent comparative survey of *formal* lenders (banks) conducted by the Philippine Institute for Development Studies and the Agricultural Credit Policy Council. Their 1986 survey involved 66 respondent banks including 27 commercial banks, 23 rural banks and 16 private development banks in eight provinces. The strength of the linkage between the formal and informal sectors seems to vary with the type of institution. Nearly a third of the commercial banks and development banks, and 17% of the rural banks in the sample, have lent to informal lenders. The percentage of total bank loans that have gone to these informal lenders ranges from 15% for rural banks to 55% for the development banks.

The predictable outcome is credit-layering *across* the two sectors. A typical description would run as follows. Bankers provide trade credit to ricemillers and, to some extent, to large traders in the agriculture sector. These clients who borrow working capital from the banks become, in effect, retailers of bank funds in the informal credit markets as they relend, either directly to small farmers, or indirectly in the form of

© Blackwell Publishers Ltd 1997

layered credit to other middlemen or commission agents (Agabin, 1988; Agabin et al., 1989).

Linkages and Policy

The links described above are by no means due to market forces alone. The government has made active attempts to incorporate the informal sector into the overall strategy of agricultural development. In a sense, efforts to institutionalize the informal sector in the Philippines took place as early as the fifties with the formation of family-run, rural unit banks. Small in their capital base and in their mode of operation, the rural banks were then perceived as the stalwarts of agricultural credit delivery. Matters were not so simple, however. Von Pischke (1991) pointed out, however, that these rural bankers were "prominent local citizens who were often involved in moneylending. By becoming rural bankers they could obtain some capital from government to supplement their own. They could expand their moneylending operations by soliciting deposits." As it turned out, rural banks did not reach the majority of the small farmers.

In recent years, the focus on informal lenders has been strengthened. The government has employed a number of approaches to reach small rural borrowers in this indirect fashion. The rediscounting policy of the Central Bank has played a key role, along with fiscal policies allocating budgetary resources and external borrowings for special credit schemes. These schemes involve the strengthening of linkages between the formal financial institutions (participating banks) and informal intermediaries such as traders.

In 1984, a government-sponsored program, aimed at providing credit at concessionary rates to the agricultural sector by using informal lenders as intermediaries, was launched. This scheme was called the National Agricultural Productivity Program, comprised of twelve specific commodity programs geared towards food self-sufficiency. Informal lender-beneficiaries included traders, millers and input dealers. Commercial banks and rural banks participated in the program by acting as financial intermediaries between the government and the informal lenders.

Two low-cost special financing programs that are largely targeted to agricultural input suppliers were the Planters' Product Credit Scheme and the End Users/Input Suppliers Assistance Scheme. Under these arrangements, end users and input suppliers receive credit at concessionary rates of interest under the condition that they extend credits (in the from of fertilizer and pesticide credits or cash production loans) to farmers.[5]

Traders and ricemillers were also utilized as credit channels under the Intensified Rice Production Program. Farmers contract to supply trader-millers with a specified volume of their produce at a buying price not lower than the government support price. Likewise, the trader-millers are required to enter into a "payment-in-kind" agreement with the National Food Authority where they deliver the milled rice equivalent of the due loan payment.

"Horizontal" competition from the informal sector therefore does not seem to be a threat to the formal institutions, nor vice versa. A senior official of one of the largest commercial banks in the Philippines typifies the viewpoint of the dominant group in the formal financial sector: the commercial bankers. According to this view, informal lenders are not bank competitors. Rather, they complement the lending activities of the banking sector:

> The informal lenders operate in a different segment of the market. The bank's market lies largely in corporate and commercial accounts which are

© Blackwell Publishers Ltd 1997

> generally fully collaterized. In fact, some of the informal lenders are, in effect, conduits of bank funds . . . This is true with our big grain miller and trader clients who provide advances to the paddy farmers in the regular course of their business.[6]

3. Are Informal Trader-Lenders Competitive?

We turn, then, to the interaction among different *informal* lenders. Conventional wisdom assumes this interaction to be competitive. In fact, the assumed presence of such competition implicitly underlies standard policy prescriptions. A direct implication of this assumption is that an increased flow of funds from the formal sector to the marketing agents will exert downward pressure on interest rates and other contractual terms, as the potential for competition is enhanced. Such an assertion is true if lenders behave competitively. If lenders somehow form a monopoly, the assertion is false. The true picture, however, may be characterized by neither of these extreme cases, but by a form of *strategic cooperation* which yields collusive outcomes in many situations. This requires further analysis of the delicate balancing mechanism of threats and counterthreats before reaching any conclusion.

There is surprisingly little empirical evaluation to draw upon. We examine the indirect evidence regarding the interaction of marketing agent-lenders in the sphere of trading, and comment on its implications for interaction in the sphere of credit.

Standard Measures of Competition and Their Limitations

Conventional wisdom produces two easy rules of thumb to judge competitiveness: the *number* of informal lenders in a given locale, and the *rate of return* to lending activities.

There are, however, several problems in using these indicators to study the market structure of the informal credit sector. First, the existence of market interlinkages makes the measurement of the true rate of return to lending problematic. Since trader-lenders not only jointly maximize the returns to two or more activities, but may also impose "hidden" charges by way of output underpricing or input overpricing, it is difficult to calculate a true measure of profit simply by looking at the explicitly declared rate of interest.

Second, the large number of informal lenders in an area may be deceptive. It does not take into account that a significant sorting of borrowers occurs based on the informational, monitoring and enforcement advantages of particular groups of lenders. This matching of borrowers with lenders helps form sub-sectoral "zones of influence" that dramatically reduce competition and create some barriers to entry.

A third reason for the inadequacy of number of lenders as an index of competition is the presence of vertical credit relationships among informal lenders.[7] Thus even within a particular lender type such as paddy rice trader-lenders, certain subgroupings do not compete in credit lending. Rather, they form several tiers in the informal financial structure. For instance, ricemillers can (and do) pass on funds to second-tier financial intermediaries: paddy traders or commission-agents. In particular, if the informal suppliers of loanable funds are noncompetitive, then the rest of the downstream credit chain may tend to be noncompetitive as well. This suggests that the behavior of the upstream group of lenders, namely the informal suppliers of loanable funds, is critical in the determination of market competitiveness.

In the present context, these are the ricemillers. At this point, we rely heavily on

© Blackwell Publishers Ltd 1997

Umali's (1990) study of rice marketing in the Philippines, where traders and ricemillers provide the bulk of farmer loans.[8]

Market Interaction Among Trader-Lenders

Unfortunately, there is no direct information regarding the behavior of ricemillers and paddy traders in the credit channel. There is some evidence, however, regarding the nature of their interaction with respect to other ricemillers and to paddy traders in the *marketing* channel. We may use this information to draw some (admittedly probabilistic) inferences regarding their interaction in the sphere of credit.

