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A RAND NOTE

DUALISM, TECHNICAL CHANGE, AND RURAL FINANCE MARKETS IN DEVELOPING COUNTRIES

Farrukh Iqbal

September 1981

N-1723-AID

Prepared For

The Agency for International Development

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PREFACE

This Note was prepared with the support of The Rand Corporation's Family in Economic Development Center, which is funded through Grant No. OTR-G-1822 from the U.S. Agency for International Development. The purpose of the Center is to provide effective policy research through the integration of good technical research with training of, and collaboration with, Third World scholars and government officials. The research emphasizes the role of human resources in the process of economic development, and individual and family responses to programs and policies for promoting growth and development.

The research presented here is drawn from a larger study of borrowing and savings behavior among agricultural households in India. The technical and policy conclusions should be of interest to those concerned with the functioning of rural credit markets in developing countries and to those who manage credit operations both in international donor agencies and in Third World governments.

At the time the Note was written, the author held a Family in Economic Development Center Postdoctoral Fellowship.

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SUMMARY

This study investigates the anatomy of rural finance markets (RFMs) in a major developing country, India. The heart of the study consists of an empirical model of the determinants of moneylender interest rates which takes into account both the special features of Indian RFMs as revealed by a cursory overview of the distribution of rural loans by size, type, purpose, and source and some special features of the dataset used. The model allows tests of some important propositions linking RFMs to various aspects of rural economic development.

The results show that interest rates charged by rural moneylenders are sensitive to a host of borrower-specific and locational characteristics that are affected by the process of economic development. In particular, lower rates are charged to farmers who display progressive attitudes or are in a position to benefit from exogenous technical change in agriculture. It is also demonstrated that while monopoly power exists in India's RFMs, its quantitative impact is small and does not justify the low-interest-rate policies followed by official lending institutions. It is concluded that the provision of technical change and investment opportunities may be less costly than direct subsidization as a way of bringing down rural interest rates in developing countries.

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I am grateful to William Butz for his painstaking review of an earlier draft, to Dennis De Tray and James Smith for helpful discussions along the way, and to Christine Peterson and Karl Schutz for assistance with programming. The views (and errors) contained in this Note are to be attributed only to me.

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CONTENTS

I. INTRODUCTION

The workings of rural finance markets (RFMs) in less-developed countries (LDCs) have long been the object of academic and official concern. This concern originates in the realization that credit has historically played an important role in agricultural development and technological change and that the processes and outcomes that characterize RFMs can have important implications not only for agricultural growth but also for income distribution and poverty. A cursory glance at the literature (summarized in Donald, 1976), however, reveals that research interest has been selective, has tended to ignore several important issues, and has failed to provide a consensus on many others. The implications of two developments in particular have failed to receive adequate attention: (1) the growth of government-sponsored, subsidized credit (through rural banks and cooperative credit societies) and (2) the incidence of technological change in LDC agriculture over the 1960s, a process and a period popularly known as the "Green Revolution."

The entry of formal lending agencies is said to have imparted a dualistic structure to RFMs in that two different types of markets can now be distinguished, the formal (comprised of banks and cooperatives) and the informal (comprised largely of moneylenders), each with different rules of economic behavior and different sets of clients. Similarly, the differential incidence of technical change is said to have created two different types of farmers, the "progressive" (those who have partly or fully adopted the Green Revolution technology package) and the "non-progressive" (those who still use the traditional farming technology). This study

considers the effects of these developments in a major developing country, India, and examines their potential impacts on the structure and behavior of RFMs and their implications for rural credit policy.

Section II offers an overview of the demand and supply of rural funds, looking at the level and distribution of loans by size, type, purpose, and source. This overview establishes the importance of dualism and technical change in India's RFMs and provides a backdrop for the analysis that follows.

Section III presents an analysis of the determinants of moneylender interest rates. An empirical model is derived from some general theoretical notions regarding the costs of lending in an uncertain environment, and a methodology is described for estimation, which takes into account some special features of the data to be used. Our model allows tests of some important propositions linking RFMs to various aspects of rural economic development. In particular, we can test for the existence of monopoly power in the informal sector, a matter whose empirical treatment has agitated many (including Wai, Bottomley, Chandavarkar, Nisbet, and Long) and satisfied few. Section IV summarizes the conclusions of the study.

The data for our study come from a national panel survey of approximately 3,000 Indian farm households, conducted by the National Council of Applied Economic Research (NCAER) between 1968 and 1971. The third round of this survey (1970-1971) contains a wealth of detail on the borrowing activities of farmers. We have also used aggregate data from two earlier surveys, the All-India Rural Credit Survey (AIRCS, 1951-1952) and the All-India Rural Debt and Investment Survey (AIRDIS, 1961-1962). Relevant details of the NCAER data are provided throughout the Note.

