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Access to Credit as Insurance

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Abstract

One main advantage of having developed credit institutions is that there are better opportunities for dealing with risk. This paper measures access to credit in rural India and the role of credit institutions as insurance mechanisms. I am able to do this by comparing data for 720 rural households that I collected from two Indian states, Kerala and Uttar Pradesh. To measure a household's access to credit, I develop an equilibrium model of sorting based on a random utility approach. The initial results indicate that there are large disparities in access to credit, particularly formal credit. The predominant sources of credit, however, are cooperative societies and informal ties between households. The main results indicate that access to credit is a significant insurance mechanism, however this crucially depends on the source of credit. Banks do not provide any insurance against idiosyncratic income shocks. Households that rely on moneylenders are the worst hit during such income shocks. Credit from a cooperative society

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and from informal ties offer the best insurance against income shocks. The results show that a 1 percent increase in access to cooperative, lowers the probability of reducing consumption by 18 percent and cutting input expenditure by 27 percent, when a household is faced with an income shock.

1 Introduction

Access to ready and available credit is an important factor in the economic well being of a rural household. Perhaps one of the main advantages of having developed credit institutions is that there are better opportunities for dealing with risk. This is particularly relevant in rural communities. Opportunities for personal savings in less developed communities are often restricted. However, personal savings alone only offer limited potential for protection against risks of fluctuating income. Therefore, there is reason to believe that credit arrangements within communities can be beneficial. Various policy issues rest on our understanding of nature of risk and household access to risk bearing institutions that provide insurance against severe income fluctuations. This paper poses a few simple questions: does vulnerability depend on access to credit? What is the role of credit market as insurance mechanism? Does this role depend on the source of credit?

This study is in two parts. In the first, I measure a rural household's access to credit and in the second part, I look at how participation in different credit arrangements affects a household's response to idiosyncratic income shocks. I am able to do this by comparing data for 720 rural households from two states of India ,Uttar Pradesh and Kerala.

First of all it is important to acknowledge that there are several potential risk bearing mecha-

nisms that a rural household takes recourse to. There are *ex ante* measures and *ex post* measures of risk management. Ramaswami and Ravi (2004) provides a comprehensive analysis of types of risks faced by rural households, risk management mechanisms adopted at the household and community level and government insurance schemes and their impacts. Based on earlier work, we can claim that there is sufficient evidence to suggest the significant presence of mutual risk sharing arrangements between individuals within a community. In his study, Townsend (1994) tests the proposition that with perfect risk sharing, consumption at the household level should be insured against idiosyncratic risks and thus depend solely on the realization of the aggregate risk. He reports that the full insurance hypothesis provides a surprisingly good benchmark. But Morduch (2003) disputes this and shows that risk sharing with respect to total consumption is in practice quite imperfect, both at village level and within groups defined by caste and farm size. Other works include Rosenzweig (1988) that looks at intrafamilial transfers, Townsend (1995) that looks at implications of risk sharing in southern India and in rural Thailand, Udry (1994) looks at informal credit institutions in northern Nigeria, which involve lending and borrowing arrangements between friends and relatives. Hoff (1994) also looks at informal risk sharing arrangements. Morduch (1995) focuses on risk coping strategies that involve risk mitigation through production and employment decisions. He highlights the empirical importance of income smoothing where households make

conservative production and employment choices to protect themselves from income shocks before they occur.

Over the years, rural credit programs have become an integral part of government policy in developing countries. Special banks for rural population were set up in countries like India, Thailand and the Philippines. Informal lenders, however, still remain an important source of credit within villages. Bell and Srinivasan (1986) show this for several states of India. While 84 percent of rural households in Bihar, relied only on informal credit, even in a more developed state like Punjab, this figure was as high as 46 percent. Institutional creditors like banks, on the other hand, have been accused of bureaucratic rationing and bias in favor of more educated and privileged households.[1]

Today, a typical rural credit 'market' in a less developed country comprises of many lenders extending a variety of forms of credit. Alongside public lending institutions like banks and co-operative societies, there is also a thriving informal sector where private transactions occur on standard or personalized terms. Indeed the economics of these two broad categories of credit are quite different. In the data I observe presence of different institutions in the two regions. Beyond the scope of this paper, there are several potential explanations for the emergence of diverse institutions in different regions. Kerala has always been a 'special' state due to it's extraordinary

[1] Dreze, Lanjouw and Sharma (1997)

achievements in education and health. Dreze and Sen (2002) suggest that Kerala's success is the result of public action that promoted extensive social opportunities and the widespread, equitable provision of schooling, health and other basic services. On the other hand, they attribute failures of Uttar Pradesh to the public neglect of these very same opportunities. In this paper, I will not attempt to explain why credit institutions exist in certain regions and not in others. I will, however, assess household participation in different credit institutions and then compare how this affects the household behavior.