In addition to their dependence on ricemillers as a major source of funds, paddy traders obtained their buying price information primarily from ricemillers and other paddy traders (Tables 1 and 2 illustrate both these features.). Moreover, "paddy traders relied mainly on the price offered by the ricemiller and the selling price of other paddy rice traders as reference for their selling price . . . In cases where the ricemiller provided a cash advance to the trader, the selling price was agreed upon in advance" (Umali, 1990, p. 251). This suggests the dominating influence of the ricemillers on the rest of the credit-cum-marketing chain. They effectively set the price floor for buying paddy rice from traders and commission agents as well as the ceiling for the procurement price of the farmer's marketed output.

Table 1. Paddy trader sources of financing, 43 sample traders

Source of funds	*No. of loans*	*Distribution (%)*	*Annual interest rate (%)*
Personal	14	32.56	—
Rice mill	12	27.91	0
Relatives/friends	10	23.26	84
Banks	7	16.28	21
Total	43	100.00	—

Source: Umali (1990).

Table 2. Paddy trader sources of price information, 43 sample traders

Information source	*Nueva Ecija (no.)*	*Distribution (%)*
Buying:		
Other paddy traders	26	65.0
Ricemillers	11	27.5
Farmers	2	5.0
Out-of-town buyers	1	2.5
Selling:		
Other paddy traders	10	32.3
Ricemillers	19	61.3
Paddy buying price	2	6.5

Source: Umali (1990).

© Blackwell Publishers Ltd 1997

Table 3. Ricemiller sources of price information, 38 sample ricemillers

Source of information	Nueva Ecija		Iloilo		Total	
	No.	*(%)*	*No.*	*(%)*	*No.*	*(%)*
Buying:						
Other ricemillers	23	60.5	15	93.8	38	70.4
Wholesale rice price	11	28.9	0	0.0	11	20.4
Paddy traders	4	10.5	1	6.3	5	9.3
Total	38	100.0	16	100.0	54	100.0
Selling:						
Other ricemillers	18	40.0	15	88.2	33	53.2
Wholesalers/retailers	20	44.4	1	5.9	21	33.9
Paddy buying price	6	13.3	1	5.9	7	11.3
NFA rice	1	2.2	0	0.0	1	1.6
Total	45	100.0	17	100.0	62	100.0

Source: Umali (1990).

A key indicator, therefore, of the extent of market competitiveness in the trading business is the nature of the ricemillers' behavior and interaction.

Credit layering and vertical integration in marketing are intrinsic functions for the ricemiller. A miller ensures rice supplies for his mills by extending loans to the farmers, either directly, or indirectly via the traders and commission agents. The relatively few number of ricemillers and the large size of their operations makes the *potential threat* of competition not only credible but also formidable. Therefore, it is superficially paradoxical but on reflection not surprising that "according to the millers, their circle is characterized more by friendly cooperation than intense competition" (Umali, 1990. p. 260). Millers, for example, obtain price information mainly by keeping in daily contact with each other (Table 3 illustrates this):

> In both provinces, the millers formed a unique circle fostered by consanguinity, membership in the same social groups (e.g., church and charities), very close relations resulting from religious bonds and membership in the millers' association. Market information was easily and quickly exchanged among them. Daily telephone calls transmitted information on buying and selling prices, sources of paddy, the reliability and honesty of buying stations or commission agents, potential markets and potential threats.
>
> (Umali, 1990, pp. 259–60)

The extent of information sharing among ricemillers as well as the barriers to entry in ricemilling activity supports the hypothesis that ricemillers are "strategically cooperative" in their marketing behavior. If there is little or no substitute for the product or service of the upstream "firm," namely the ricemillers, then one can conclude that the whole rice marketing system operates under strategic cooperation (Scherer and Ross, 1990). A similar hypothesis is likely to be true in their credit activity as well. Indeed, the interlinked character of credit and marketing exchanges indicates that the two are part of an overall package that determines market share. The sharing of information and collective monitoring is demonstrated for example in the following case of commission agents of ricemillers in Iloilo.

© Blackwell Publishers Ltd 1997

> [Agents] served as the eyes and ears of millers in the villages, taking paddy samples from the farmers to the millers for pricing, and relaying the miller's price to the farmers . . . One commission agent explained that no agent will attempt to add a mark-up over the miller's quoted price, because if found out, word would quickly spread among the millers. The dishonest trader will automatically be blacklisted, permanently ending the agent's trading career.
> (Umali, 1990, p. 253)

In the next section, we turn to the analytical implications of these empirical findings. The framework we develop will be firmly based on the above empirical discussion, and will serve as a method of evaluation of the policies under consideration.

4. An Analytical Franework

We set up a framework for understanding vertical credit links between the formal and informal sectors. The general scenario that we adopt is closely related to the empirical discussion elsewhere in this paper. Consider a geographical region, populated by farmers with different endowments of productive assets. Our focus is on *small farmers* who must borrow at regular intervals to finance their production but lack the necessary collateral to secure a formal sector loan.

In line with the empirical discussion, we suppose that these farmers are locked into the following production-credit cycle. At the start of the production cycle, they receive cash advances, largely from ricemillers, rice traders and commission agents. These advances are then repaid at harvest time, typically at the harvest site when the crop is collected for transportation to the mill. After this, a new round of the same process starts.

We next distinguish between ricemillers, each of whom typically represent a large economic unit, and traders or commission agents, who serve as the intermediary between the farmer-borrowers and the miller-lenders. Based on the evidence presented, the former group tend to engage in a "strategically cooperative" relationship. Although the threat of encroachment onto rival territory is present, this is counterbalanced by the threat of competitive reprisal. Modeling the behavior of these "upstream" lenders as *myopically* competitive would be a seriously flawed description of the existing situation.

On the other hand, some evidence suggests that paddy rice traders or commission agents are relatively more competitive in the short run. Ricemillers may hire several middlemen or commission agents as intermediaries to the extent of their loanable funds. There are also no large overhead capital requirement barriers to entry as in the case of ricemilling. Thus it is more difficult to overcome the free-rider problem associated with strategic cooperation since the number of agents is relatively large.

These observations suggest that it will be useful to maintain a distinction between millers (upstream lenders) and commission agents, traders and middlemen (downstream lenders) in the analysis that follows. Accordingly, we start by considering a model where the latter are out of the picture, and assume for the sake of simplicity, a two-tier situation with millers as principals and farmers (or borrowers) as agents. The following analysis of the millers' interaction first examines the basis for each miller's "zones of influence" in the credit market. This section takes into account the process between the miller and the borrower which determines the respective utilities gained by each contracting party. How (myopic) competition or collusive agreements between millers is affected by the expansion of informal sector credit and the increased presence of formal–informal linkages is discussed next.