II. AGGREGATE ASPECTS OF INDIAN RFMs

THE DEMAND SIDE

The total amount of rural borrowing in 1970-1971, as estimated from the NCAER survey, comes to Rs.16,232 million.[1] This is more than twice the Rs.7,500 million reported in 1951-1952 and over one and one-half times the Rs.10,341 million reported in 1961-1962 (see Table 1). The average amount borrowed per cultivating farm household has also been rising, from Rs.210 in 1951-1952 to Rs.205 in 1961-1962 to Rs.376 in 1970-1971. These figures are not strictly comparable, however. Some definitional inconsistencies exist, and it has also not been possible to convert the figures to real terms. Still it would not be inappropriate to assert that they support the casual observation that the use of rural credit has been growing steadily in India.

The average figure conceals much variation. As shown in Table 2, disaggregation reveals several general patterns: Large farmers borrow more than small farmers; progressive farmers borrow more than non-progressive farmers; and those with irrigation borrow more than those without. The nature of one's farm is an important factor even when average borrowing per hectare is considered. In this case, shown in Table 3, the last two results remain unchanged although small farmers

[1] This figure is reported in Credit Requirements for Agriculture (CRA), National Council of Applied Economic Research, 1975, p. 11. CRA also contains other aggregate statistics on borrowing and debt taken from the NCAER survey. It should be noted that the survey oversampled large landowners. Since the manner of calculation of the aggregate statistics is not described in CRA, the statistics may not be strictly comparable to similar ones from other surveys.

Table 1

COMPARATIVE STATISTICS ON BORROWING

Item	AIRCS 1951-1952	AIRDIS 1961-1962	NCAER 1971-1972
Aggregate amount (rupees)			
Total borrowing	7,500,000,000	10,391,000,000	16,232,000,000
Total debt	...	23,759,000,000	13,152,000,000
Average borrowing	210	205	376
Average debt	364	473	305
Purpose of borrowing (%)			
Long-term capital expenses	31.5	22.2	29.8
Current operating expenses	10.6	13.5	22.6
Consumption expenses	57.9	69.3	47.6
Source of borrowing (%)			
Government	3.3	2.6	3.6
Cooperative societies	3.1	15.5	22.7
Commercial banks	0.9	0.6	4.0
Moneylenders and traders	75.2	58.0	49.6
Friends and relatives	14.2	8.8	18.8
Landlords and unspecified	3.3	14.5	1.3

SOURCE: CRA, Tables 11 and 32.

are now seen to be the more "intensive" borrowers. Even such crude disaggregation provides a glimpse into the interrelationship of innovative farming and external finance. Progressive farmers borrow far more than non-progressive ones: Rs.759 versus Rs.254 on average, and Rs.208 versus Rs.77 on a per-hectare basis. Whether this behavior is due solely to the difference in technology or whether it is simply a function of size or some other factor remains to be seen.

It used to be fairly commonly asserted that Indian farmers were basically subsistence-oriented ...ked into traditional, low-

Table 2

AVERAGE AMOUNT BORROWED PER CULTIVATING HOUSEHOLD FOR ALL PURPOSES ACCORDING TO SIZE AND TYPE OF HOLDING

(Rupees)

Size of Holding (hectares)	HYV[a]		Non-HYV			All		
	Irri-gated	Total	Irri-gated	Unirri-gated	Total	Irri-gated	Unirri-gated	Total
0-2	355	342	235	130	172	273	140	202
2-4	575	527	442	229	309	511	224	377
4-6	1174	1080	945	154	515	1058	207	709
6 and above	1926	1866	684	445	518	1527	564	1086
All holdings	799	759	362	184	254	549	205	376

SOURCE: CRA, Table 1.

[a]Figures for unirrigated HYV farms (i.e., those that use high-yield varieties of seeds), which form a very small part of the total, are not given separately. This applies to other tables as well.