Several features of an existing rural credit infrastructure are determined by the way that borrowing households sort among different creditors. A full understanding of the existing credit situation requires knowledge of heterogeneous households' participation in different credit arrangements. The first objective of this paper is to study the nature and extent of household's access to credit in a rural economy. I assess the strength and direction of different factors that influence credit access of a household. In order to do so, I consider a wide spectrum of variables that enter into a borrowing decision. I study three kinds of loans, production, consumption and medical loans. It is necessary to include non-production loans because they form a significant proportion of total borrowing by rural households. Within the data, consumption and medical loans account for close to 40 percent of total outstanding loans.

To measure a household's access to credit, I develop an equilibrium model of sorting based on a random utility approach. Building on McFadden's (1978) discrete choice framework, I allow borrowers to have choice over a wide variety of attributes of a contract, for example, the loan repayment frequency, nature of collateral and type of loan. Household choices are allowed to vary with household characteristics. Based on this model, I am able to generate for each household, a predicted probability distribution over all creditors. In the second part of this paper, I analyze the role of access to credit as insurance mechanism. Using unique data on household responses to idiosyncratic income shock, I estimate the impact of credit access on different risk responses. In particular, the household responses to income shock that I study are lowering consumption expenditure, reducing input expenditure and seeking additional jobs.

The initial results, not surprisingly, reveal that there are large disparities in access to credit and particularly access to formal credit across households. Comparison across different sources of credit shows that access to bank increases with wealth level while probability of borrowing from a moneylender decreases with wealth level. However, predominant sources of credit, across different wealth levels, are from informal ties with neighbors and relatives and from local cooperative societies. Both emerge through mechanisms of cooperation within the community. Cooperative is an institutionalized form of cooperation while financial ties with neighbors and relatives is informal

cooperation. One main difference, however, across these two mechanisms is that while cooperatives can charge positive interest on loans, social norms restrict informal interest rate to zero. I exploit this difference and present a simple model to explain why the presence of a cooperative within a community can lead to better outcomes. One implication of this model is that the presence of community level institution such as a cooperative society, can discourage informal financial ties between households.

The main results indicate that access to credit is a significant insurance mechanism, however this crucially depends on the source of credit. The four main sources of credit that we study are banks, cooperative societies, moneylenders and informal financial ties among households. It is surprising and interesting that access to banks does not provide significant insurance against an idiosyncratic income shock. It is not surprising that households that rely on moneylenders are the worst hit during such income shocks. Credit from a cooperative society and from informal ties offer the best insurance against income shocks. The results show that a 1 percent increase in access to cooperative, lowers the probability of reducing consumption by 18 percent and cutting input expenditure by 27 percent, when a household is faced with an income shock.

I also study the loan rejection data and test whether access to a particular source of credit affects the probability and cost of getting a second loan. The results indicate that while households that

participate in cooperative and informal borrowing are more likely to get a second loan after being rejected once, however the cost of second loan is significantly higher for cooperative households. A closer look at the interest rate data reveals that the only source of credit more expensive than cooperative is a moneylender.

The plan of the paper is as follows. Section 2 describes the data in some detail. Section 3 has a model of household borrowing decision, estimation strategy and results for access to credit. Section 4 looks at credit through cooperation and includes a small model, estimation strategy and results for household responses to income shock. The last section 5 has concluding remarks. Data appendix has survey methodology details and some more descriptive statistics.

2 Data

The study is based on an original and comprehensive primary data set that was compiled from a household survey. The survey covered 720 rural households from 21 villages across two districts in India and was held from June to September 2002. Survey districts are from two diverse states Kerala and Uttar Pradesh (U.P.). We deliberately picked two separate regions of the country to study differences, if any, in the borrowing behavior of rural households and local credit infrastructure. Data appendix details the sampling methodology and some summary statistics.