© Blackwell Publishers Ltd 1997

The analysis of collusion in a repeated relationship builds on three elements: (1) the collusive arrangement that is to be sustained over time, (2) the strategic inroads that can be made into a rival's territory while the rival is adhering to the collusive arrangement, and (3) the *credible* punishments that can follow the territorial encroachment in (2). A crucial feature of the model is the effect of financial links between the formal and the informal sector on both items (2) and (3). These links also have implications for item (1).[9]

We develop a simple model that captures these essential features. With each miller we attach a group of borrowers with whom the miller-lender has comparative advantage in dealing. A miller's advantage in information gathering and monitoring of a particular borrower is a result of several factors. First, there is the issue of spatial accessibility. Some millers may find it easier to deal with particular farmers in a geographically contiguous region simply because of the saving of fixed costs entailed in the process of transportation. Second, there is the issue of historical association. Regular borrowers or those with previous dealings present informational problems that are less severe than those of new borrowers. Third, there is the obvious correspondence between borrowers and millers with respect to the crop produced.[10]

The easiest way to visualize the heterogeneities that give rise to such initial "zones of influence" is to adopt the device of a locational model, pioneered by Hotelling. All the small farmers of a particular region (whether currently borrowers from traders or not) are thought of as being located on a segment. Different points on this segment reflect the special characteristics of the borrower "located at that point".[11] Millers, too, may be thought of as being located on this segment.

The interpretation is that a particular miller is possibly most suited to dealing with a certain class of farmer-borrowers. Presumably, for borrowers located "further away," relatively smaller gains are to be had in dealing with that particular miller.

A particular miller and a borrower are engaged in more than one transaction. First, there are the loans advanced by the miller to the borrower. Of course, the act of making these loans implies that the miller incurs an opportunity cost on the funds involved. If the miller is not credit rationed in *his* dealings with rural banks or other formal financial intermediaries, the correct way to value this opportunity cost is at the going rate of interest on such credit to the miller. More likely, the miller too faces a credit constraint in the formal sector. In this case, the opportunity cost is higher than that reflected by the formal sector rate of interest alone.

Next, the miller buys the output of the borrower, in turn processing it for further wholesale trade or retailing. Presumably, the revenues from such trading are captured by the going market price of the final output. While millers in a *particular* region may be collusive, there is little reason to believe that one such group can influence the overall market price of final output, so we may take this as given. This is, however, not true of the buying price offered by the miller to the farmer, which we treat as part of the contractual arrangement.

Finally, there are certain transactions costs inherent in the relationship itself. There are additional costs of transportation, monitoring, as well as costs of ensuring repayment and output sale. If all *transactions* costs and production technologies are taken into account, it is possible to estimate the overall net gains generated by miller and borrower coming into contact. We denote the maximum potential value of these gains by S. Of course, the magnitude of S depends on the characteristics of the miller and the borrower. *In addition, S depends on the ease with which the miller can borrow funds from formal financial intermediaries.*

The distribution of S between the miller and the borrower depends on several

© Blackwell Publishers Ltd 1997

factors. If the borrower enters into a deal with this particular miller, there are alternatives foregone. The borrower has to be compensated for this opportunity cost; hence he must receive at least his reservation utility (to be endogenized in the sequel). The *design* of the contract is also important. The theory of interlinkage teaches us that it is meaningless to conduct a narrowly focused examination of any one aspect of an interlinked contract (such as credit or output sale alone) and even misleading with respect to understanding the returns from such a contract. In general, the optimal contract cannot be sensibly decomposed into meaningful production and credit contracts, viewed separately (Gangopadhyay and Sengupta, 1987).

What factors determine the reservation utility of a borrower? The first consideration is the utility received if a farmer falls *outside* the nexus of the interlinked credit–output markets. This includes the utility of a production activity with no credit or the utility of taking an unlinked loan provided by a moneylender, or the (probabilistic) prospect of borrowing from a rural bank or a cooperative. The second factor is the utility received by entering into an interlinked contract with *another* miller. For the purposes of our model, we treat the first factor as *exogenous* to the system, and focus on the second. The borrower's option of going to another miller is endogenous in the following story concerning threats and counter-threats.

To this end, we may regard S, the potential gains, as *net* of the exogenous (first) factor, but do not factor out the endogenous (second) factor just yet. To be sure, S is a function of borrower characteristics for a *given* miller. By definition, S is highest for contracts between borrowers and millers who incur the lowest information and transactions costs in dealing with each other. To use the Hotelling locational analogy, S falls as the "distance" between borrower and miller increases.

If there were only one miller, or a monopolistic group of millers with no need of an internal monitoring and enforcement mechanism, our story would come to an end at this point. The miller would push the borrower to his reservation utility, and appropriate all the potential gains for himself by a suitable choice of contract (Gangopadhyay and Sengupta, 1987). An expansion of formal sector credit would thus have no effect on the well-being of the farmers unless such expansion were to directly change the borrower's *reservation* utility. This happens if farmers are now able to *directly* obtain formal sector credit, as in the study by Bell (1990) in the context of India. However, in the case of credit expansion via informal intermediaries such as the millers, the effect on the well-being of borrowers depends on the resulting policy impact on the degree of competition between these intermediaries.

Consider, then, a group of millers engaged in strategic cooperation. Figure 2 illustrates the dynamics of interaction in the case of two millers.

Two possible situations are shown in Figure 2. In panel A, the set of farmers with potentially positive gains from interacting with miller 1 is disjoint from the corresponding set for miller 2. Transactions costs prevent the invasion of each other's territory. This case, however, is likely to be unrealistic (and it is trivial to analyze anyway), and thus ignored in the analysis. The following discussion focuses on the situation described in Panel B. Each of the millers in the case competes for the clientele of the other. In both panels, we denote the potential surplus to be generated between a farmer such as x and a miller such as i by $S^i(x)$. The curves S^1 and S^2 depict these loci for millers 1 and 2 respectively. The potential (or lack thereof) for competition in this situation depends on the strategic devices that can be invoked to maintain collusive outcomes.