Table 3

AVERAGE AMOUNT BORROWED PER HECTARE FOR ALL PURPOSES CLASSIFIED ACCORDING TO SIZE AND TYPE OF HOLDING

(Rupees per cultivating household)

Size of Holding (hectares)	HYV		Non-HYV			All		
	Irri-gated	Total	Irri-gated	Unirri-gated	Total	Irri-gated	Unirri-gated	Total
0-2	361	346	262	133	183	294	151	217
2-4	205	190	168	84	116	188	84	138
4-6	247	230	195	32	106	220	44	148
6 and above	200	180	72	44	52	158	54	109
All holdings	227	208	168	77	114	200	82	143

SOURCE: CRA, Table 2.

productivity techniques and averse to such economic activities as reinvestment, capital accumulation, and innovation. Borrowing was primarily done to meet unanticipated consumption needs such as marriage and death ceremonies, medical and litigation charges, and repair of houses damaged by natural disasters. As Table 1 shows, almost 58 percent of total borrowings in 1951-1952 were reported to be for family or consumption expenditures, while capital expenditures (long-term farm improvement funds) accounted for roughly 31 percent and current operating expenditures for the remaining 11 percent. This pattern has changed significantly over the years. The NCAER data show that consumption and nonfarm needs accounted for only 48 percent of borrowing in 1970-1971, whereas capital expenses and current operating expenses accounted for 30 and 22 percent, respectively. It is clear that farmers are beginning to use credit to finance their farm activities to a greater extent. This is of course in accordance with what we know of the changing economic character of farming in India. The introduction of high-yield varieties of seed, chemical fertilizers, and sophisticated mechanical implements has led to an increase in the demand for supporting credit with which to finance the changeover to the new technology. While consumption needs still account for almost half the total borrowing in India, it is evident that the picture of a static, subsistence-oriented peasantry is rapidly becoming dated.[2]

[2] A study by Khrishna and Raychaudhri (1969) shows that rural savings and investment increased markedly in the late 1960s. The savings rate rose from an average of 2.3 percent between 1950 and 1964 to 3.3 percent between 1964 and 1970, while the investment rate went from roughly 2.5 percent between 1950 and 1964 to roughly 4 percent between 1964 and 1970. The rural income series also shows a spurt in the middle 1960s, coinciding with the onset of the Green Revolution. It should be noted, however, that this pattern of improvement is dominated by the experience of a few states such as the Punjab.

THE SUPPLY SIDE

Moneylenders remain the most important single source of credit supply, although their relative importance has declined sharply over the years as government efforts to penetrate India's RFMs have intensified. As shown in Table 1, moneylenders provided almost 50 percent of the total credit made available in 1970-1971, compared with 75 percent in 1951-1952 and 58 percent in 1961-1962. The second most important source of credit is the cooperative society. Such societies were formed as early as the turn of the century in various parts of India but have only recently begun to make their presence felt in the rural money market. All told, official institutions, which include cooperatives, commercial banks, and other government sources (e.g., land development banks), provide about 30 percent of the total supply, up from 7 percent in 1951-1952 and 18 percent in 1961-1962. The impact of official intervention is clearly visible in these changing proportions.

This impact, however, is sharply concentrated. Official institutions channel most of their credit to (1) progressive, or HYV, farmers, i.e., those who use high-yield varieties of seeds, and (2) those who borrow for investment rather than consumption purposes. As Table 4 shows, 81 percent of government and 62 percent of cooperative lending was channeled to HYV farmers, whereas 71 percent of moneylenders' funds went to non-HYV farmers. There is also some unevenness in the distribution of credit by size of farm. Thus, larger landholders (defined here as those owning more than 4 hectares of land), who form only 29 percent of cooperatives' borrowing clientele, receive 46.4 percent of cooperative

credit. In contrast, the poorer farmers who form 71 percent of the borrowing pool receive the remaining 53.6 percent. This unevenness is mitigated somewhat when we consider the supply of credit on a per-hectare basis.

The symbiotic relationship between moneylenders and small farmers is illustrated by two statistics: Small farmers constitute the single most important outlet of moneylender finance, accounting for 87.7 percent of the borrowers and 70.5 percent of the total credit disbursed by

Table 4

PERCENTAGE DISTRIBUTION OF LOANS AMONG DIFFERENT FARM CATEGORIES, BY SOURCE

	Size and Type of Holding					
	Small Holders			Large Holders		
Souce	HYV	Non-HYV	All[a]	HYV	Non-HYV	All[a]
Government	51.0	11.9	62.9 (90.0)	30.4	6.7	37.1 (10.0)
Cooperatives	30.6	23.0	53.6 (71.3)	31.4	15.0	46.4 (28.7)
Commercial banks	27.4	8.8	36.2 (58.2)	7.3	56.5	63.8 (41.8)
Moneylenders	16.1	54.4	70.5 (87.7)	13.2	16.3	29.5 (13.3)
Friends and relatives	13.0	12.4	25.4 (72.0)	72.1	2.5	74.6 (28.0)
Total			55.0 (81.3)			45.0 (18.7)

SOURCE: CRA, Table 34.

[a] Figures in parentheses indicate the percentage of borrowers from each source in the total number of borrowers from that source.

this group; furthermore, up to 66 percent of all the credit received by such farmers comes from moneylenders (CRA, Table 35). Thus it is clear that small farmers do most of their business with moneylenders, who in turn do most of their business with such farmers. The other side of the coin is a growing amount of business between larger landholders and formal lending agencies.

This brief overview of the demand and supply of rural credit in India reveals three salient features: the growing importance of formal agencies as sources of credit supply; the current importance of technological change as a factor in the demand and supply of credit; and the tendency for smaller and less-progressive (non-HYV) farmers to be confined to the informal lending sector for their credit needs. The role of these features in the informal sector is discussed in the next section, which examines the determinants of moneylender interest rates.

III. THE DETERMINANTS OF MONEYLENDER INTEREST RATES

THE COSTS OF LENDING

It is generally agreed that three basic costs comprise the nominal interest rate (Rn) in a competitive credit market: the opportunity cost (Re) of providing a loan, the administrative cost (Ra) of handling a loan, and the risk premium (Rp) to be assigned to different borrowers. If the credit market is not competitive, then an additional cost (Rm) must be dealt with--a "monopoly surcharge," which consists essentially of the difference between the interest rate charged by the non-competitive lender and his marginal cost of providing the loan. Thus the nominal interest rate can be expressed as

$$Rn = Re + Ra + Rp + Rm$$

or, in estimable form, as

$$Rn = a0 + a1.X + a2.Y + a3.Z + a4.M + u \ ,$$

where the vectors X,Y,Z and M contain variables that proxy for the opportunity, administrative, risk, and monopoly costs of lending, and a constant and disturbance term have been added.[1]

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[1] An empirical model of this form can be derived from a model of lender portfolio selection in an imperfectly competitive market. Two characteristics of RFMs in LDCs make the selection problem simple: (1) the short-term nature of the majority of loans (85 percent of the loans in our sample have a stipulated period of repayment of less than 15 months) and (2) the narrow range of available assets (there is no bond or security market in rural India). Furthermore, since we are dealing with individual lenders and not with banks, it seems reasonable to assume risk-aversion which ensures an equilibrium loan rate. A similar approach has been taken by James (1978) for the analysis of the structure and evolution of the U.S. money market between 1893 and 1911.

In the empirical analysis below, the opportunity cost of funds for moneylenders is assumed to vary across villages in accordance with the proximity of the village to market or urban areas. The underlying idea is that village moneylenders often get their own funds from larger moneylenders who operate in towns and market centers where the volume and sophistication of business is greater. Therefore, the further a village is from a market or urban area, the greater the costs incurred by the moneylender in procuring funds to relend. The actual proxy used here is distance (in kilometers) of the village from the nearest bus stand. If, as sometimes happens, the borrower goes to a town moneylender directly, the moneylender still incurs the costs of traveling to the borrower's village to inspect his farm and his assets. Furthermore, distance is also likely to affect the probability of having idle funds. A moneylender situated close to a town is more likely to be able to place his entire stock of loanable funds on loan throughout the year.

The administrative cost of funds is perhaps best captured through the size of loan negotiated, such that the larger the loan, the smaller the unit cost of administering it. However, the size of loan could also carry a risk cost, such that the larger the loan the higher the risk involved; this would render the expected sign ambiguous. Because of the ambiguity of this relationship and because of some econometric problems involved in estimating it, the administrative cost proxy used here is not amount borrowed but an alternative measure of demand given by the size of village population. This will be discussed in more detail below.

The risk cost of lending is proxied by a set of variables that are likely to affect the probability of repayment. Perhaps the best single measure of this is a household's permanent income. This is, however, not directly observable by the moneylender, who is likely to base his judgment instead on a number of characteristics that can be thought of as the underlying determinants of permanent income. These include land owned, other assets owned, family size, and education. Since permanent income will also be affected by location-specific factors such as quality of soil and weather, those factors will also enter as proxies for risk. The NCAER data contain direct measures of all the household-specific variables mentioned above. For location-specific risk, we have used the average amount of rainfall (by district) as a measure of weather and the price of unirrigated land (by village) as a measure of soil quality.

Education is not widespread in rural India; thus the education variable may not have the discriminatory power to distinguish between farmers who have progressive attitudes and those who do not. However, a "modernity index" consisting of a score based on answers to questions regarding attitudes about superstition, fertility goals, innovation, etc., is available in the data, and we have used this index to supplement the information obtained from the education variable. The higher the modernity score, the more progressive and knowledgeable the farmer may be assumed to be.