The basic postulate of the model, as in the theory of repeated games, is that the alternative to collusive behavior is competition, or rather, the *credible threat* of

© Blackwell Publishers Ltd 1997

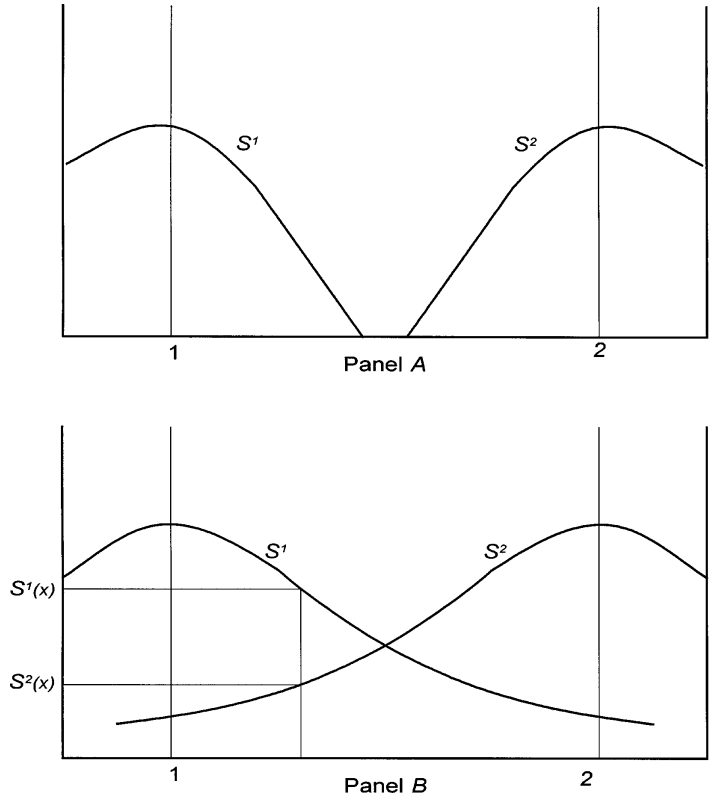

Figure 2. Two Millers: Zones of Influence and Overlap

competition. To this end, suppose that one of the millers believes that the other is engaged in what might be called "myopic" competition. Then it is easy to see that the likely response of the former is to be myopically competitive himself. Consequently, the threat of myopic competition becomes a credible one, and it is this threat that determines the possibility of collusion.[12] But before we analyze this, we consider the policy effects of informal–formal linkage expansion in a Bertrand model of myopic competition.

Myopic Competition

Suppose (*not* as a matter of realism, but as a means of exposition) that the two millers in our story are simply unaware that they are engaged in a repeated relationship with each other, and hence assume a naive, short-sighted view of the gains from lending. Our objectives are (1) to examine myopic competition as a benchmark for testing the possibility of collusion, and (2) to examine how an expansion of formal sector credit affects the outcome in this case.

Consider a borrower x, as shown in Figure 2. If millers 1 and 2 compete for credit transactions with this borrower, then it is reasonable to presume that 1 will have a comparative advantage over 2. Unlike the case of monopoly, miller 1 can no longer capture the entire potential gains $S^1(x)$ in dealing with farmer x. If this were to happen, miller 2 can offer a contract that promises higher utility to borrower x while still retaining a positive profit for himself. This (imaginary) process culminates in a situa-

© Blackwell Publishers Ltd 1997

tion in which borrower x must now be given at least $S^2(x)$ if miller 1 is to be able to deal with him without being undercut by miller 2. Figure 3 portrays the outcome of Bertrand competition, with 2's profits (*vis-à-vis* x) being driven to zero. In general, the solid lines marked C^1 and C^2 describe the competitive profits accruing to the two millers, if they were to compete for particular borrowers. The dotted line shows the original curves S^1 and S^2. Indeed, the C^i curve for each miller i is derived by appropriately subtracting one of the S-curves from the other.[13]

Having described the basic elements of the model, let us now examine the conventional wisdom regarding formal–informal linkages and the intensification of competition in the credit market. We consider two ways in which the government can pursue these objectives. First, the *interest rate* at which formal sector loans are obtained by millers is reduced. Second, the average quantity of formal loanable funds per miller is increased. It is of course possible that a policy change may involve combinations of these two factors, but for purposes of exposition it is useful to consider the two extremes.

A decrease in the formal interest rate faced by a miller magnifies the potential gains to be made from each farmer. This effect manifests itself in an upward shifting of the S-curve. On the other hand, an increase in the *quantity* of loanable funds has no effect on the S^1-curve at all. The effect of such a policy is to widen *outreach*, in terms of the number of potential borrowers the miller can consider lending to.

We now examine the implications of such a policy. First, if the availability of loanable funds is low, the two millers will be segregated, with no possible avenue to compete nor to collude. In this situation, an expansion of credit to the lenders will create what might be called a *spread or outreach effect*, with more and more previously isolated potential borrowers being drawn into the credit network. It should be pointed out, however, that the outreach effect does not affect *existing* borrowers, nor does it alter lenders' monopoly power.[14] The outreach effect is minimal in the case where the credit policy lowers the interest rate. What it simply does is to raise the returns to the miller without affecting the returns to the borrower.

Returning to the case of credit expansion, consider Figure 4. The ceiling on loanable funds for each intermediary is denoted by D. Suppose that there is excess demand for credit and that potential borrowers situated between A and B as shown in Figure 4 are currently not being served. With credit expansion, D increases, and potential borrowers situated between A and B are progressively drawn into the credit nexus of each miller.

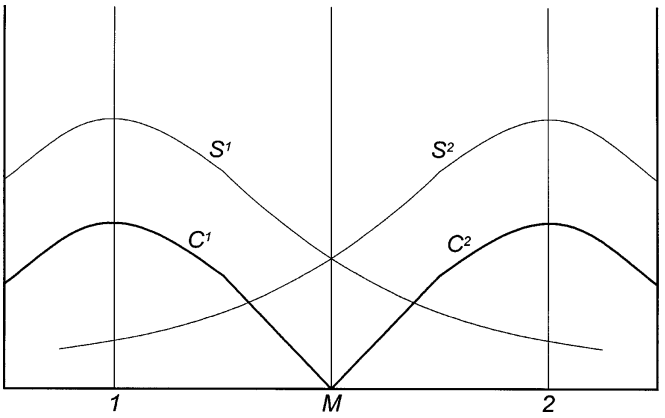

Figure 3. Myopic Competition for a Given Borrower

© Blackwell Publishers Ltd 1997

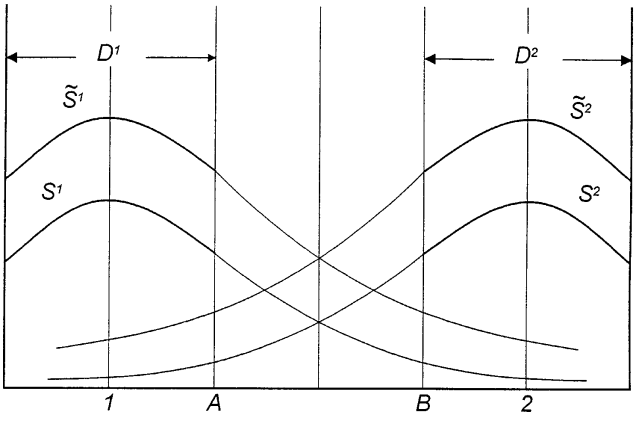

Figure 4. The Outreach Effect of Increased Supply of Loanable Funds

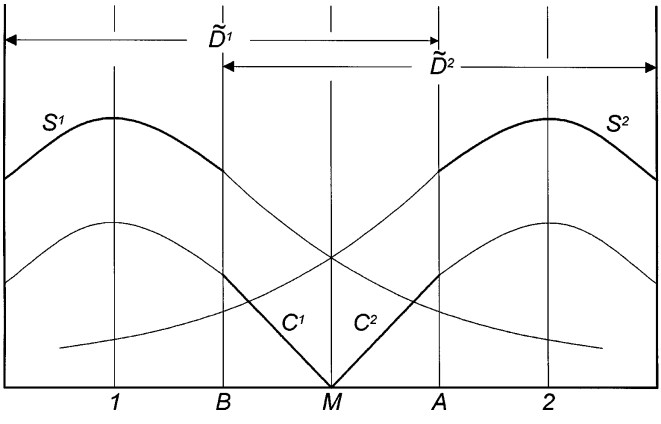

Figure 5. The Competition Effect of Expanded Funds

The outreach effect of credit expansion continues until the supply of loanable funds permits the two lenders to enter each other's market. At this point, the spread effect ceases and competition commences in the overlap area (see Figure 5). This "competition effect" drives down each lender's return, transferring more of the potential gains to the borrower.