The role of weather is not necessarily straightforward. Agricultural fortunes are subject to both permanent weather characteristics and transient ones. The demand (and supply) for funds, in particular, is

likely to be affected by unexpected weather changes such as a temporary drought or by weather-related phenomena such as locust infestations. The dataset contains information on three years of weather behavior in binary form (0, 1), with the value 1 being taken if the weather in that year was adverse in the sense that it destroyed crops. A "transitory weather" variable has been constructed from this as the deviation of current weather from the average over the three years. It is hypothesized that unexpectedly bad weather will push interest rates up if the flow of funds across RFMs is sluggish, because the demand for funds will rise without a corresponding accommodation in supply.

The profitability of farming and, consequently, the riskiness of rural lending can be dramatically affected by the incidence or prospect of technical change. From all accounts of the Green Revolution experience in India, we know that the technical change there was essentially scale-neutral and yield- and income-augmenting in its effects. Permanent income profiles of farmers who have adopted this new technology or are in a position to benefit from it are bound to have shifted upwards, and by our earlier arguments, the risk of lending to them has decreased. This effect on permanent income and risk of lending has been captured in our empirical model by a number of alternative proxies: a district-wide index of area under investigation; a binary measure of the use of HYV seeds by the farmer; and a state-wide index of expenditures on agricultural research. The index of research expenditures is intended to capture differences in investment opportunities (expected

income) among farms, opportunities generated by the provision of research, advice, and information to farmers.[2]

THE MONOPOLY POWER QUESTION

The tendency in the literature has been to make "reasonable" assumptions about the opportunity costs, administrative costs, and risk premiums (for different maturities of loans) and to subtract the sums thereby achieved from average interest rates actually observed and ascribe the difference to monopoly profit. Thus, Bottomley (1975), Long (968), and Wells (1979), by constructing hypothetical cost curves that are strongly affected by administrative costs and risk premiums, conclude that monopoly profit is not an important feature of LDC rural credit markets. On the other hand, Wai (1957) and Nisbet (1967), by making somewhat different assumptions about default rates and reasonable rates of return, conclude that monopoly profit plays a substantial role. Clearly, as long as calculations are based on hypothetical costs and definitions of reasonableness that vary, this approach is unlikely to shed much light on the issue.

Another approach is to calculate the average costs of making a loan on the basis of internal accounting information from banks and coopera-

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[2] The research index measures annual expenditures by each state and by the central government on major crop research, adjusted by the number of "community development blocks" in each state. These blocks contain a roughly equal number of farms and function as basic extension and village development units in rural India. To the extent that the results of research are transmitted through an extension system, it seemed appropriate to account for the differences in research intensity that arise because of differences in extension service availability--hence the use of block-adjusted figures. The figures actually used pertain to the year 1965 under the assumption that research expenditures in a given year are reflected in enhanced investment opportunities in that region a few years later. The relevant information is taken from Evenson and Kislev (1975).

tives (see Datey, 1978). This approach has the advantage of being based on actual cost estimates and loss rates but can only be used with official agencies that keep such records. In general, very little is known about the actual costs incurred by informal moneylenders in "producing" loans. So a test of the existence of monopoly profit by the method of comparing marginal costs to prices (rates actually charged) is ruled out.

Furthermore, such accounting procedures are unable to account for borrower-specific risk to as fine a degree as is likely to have been determined in the the highly personalized transactions that moneylenders and their clients engage in. Finally, such methods yield estimates only of the average, not the marginal cost of funds, which is the appropriate measure from a theoretical standpoint. Since the difference between the two estimates may be large and since we are really interested in the operations of the informal sector, the accounting approaches are not very helpful.

The theory of the competitive firm suggests an alternative approach. A well-known result of competitive pricing is that no firm can make abnormal profits in such a situation and that firms operate at the minimum point of their long-run average cost curves. Consider, then, the implications of the entry of a non-profit-maximizing, government-subsidized lending agency into a competitive credit market. As long as the formal agency charges a lower interest rate than that charged by the existing moneylenders, there will be a tendency for all borrowers to flock to it. If the agency has funds sufficient to satisfy all borrowers, the informal sector will disappear entirely. If, as is the case in reality, the agency has limited funds and makes them avail-

able to a select group of borrowers, the result should be the exit of all those moneylenders who have lost enough clients to make business unprofitable at the reduced volume. Furthermore, as long as competitive conditions prevail in the informal market, the rate of interest charged by moneylenders can either stay constant or rise. The important point here is that the rate cannot fall because that would drive the competitive moneylender out of business. The presumption is that it might rise because a more risky clientele is now left for the informal sector, the formal sector having taken in the less risky clients. Thus a test of the existence of monopoly or competition can be carried out by investigating the effect on the informal interest rate of the presence of a formal agency in the village. If the rate declines, we have evidence of the existence of an abnormal profit margin and, therefore, of monopoly power.[3]

This test is carried out below by means of a multivariate regression using the moneylender's consumption loan rate as the dependent variable and variables proxying for the risk, administrative, and opportunity cost of funds as the independent determinants. The test of the existence of monopoly power is conducted through the inclusion of a dummy variable which takes on the value 1 if a bank is present in the village and 0 otherwise. Our test, of course, is not immune to ambigui-

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[3] A note on some institutional features is in order here. Formal lending agencies are regulated by the Indian government: Restrictions are placed on the size and kind of loan that may be advanced and the collateral that is acceptable, and interest rates are deliberately set at below the "market" rate, for "development" reasons. It follows that (1) there is excess demand for such loans, (2) a rationing process is employed to award loans, and (3) incentives exist to use one's political power to influence the rationing process.

ties of interpretation. And it does not work in the case of moneylenders who borrow from banks and cooperatives and relend to their own clients. Since their opportunity costs of acquiring funds are now lower, they will probably lower their interest charges whether or not they are competitive. It is not clear that this possibility is a serious one, however. The rules under which formal agencies operate prohibit the giving of loans for purposes of relending, so it is unlikely that large sums of money are made available to pure moneylenders. However, those moneylenders who are also farmers can probably take advantage of the fungibility of funds and engage in relending. Our data (Table 1) indicate that only 1.3 percent of loans originate from landlords, so we can discount this possibility.

It was mentioned earlier that the proxy to be used for administrative cost is size of village population rather than size of loan. This is a useful substitute for several reasons. It would seem to capture the demand side of the model reasonably well without involving the issue of endogeneity that loan size clearly would. It reflects the size of the market faced by village moneylenders and, as such, proxies not only for the administrative cost of borrowing but also for all other costs. Thus the larger the village population, the greater the size of the potential market and the lower the opportunity cost of procuring loans. Like nearness to towns and market areas, greater village size also increases the chances of keeping one's loanable funds occupied year-round. Larger villages tend to be more prosperous, and the higher level of income per household should reflect a lower level of average lending risk. Finally, the greater the population and potential market, the

greater the likelihood of supply competition and the lower the scope of possible monopoly power. Our model is thus strengthened in many ways through the inclusion of this variable.

It hardly needs to be emphasized that rural interest rates are likely to be influenced by a host of other factors that we cannot hope to control for. Some of these are unobservable, e.g., the risk-aversion characteristics of borrowers and lenders, and some are not available in the data, e.g., information on past repayment behavior. Wherever possible, therefore, we have tried to check the robustness of our results by using alternative proxies.

ESTIMATION ISSUES AND EMPIRICAL RESULTS

The empirical analysis presented below is restricted to the most important type of transaction in the informal sector: consumption loans advanced by moneylenders. Consumption loans account for 85 percent of the total number of loans made in this sector and for 87 percent of the loans made by moneylenders. Other sources of informal loans, such as landlords and relatives, are ignored because it is felt that the reported interest rate does not capture the true price of a loan in the multifaceted transactions usually engaged in by such sources.

The estimation procedure followed below is necessitated by special features of the data at hand. Of the 1,167 households who borrow in our sample, only 512 report consumption loans from moneylenders. If these households are not randomly selected from the overall sample, then a least-squares regression based on just the subsample would be subject to selection bias, arising from the possibility of confounding the

behavioral function relating the interest rate to its determinants with the sample selection function relating the probability of borrowing from moneylenders to its determinants. This problem is similar to the missing-wage (for housewives) problem in the labor supply literature. A popular solution involves the construction of a new regressor based on the probability of participation in the sample which, when included in the behavioral function of interest, corrects for the presence of selection bias and yields consistent estimates (Heckman, 1979). This procedure, while attractive for its computational ease, has the disadvantage of giving biased t-statistics. Since these are important to our argument, a full-information maximum-likelihood procedure is employed instead. The procedure used here is cited in Griliches et al. (1978) and yields both consistent estimates and correct standard errors in the presence of sample selection. Three interest-rate regressions are reported in Table 5; they differ slightly in specification.[4]

The results confirm our prior expectations. All those variables we have taken as proxies for the risk cost of lending have appropriate signs. The negative association between land owned, modernity, and education of farmer on the one hand and the interest rate on the other testifies to the sensitivity of the informal market to differences in personal risk characteristics. The effect of modernity and education (typically significant at the 10 percent level) is particularly revealing and indicates that moneylenders view progressive attitudes and human capital with considerable favor. The signs of the proxies used for the effects of soil and weather are as expected, and both effects are

[4] See the Appendix for details.