Competition therefore occurs when "zones of influence" overlap, and its level or intensity will depend on the particular interaction between the lenders. The analysis implicit in Figure 5 assumes Bertrand competition, where millers progressively undercut each other (by offering better contractual terms to the borrower) until one of the millers can undercut no further. This limit determines the profit of the miller who is better placed. This competitive profit is denoted by the solid lines C^1 and C^2 in Figure 3 and represents the minimum level to which the profit can fall in Figure 5, within the "competitive zone" accessible to both millers. The zone widens as the supply of loanable funds expands, intensifying competition.

What if the interest rate on loanable funds decreases? In this situation, it is important to note that while the potential gains increase—the *S*-curves shift upwards—the effect on (myopically) competitive profits (C^1 and C^2) is likely to be minimal. These

© Blackwell Publishers Ltd 1997

profits are represented as the *difference* between the potential gains that the millers can make from a particular farmer. To the extent that these gains shift in the same direction, they have opposing (and roughly equal) effects on competitive profits.[15] *Changes in the interest rate are unambiguously passed on to the farmers, when competition is myopic.*

Strategic Cooperation

The preceding discussion on myopic competition has demonstrated that indirect financing of intermediaries by the formal credit system leads to more informal borrowing, and better terms of credit for the borrowers. But when interaction between the lenders is one of strategic cooperation, the implications are substantially altered.

A straightforward case of collusion whereby millers simply conform to a cooperative agreement requires little explanation. A policy of expanding formal loans to the informal lenders would have little or no effect on the welfare of borrowers. Collusive behavior, however, does not arise from a friendly desire to cooperate, but from a careful calculation of intertemporal costs and benefits. A deviation from a collusive arrangement clearly yields short-term gains for the deviant. These short-term gains need to be weighed against the potential loss brought about by a *credible* promise of retribution. The credibility of such a reprisal is important if any deviant action is to be thwarted. Game theory, particularly that of repeated games, stresses the issue of credibility in dynamic interaction between players. Repeated games generate a multiplicity of equilibria. "Collusive" or "cooperative" behavior in a multiperiod context can be sustained by credible arrangements to continue with a "profitable" equilibrium in the case of conformity, or to revert to a "bad" equilibrium in the case of noncompliance. The emphasis of always using *equilibrium* paths underlies the notion of credibility (Selten, 1975).

Within this context, the policy impact of an expanded supply of loanable funds depends directly on the question of how the gains and losses of deviation from a collusive path are affected. We turn to an examination of this issue.

Let us denote the amount of loanable funds to the two millers by D_1 and D_2 respectively. Consider then a cooperative arrangement in which each miller retains that part of the market to which his characteristics are more suited. The *initial choice* of how the market will be segmented is somewhat arbitrary, but it is natural to argue that millers will retain those borrowers that are most advantageous from the point of view of their characteristics (Ray and Sengupta, 1989; Floro and Yotopoulos, 1991). In the schematic representations of Figures 3 and 5, the "natural" market for miller 1 is to the left of M and that of miller 2 is to the right of M.

As in the case of myopic competition, one observes that the spread or outreach effect is dominant at first, and there is no question of competition (nor collusion) since there are no areas of overlap. But as the loanable funds available to the millers expand further, a "competitive zone" is created (Figure 5). This now makes the question of competition relevant. The remainder of the analysis will focus on this particular situation.

Suppose that the two millers attempt to maintain a collusive outcome, each miller serving its own captive market at monopolistic terms. As D_1 increases further, say beyond M, there arises the possibility of invading the "zone of influence" of miller 2. The short-term gains from doing so are depicted in Figure 6.

The two millers are serving borrowers in their own implicitly demarcated territories, even though there are sufficient funds for each to invade the market of its rival. In the

© Blackwell Publishers Ltd 1997

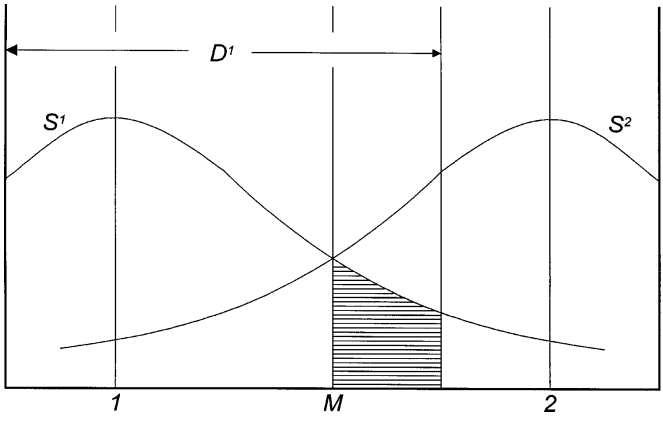

Figure 6. Gains from Upsetting a Collusive Arrangement

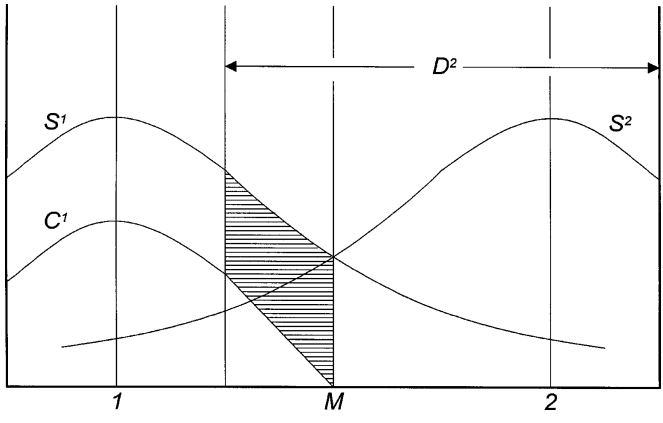

Figure 7. Losses Following a Deviation from Collusion

absence of any competition (under the collusive arrangement) arrangement, each miller *i* initially is able to extract the potential gains S^i from each farmer he is dealing with. But this high return attracts potential invasion by the other miller. The rival miller can obtain nearly all of *his own* potential gains by offering a slightly better contract to the farmers served by his competitor. Given the size of loanable funds D_1 and the formal sector interest rate, this extra potential profit for miller 1 is depicted by the shaded area in Figure 6. A similar story can, of course, be told for miller 2.

If miller 1 proceeds to invade the "zone of influence" of miller 2 (or vice versa), such deviant behavior would certainly be detected in due course. The invasion would then be punished. One such credible punishment is the abandonment of cooperation leading to a sequence of competitive outcomes such as those described in the previous section. This leads to a *loss* relative to the collusive outcome. Figure 7 describes the loss that can be inflicted on miller 1 following his invasion. His returns on lending in the zone of overlap formerly monopolized by him drops from S_1 to C_1.

There is another element in the story that has an important bearing on the outcome. This has to do with the speed by which an invasion is perceived. The quicker a rival perceives that a strategically cooperative outcome is being undercut, the *easier* it is to

© Blackwell Publishers Ltd 1997

maintain strategic cooperation. To the extent that such detection time is affected by the supply of credit, we must consider it explicitly in the analysis.[16]

The discussion above demonstrates that the probability of a "successful", strategically sustained cooperative outcome depends on the following factors: (1) the additional profits initially gained from undercutting one's rival, (2) the subsequent loss in terms of a reduction in profits that occur as a result of a counter-invasion by the rival miller, and (3) the lag or detection time that elapses between the invasion and the reprisal. The probability for sustained cooperation is higher if the initial gain from invasion is small, or the subsequent loss from counter-invasion is large, or if the time lag between invasion and reprisal is long.

To illustrate how these factors affect the outcome in a simple Bertrand competitive example, we consider the special case of a perfectly symmetric model. To this end, suppose that the S_1 and S_2 curves drawn in Figures 6 and 7 are perfectly symmetric with respect to the two millers. Recall, also, that the function C^1 depicting competitive profits to miller 1 is simply the difference between the potential gains (S^1) of miller 1 and those of miller 2 (S^2). Consequently, the *loss* to miller 1 depicted in Figure 7 as the area between S^1 and C^1 corresponds to the area under S^2 over the same interval in Figure 7. By symmetry, this is precisely equal to the shaded area under S^1 shown in Figure 6, which depicts the *extra profit* from invasion.

We use this to further examine the dynamics between millers, applying repeated game theory. Suppose that each miller has a discount factor δ applied to the future, and suppose that an invasion is detected after one time period.[17] Then collusion is possible if (and only if) for each miller,

$$\text{invasion profits} \leq \frac{\delta}{1-\delta}\left[\text{reprisal loss}\right]. \tag{1}$$

In the above example, the profit from invasion is exactly equal to the loss from reprisal, as we argued in the previous paragraph. We can therefore translate condition (1) to the following: for strategic cooperation to prevail, $\delta \geq 0.5$.

It should be noted that this condition is *independent* of the type of credit policy pursued by the government. In other words, the presence of government intervention has no effect on the ability to enforce collusive practices in this example.

An expansion of formal sector credit has two opposing effects. On the one hand, it tends to expand competition because each miller now has an incentive to undercut his rival. On the other hand, it tends to reinforce collusive practices by increasing the severity of credible punishments should deviations occur. In this example, these two effects are equal and hence cancel each other, so the net effect is neutral; i.e., the possibilities of strategic cooperation are unaffected, and the gain to the borrowers may be minimal.

Now let us extend this example to more realistic situations. There are actually good reasons to argue that the possibility of strategic cooperation may indeed *improve*. One of the potential effects of informal sector loan expansion is the reduction in detection time. In other words, the opportunity cost of monitoring the actions of one's rival is lowered. If the speed of detection is increased, then there is a high probability of sustaining a collusive arrangement after credit expansion. For a given level of deviation gains and reprisal loss that permit competition between millers, the shortened detection time promotes strategic cooperation.

The increased probability of strategic cooperation stems primarily from the fact that it is difficult to engineer a large invasion of a rival's territory without rapid detection. As D_1 increases, the larger is the area of overlap and the correspondingly larger

© Blackwell Publishers Ltd 1997

invasion is more easily detected, thus cutting down the response time before reprisal. Additionally, as the miller's interaction moves into the reprisal or punishment phase, the losses will likely increase with the increase in loanable funds. These two factors effectively *lower* the ratio of invasion profits to deviation losses.

Other variations of the basic repeated games model developed here will yield similar results. For instance, consider a situation where miller 1 specializes in processing a particular crop A, while miller 2 specializes in crop B. Imagine a (proposed) collusive outcome whereby miller 1 (resp. 2) lends money to small borrowers specializing in the production of crop A (resp. crop B). Typically, interlinked contracts will be offered, with loans being repaid in large part by the sale of the crop to the trader at reduced prices (see Gangopadhyay and Sengupta (1987) for the first definitive treatment of this problem). Now, because of the monopolistic behavior of each trader, there is scope for invasion of each trader-miller's territory by the rival trader-miller. The extent of possible invasion will depend on the supply of loanable funds available to each trader. The specific form that such competition might take is somewhat more complex and is beyond the scope of this study.

While we abstract from a formal treatment, the scenario to be described is quite intuitive. Miller 1, say, might offer a loan to a borrower specializing in crop B on the understanding that the farmer will divert some of his land to the production of crop A, which is then sold to the trader. Suppose that the production function for the farmer exhibits diminishing returns in the production of each crop (though overall it may be more suited to the production of crop B). Then the outcome will be a large gain for miller 1 if the amount of the invasion is small, but with diminishing marginal gains as the size of the intervention becomes larger.

While the deviation gains are small, the *loss* that can be imposed on the deviating trader following a reprisal can still be substantially large. As his clientele shift the pattern of crop production, this leads to a fairly small but positive marginal gain for the rival, it will still be imposing large marginal losses on the incumbent trader. Unlike the simple Bertrand model of the previous section, this situation does not lead to a zero-sum game. The total surplus S between the lenders depends on the number of millers dealing with a given potential borrower, as well as the scale of their participation.

In this scenario, the expansion of credit line to millers also leads to a decrease in the ratio of invasion profits to reprisal losses, leading to an increase in the chances of collusion.

The examples discussed emphasize the importance of understanding the nature of interaction between lenders. The impact of any (credit) policy initiative on the welfare of borrowers crucially depends on the resulting effects on competition (or collusion). As shown in the above extensions of the basic Bertrand Competition model, different scenarios lead to different outcomes. In particular, we stress the possibility that an expansion of credit may, in fact, enhance the ability to strategically cooperate.