Table 5

THE DETERMINANTS OF RURAL INTEREST RATES[a]

(maximum-likelihood estimates: asymptotic t-statistics in parentheses; number of observations = 1167)

Independent Variable	Dependent Variable (Moneylender Consumption Interest Rate)					
	Case 1		Case 2		Case 3	
Modernity index	-5.85	(1.83)	-6.21	(1.94)	-5.31	(1.67)
Land owned	-1.57	(2.57)	-1.68	(2.71)	-1.32	(2.09)
Education of head	-8.37	(1.74)	-10.83	(2.17)	-8.79	(1.76)
Average rainfall	-0.01	(0.83)	-0.02	(1.90)	-0.02	(2.34)
Transitory weather	18.55	(1.32)	23.94	(1.65)	28.41	(2.00)
Technical change indices						
Proportion irrigated land	-0.61	(2.45)	...		...	
Research expenditures	-1.11	(2.74)	-1.37	(3.52)	-1.17	(2.99)
HYV use[b]	...		-36.63	(2.56)	-34.05	(2.39)
Distance to bus stand	0.05	(0.08)	0.27	(0.46)	0.27	(0.46)
Village population	-0.007	(2.88)	-0.007	(2.89)	-0.006	(2.57)
Existence of bank	-27.60	(2.65)	-36.12	(3.33)	-31.52	(2.89)
Land-ownership Gini index	...		...		184.91	(2.85)
Constant	290.56	(15.38)	276.80	(13.87)	174.19	(4.24)

[a]An interest rate of y percent is recorded in the data as the number 10y. Thus the coefficient on the bank dummy indicates that the existence of a bank reduces the interest rate by 27.6/10 or 2.76 points (see column 1 results).

[b]HYV use is a dummy variable which takes the value 1 if the household had sown any part of its land in high-yield varieties of seeds.

significant at the 10 percent level in at least two of the specifications. The transitory weather effect seems to indicate a certain amount of sluggishness in the flow of funds across RFMs in India, but too much should not be read into this, since our proxy is relatively crude.

All three of our proxies for technical change confirm the notion that improvements in agricultural productivity go together with reductions in the interest rate. This notion has been advanced before (Bottomley, 1969) but has never been empirically verified. It should be emphasized here that our results pertain to the consumption interest rate and thus constitute an even stronger indication that agricultural development (i.e., rural income growth and prospects of income growth) tends to lower the margin of risk in general. Further, a related study (Iqbal, 1981) finds that agricultural borrowings tend to increase in the face of improvements in investment opportunities (as proxied by the above variables). Thus the introduction of Green Revolution technology has implications for both the demand and the supply of funds, and in both cases the observed responses are consistent with an interpretation that stresses the risk-reducing nature of the new technology. This stands in sharp contrast to some other interpretations of the Green Revolution which stress the supposedly greater risk associated with the new technology in explaining farmer resistance to its adoption. Even if the new technology is characterized by higher variability of yield, the virtual certainty of a higher average return over a few years of use appears to dominate the decisions of borrowers (who increase their demand in anticipation of higher incomes) and lenders (who reduce their

interest rates in the belief that they are faced with less risk of default).

The effect of the size of the "potential" market is consistent with the arguments made earlier that the larger such a market is, the lower the cost of procuring and administering loans and, therefore, the lower the interest rate charged. The distance variable is, however, not significant in any of the equations. This is probably due to the collinearity between village size and degree of integration. Larger villages tend to be better placed with respect to transportation and markets--in fact, if they are large enough they constitute markets themselves.

The presence of a bank in a village reduces the informal interest rate by about 2.7 to 3.6 percent, and the effect is uniformly significant. This confirms the presence of a monopoly margin in India's RFMs. The magnitude of the effect, however, suggests that if the sole justification of the Indian government's low-interest-rate policy is the combating of monopoly power, the policy is too strong--it more than compensates for the monopoly surcharge and to that extent is not an efficient use of social resources. A rough estimate of this overcompensation can be obtained by subtracting 3.2 percent, the average monopoly surcharge from Table 5, from 21.2 percent, the average moneylender consumption-loan interest rate. This yields a figure of 18 percent as our "free market price," twice the 9 percent charged by formal agencies. Even if a distinction between investment and consumption loans were introduced by taking investment loans to be about 2 to 3 percent cheaper (for the

basis of this calculation, see Iqbal, 1981), a fairly substantial over-compensation remains.[5]

A further test of the monopoly power hypothesis was conducted by including the Gini index for land-ownership (by district) as an independent regressor. The underlying argument is that villages with highly unequal land distributions are likely to have a large number of smaller, poorer farmers beholden to a few large farmers for credit and other relief measures. As such, oligopoly power is likely to exist in such villages and should be reflected in the interest rates charged.[6] The coefficient on this variable is quite significant and positive, thus adding to the evidence that some monopoly/oligopoly margin is present. However, the coefficient on bank presence still indicates a small rather than a large monopoly margin.