The above analysis has important welfare implications. In a world where informal lenders are competitive in the myopic sense, the indirect route of expanding formal credit to informal financial intermediaries may well foster increasing competition among such intermediaries, leading ultimately to a greater availability of credit (and on better terms) for the small borrower. Matters are dramatically different, however, when there exists strategic cooperation among these intermediaries. In this case, the expansion of credit may actually strengthen the possibilities of collusion, leading to the pocketing of gains by the intermediaries themselves.

This is not to deny, however, the potential usefulness of such interventions. But they have to be carried out with an explicit consideration of the effects induced on the various

© Blackwell Publishers Ltd 1997

features determining collusion. The specific characteristics of the informal intermediaries and the degree of their market power affect the outcomes of their repeated relationship. Our analytical exercise regarding "strategically cooperative" miller-lenders is merely a case in point. One should not preclude the possibility of superior outcomes using a group of informal intermediaries with a different set of characteristics.

5. An Expanded Hierarchy: Millers, Traders and Farmers

Our model so far simplified the interlinked marketing–credit nexus in one important respect. It ignores the more complex situation derived from marketing–credit layering. The following question remains: does the inclusion of this additional category invalidate the postulate of strategic cooperation that we have so far discussed? The answer is not quite straightforward for the simple reason that the evidence presented earlier refers to the behavior of millers and traders/commission agents on trading activity, and not directly on credit.

It will be useful in this case to divide the issues into two categories: (1) the entire set of questions associated with *marketing*—the quoting of buying prices in particular, and (2) issues concerned with the provision of *credit* to the farmers. As far as the first set of issues is concerned, it is not difficult to see that monopoly power will be transmitted from the rung of millers through the lower rung of traders, even though the latter group may be competitive. Rice traders take the quoted buying price of the millers as given, and then compete among themselves to secure farmers. The effect of such competition is to drive down the commission rates to the traders, but does not in any way eliminate the monopoly margin of the millers, gained from their collusive behavior.

Whether this pattern of collusion occurs in lending activity depends on the millers' share of the credit market. If they tend to dominate as the source of loanable funds of the "downstream lenders" and no close substitute exists, then there is a strong likelihood that their lending behavior would be close to or a mirror image of their behavior in marketing.

Umali (1990, Table 6.13) suggests that a substantial portion of the financing of rice traders was carried out by the ricemillers themselves, although it is quite difficult to obtain precise information on the amounts received. Traders also received loans at low rates through the Quedan Guarantee Loan Program, which they could relend to farmers. But the fact that a large percentage of their finance came from the millers suggests that traders and commission agents are substantially credit-rationed in the formal sector. It is therefore unclear that their lending practices could destroy implicit collusive arrangements between the millers. If traders attached to a particular miller were to offer more attractive credit–marketing contracts to the farmers under a rival miller, would this count as a breaking of the implicit arrangement? Our conjecture is that it might, and millers would accordingly like to restrict the activities of their commission agents (for instance, by refusing reemployment in the case of a deviation from "normal practice").

Empirical evidence on this issue is of critical importance. There *may* be a case for expanding formal sector credit to large, noncollusive groups such as informal credit associations, small traders and commission agents in the hope of improving access and at better terms to the intended beneficiaries. The number of informal intermediaries that *horizontally* interact has some influence on coordination. As the number increases, these agents are increasingly apt to ignore the effect on their "zones of influence" since the cost of policing a huge number of rivals is quite substantial. This, however, is beyond the scope of this study but merits further research investigation.

© Blackwell Publishers Ltd 1997

6. Summary and Conclusions

This paper has examined vertical linkages between the formal and the informal sector in the Philippine rural financial market. Formal sector banks are a major source of funds for informal lenders, particularly for those lenders involved in trading operations. This forms part of a complex system of credit-layering that exists to deal with the problems of information gathering, monitoring, collateral, and the enforcement of repayment. In this sense the two sectors are complementary. While banks cater to larger, collateralized borrowers such as ricemillers and traders, informal lenders can observe the realization of a wider set of loan variables with respect to small farmers, and can accept collateral in forms that banks simply cannot.

It is therefore not surprising that the promotion of linkages between formal and informal sectors by way of increased access of informal lenders to formal sector funds has been viewed as an effective way of promoting competition in the informal sector and as a way of exerting downward pressure on interest rates. Such an assertion rests, however, on the assumption that the informal financial market is competitive with freedom of entry for new participants. We do not criticize this view by simply asserting that the informal sector is monopolistic; monopoly is far from a correct description of the facts. Our analysis of the particular structure of informal financial markets, however, indicates that major groups of informal lenders (such as marketing agents) are likely to engage in *strategic cooperation*, thus limiting competition. It is a collusive arrangement that is supported by a web of economic threats and counterthreats. It is this situation that we have explored analytically.

We argue that some degree of strategic cooperation undoubtedly prevails among the trader-lenders in the highest rung of the informal credit hierarchy. In rice farming and trading, there is evidence (at the ricemiller level) of noncompetitive behavior supported by accounts of comprehensive information sharing, collective monitoring, "informal" price setting and substantial capital requirements that effectively set some barriers to entry. Millers lend funds on to paddy traders and commission agents (intermediate and downstream firms) in the form of cash advances for buying the output of rice farmers. It appears that they have some influence on the actual terms offered by the middleman-trader or commission agent to the farmer: the effects of collusion in the upper rung tends to be transmitted down the hierarchy.

We study strategic cooperation in the presence of formal–informal linkages. We argue that the expansion of such linkages has an ambiguous effect on strategic cooperation, and might indeed enhance it. An expansion of funds is seen to have two opposing effects on the behavior of miller-lenders. On the one hand, it heightens the tendency to undercut one's rival, thereby destroying an implicitly collusive arrangement. On the other hand, the expansion of linkages increases the threat of *potential* competition should a collusive outcome be deviated from. In many cases the latter effect is stronger, thereby enhancing the chances of strategic cooperation.

This study raises, therefore, a critical and legitimate concern regarding the policy of promoting formal–informal sector linkages, in a situation of strategic cooperation among the major lenders. The question of whether the increased supply of funds actually promote competition between informal lenders or (perversely) reinforce any collusive behavior is an important issue for policymakers. To the extent that the latter is true, any credit subsidy or targeting program of the government may only increase the ability of the informal lenders to capture rents accruing from such a program.

© Blackwell Publishers Ltd 1997

References

Abreu, D., "On the Theory of Infinitely Repeated Games with Discounting," *Econometrica* 56 (1988):383–96.

Agabin, M., "A Review of Policies Impinging on the Informal Credit Markets in the Philippines," Working Paper 88-12, Philippine Institute for Development Studies, Makati, Philippines, June 1988.

Agabin, M. et al., "Integrative Report on the Informal Credit Market in the Philippines," Working Paper 89-10, Philippine Institute for Development Studies, Makati, Philippines, June 1989.

Alam, K., "A Study on Onlending in Informal Financial Markets in Bangladesh," Working Paper, Bangladesh Institute of Development Studies, Dhaka, 1989.

Bell, C., "Interactions Between Institutional and Informal Credit Agencies in Rural India," *The World Bank Economic Review* 4 (1990):297–327.

Bernheim, D. and D. Ray, "Collective Dynamic Consistency in Repeated Games," *Games and Economic Behavior* 1 (1989):295–326.

Bose, P., "Formal-Informal Sector Interaction in Rural Credit Markets," mimeo, Department of Economics, University of Memphis, 1996.

Eoguerra, E., "Can the Informal Lenders be Co-opted into Government Credit Programs?", Working Paper Series no. 87-03, Philippine Institute of Development Studies, Makati, Philippines.

Farrell, J. and E. Maskin, "Renegotiation in Repeated Games," *Games and Economic Behavior* 1 (1989):327–60.

Floro, S. and P. Yotopoulos, *Informal Credit Markets and the New Institutional Economics: The Case of Philippine Agriculture*, Boulder, CO: Westview Press, 1991.

——, "Incentive Structures in Rural Financial Intermediation: An Analytical Approach," Washington, DC: World Bank Agricultural Policy Division, 1992.

Gangopadhyay, S. and K. Sengupta, "Small Farmers, Moneylending, and Trading Activity," *Oxford Economic Papers* 39 (1987):333–42.

Geron, P., *Microeconomic Behavior of Agents in a Credit-Oriented Market in an Agricultural Setting*, PhD dissertation, University of the Philippines, Diliman, Quezon City, 1989.

Ghosh, P. and D. Ray, "Cooperation in Community Interaction without Information Flows," *Review of Economic Studies* 63 (1996):491–519.

Green, E. and R. Porter, "Noncooperative Collusion Under Imperfect Price Information," *Econometrica* 52 (1984):87–100.

Hoff, H. and J. Stiglitz, "Moneylenders and Bankers: Fragmented Credit Markets with Monopolistic Competition," forthcoming, *Journal of Development Economics* (1996).

Kochar, A., "An Empirical Investigation of Rationing Constraints in Rural Credit Markets in India," mimeo, Stanford University, 1992.

Larson, D., "Market and Credit Linkages: The Case of Corn Traders in the Southern Philippines," paper prepared for Citibank/ABT Associates on a Rural Financial Services Project for USAID, Manila, 1988.

Mansuri, G., "Tenancy, Credit Markets, Segmentation, and Hierarchical Loan Contracts," IED Discussion Paper 72, Boston University, 1996.

Poapongsakorn, N. and P. Nettayarak, "Regional Interest Rates in Rural Thailand: Report Prepared for the Informal Credit Markets Project," Asian Development Bank, Manila, 1988.

Ray, D. and K. Sengupta, "Interlinkages and the pattern of competition," in P. K. Bardhan (ed), *The Economic Theory of Agrarian Institutions*, Oxford: Clarendon Press, 1989.

Scherer, F. M. and D. Ross, *Industrial Market Structure and Economic Performance*, Boston: Houghton Mifflin Co., 1990.

Selten, R., "Reexamination of the Perfectness Concept for Equilibrium Points in Extensive Games," *International Journal of Game Theory* 4 (1975):25–55.

Umali, D., *The Structure and Price Performance of the Philippine Rice Marketing System*, PhD dissertation, Stanford University, 1990.

Von Pischke, J. D., "Finance at the Frontier: Debt Capacity and the Role of Credit in the Private Economy," Washington, DC: World Bank EDI Development Studies, 1991.

© Blackwell Publishers Ltd 1997

Notes

1. Financial sector development now involves not only the growth of formal financial institutions, but also entails an examination of the *direction* of development of the informal financial sector, and of its role in the overall development process.
2. One basis for such a framework is that the flow of information across agents is not perfect, as in Ghosh and Ray (1996). It is unclear yet if this assumption is borne out empirically in rural settings.
3. The dominant group of informal lenders varies according to the characteristics of the major agricultural activities in the area and the level of credit activity of self-help groups (Floro and Yotopoulos, 1992).
4. This observation, it need hardly be said, is not peculiar to the Philippines. Alam (1989) observes that half to two-thirds of rural informal loans in a Bangladesh study originated with the banks and was relent by informal lenders to farmers. In Thailand, Poapongsakorn and Netayarak (1988) found that about 22% of informal rural credit funds can be traced back to bank credit.
5. Esguerra (1987) and Floro and Yotopoulos (1992) discuss this in more detail.
6. May 1990, interview with Floro. Other interviews with bankers in the formal sector support this observation.
7. See Floro and Yotopoulos (1991) and Mansuri (1996).
8. There were 33 paddy traders interviewed in Nueva Ecija, 30 of whom sold rice to millers while the remaining three custom-milled the paddy themselves, selling directly to wholesalers and retailers. All the 13 commission agents in Iloilo act on behalf of the ricemillers. The sample size of ricemillers interviewed in Nueva Ecija and Iloilo were 27 and 11 respectively.
9. This is to be contrasted with the theory of competitive interaction, where greater access to the funds of the formal sector *unambiguously* fosters competition among ricemillers.
10. While we are focusing on rice as an example of a crop in which these general phenomena are to be observed, this should not lessen the importance of multiple crops and the possible sorting role that even different varieties of paddy can play.
11. This *may* be a geographical address but the literal interpretation is unnecessary.
12. In the language of repeated games, we are examining whether a collusive outcome is sustainable by the threat of reverting to a sequence of one-shot equilibria. Such a method does not, in general, take account of the most severe credible punishments available (see Abreu, 1988), but a consideration of these more complex punishments is beyond the scope of the present exposition. It should also be mentioned that the punishments studied here are open to the possibility of collective renegotiation (Bernheim and Ray, 1989; Farrell and Maskin, 1989).
13. To be precise, $C^i(x) = \max\{S^i(x) - S^j(x), 0\}$ for each miller i and each farmer x.
14. One might then argue that the utility of a borrower, potential or otherwise, is unaffected by the expansion of funds. But such an argument does not take into account that if incentives to repay must be provided, then the act of entering into a credit transaction does raise borrower utility.
15. This statement is not meant to be completely rigorous, though a more detailed model can make it so. For instance, consider the case where each farmer needs a unit loan for production. In such a situation, the assertion above is strictly valid.
16. For an analysis of collusive behavior in the presence of imperfect information, see Green and Porter (1984). It is certainly not unrealistic to perceive that resources must be expended on keeping track of rival prices, and even more so, of rival contracts. To the extent that greater liquidity permits a larger expenditure of resources on such monitoring activities, an increase in access to credit may significantly affect detection time.
17. The discount factor depends on a variety of considerations, including the rate of return that millers can obtain on their funds in alternative activities, and the time that elapses before detection of a rival invasion.

© Blackwell Publishers Ltd 1997