It is worth noting that the Heckman procedure (tried but not reported) yields coefficient-values fairly close to the ones reported here. Selection bias was found to be important: Unmeasured variables which raise the probability of borrowing from moneylenders also tend to

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[5] A dummy variable indicating the presence or absence of a cooperative credit society was also tried together with the bank dummy but was found to be insignificant. Two factors may be responsible for this: First, since cooperatives are present in over 90 percent of the observations in our sample, the variable may not possess sufficient variation to isolate the desired effect. Second, cooperatives exist in all villages that have banks, and some amount of collinearity is therefore present. The collinearity reduces the magnitude of the bank dummy effect but leaves it significant at the 5 percent level. Thus introducing a cooperative dummy would strengthen our argument that the monopoly surcharge is low. It seemed appropriate, however, to use only the bank dummy, since that possesses greater discriminatory power (banks are present in 53 percent of the observations) and the complication of collinearity is not raised.

[6] The land-distribution Gini is taken from Mitra and Mukherji (1980). For a similar use and interpretation of distribution measures see Rosenzweig (1978) and Guttman (1980).

increase the interest rate faced. This result can be interpreted as indicating that people who are confined to the informal market also tend to be "riskier" to lend to. This is consistent with the casual observation that smaller, poorer farmers with less attractive collateral tend to be clients of moneylenders while larger, richer farmers with more attractive collateral tend to have access to the formal sector.

IV. CONCLUSIONS

This study has examined the implications of credit market dualism and technical change in agriculture by investigating the anatomy of RFMs in India. One desirable consequence of the growth of the formal lending sector has been the injection of competition into the market and the reduction of the monopoly power formerly enjoyed by moneylenders. The monopoly surcharge, however, is found to be fairly low, and government interest-rate policies appear to be overcompensating in the market for this effect. The need to reduce monopoly power is therefore not sufficient in itself to justify such policies on economic grounds.

Our results concerning the consequences of technical change are consistent with interpretations that stress the income-augmenting and risk-reducing nature of Green Revolution technology. Farmers residing in areas characterized by the use and/or provision of new technology appear to benefit in that they face lower moneylender interest rates even on consumption loans. This result provides an additional point of leverage for policymakers: Interest rates can be lowered indirectly through the provision of technical change and investment opportunities and need not be altered directly through costly subsidies to some borrowers.

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Appendix

THE SAMPLE SELECTION PROBLEM

The sample selection problem can be explained in terms of the following model: Consider the interest rate function

$$Rn = X\beta + U_1 \ , \qquad (1)$$

where the vector X contains the set of household and locational characteristics that determine lending costs, and where Rn is observed if and only if a loan is actually taken. The probability of taking a loan can be represented as

$$PBR = Z\gamma + U_2 \ , \qquad (2)$$

such that PBR = 1 if $U_2 > -Z\gamma$ and PBR = 0 if $U_2 < -Z\gamma$.

Equation (2) is the sample-selection equation and in conjunction with Eq. (1) it produces the following regression function for the censored sample of borrowers:

$$E(Rn/X, PBR=1) = X\beta + E(U_1/U_2 \geq -Z\gamma) \ . \qquad (3)$$

The conditional mean of U_1 can no longer be assumed to be zero, and hence, ordinary least squares estimation of Eq. (1) will yield biased results.

The model must be cast in likelihood terms in order for a consistent estimator to be derived. Griliches et al. (1979) cite the following log-likelihood function for estimation:

$$\ln L = -s \cdot \ln\sqrt{2\pi\sigma_1} - \frac{1}{2} \sum_{i=1}^{s} \left(\frac{U_{1i}}{\sigma_1}\right)^2 + \sum_{i=s+1}^{n} \ln[1 - F(Z_i\gamma)]$$

$$+ \sum_{i=1}^{s} \ln F\left[Z_i\gamma + \left(\frac{\rho_{12}}{\sigma_1}\right)U_{1i}\right] \Big/ \left(1 - \rho_{12}^2\right)^{1/2}$$

where

s = number of observations where PBR = 1

n = total number of observations

ρ_{12} = correlation between error terms

σ_1^2, σ_2^2 = variances of error terms.

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