2.1 Lenders - main characteristics and presence

There are two types of institutional credit available to rural households in U.P. and Kerala. They are banks and cooperative societies. The banks are either commercial or specialized such as the State Development Bank and Regional Rural Bank. Nature of banks are similar in both the states. This is because the general guidelines are established by National Bank for Agriculture and Rural Development (NABARD). The cooperative societies also follow the basic guidelines set by NABARD, however, they have distinct regional characteristics. Once registered, the cooperative gets linked to District Cooperative Bank which in turn is linked to the State Cooperative Bank. These societies require membership within a specified territorial area. In U.P., cooperatives remain primarily agricultural. All loans, except 'crop loans' are seasonal and in kind, the most common being fertilizers and seeds. Membership requires landholding. The cooperatives also run specific projects of the local government which are targeted towards scheduled caste/tribe or for households that lie below "poverty line". Under these projects, assistance is provided for self employment.

In Kerala, however cooperative societies have emerged as the backbone of rural credit infrastructure. Membership are typically based on occupation. There are tailors', weavers', toddy-tappers' and even unemployed people's societies among others. All cooperative societies have total functional

autonomy[2]. Except against deposit and personal security, all other loans are given to members only. Deposits are of various kinds but mostly gold, insurance policy, promissory certificate, government security and debenture certificates. When a loan is taken, both parties - borrower and the cooperative society, agree to a repayment schedule. But incase of failure to comply with the agreed schedule, there is recasting into a new schedule.

Unlike previous works, I do not treat informal creditors as a homogeneous entity. There are three broad informal sources of credit to rural households: 1) professional moneylenders 2) traders, landlords and employers and 3) neighbors and relatives. Each have distinct characteristics and provide credit under varying terms and conditions. Professional moneylenders generally provide credit against collateral and charge regular monthly interest payments. Professional moneylenders are typically jewelers. There are no eligibility restrictions and moneylenders provide credit to anyone who can make collateral payment. The rate of interest they charge is monthly and depends on the collateral which is commonly gold or silver. It is higher if no collateral is placed. There are four cases in the data where previous defaulters have received loans against new collateral[3]. Credit

[2]The state appoints a registrar whose approval is required for any change in the rules and by-laws of the society.

[3]This is because a moneylender gives loans worth 50 to 60 percent of the collateral value. Only small borrowers who repeatedly default have difficulty acquiring new loans.

Village name (distance to metallic road)	Number of moneylenders in	Distance to nearest bank	Nearest bank name	Number of cooperatives
Alampur (2)	4	4	AB	1
Bahsuia* (3)	2	7	AB	0
Balanpur (0)	4	6	BoI	1
Ferozpur* (6)	0	8	BoI	0
Garaulli** (4)	0	2	AB	0
Naurangpur (5)	1	3	BoI	0
Nisthauli** (2)	2	1	AB	0
Patti (5)	0	6	AB	0
Ramipurva (0)	0	2	AB	0
Sikrauri (4)	3	3	BoI	0
Siyapur (2)	2	3	BoI	0
Thathia (0)	12	1	AB, BoI	1
Uttar Pradesh	3	3.83		0.25
Alathur* (0)	12	2	CB	13
Erimayur (0)	5	2	NB, CB, SBT	2
Kannambra (0)	10	2.5	SBT, CB	2
Kavasseri (0)	6	3	SBT, CB	1
Kizhakencherri (0)	5	5	VB, CB	5
Pudukode (0)	4	2.5	CB, SBT	2
Tharoor (0)	5	4	SBT, CanB, CB	3
Vadakkencherri* (0)	6	2	SBT, CB	1
Vandazhy (0)	3	1	CB, VB	4
Kerala	6.22	2.67		3.67

* Schedule caste, ** Muslim; AB= Allahabad Bank; BoI= Bank of India; CB= Commercial Bank; SBT= State Bank of Travancore; CanB= Canara Bank; VB= Vijaya Bank; NB= National Bank

Figure 1: Table 1.1: Village Creditor Information

from traders, landlords and employers is based on some economic relationship that the borrower shares with the lender. The loans are either interest free or at a nominal rate. But typically they involve collateral payment, which could be in the form of future crops, labor time or future salary. Traders lend in the beginning of a season, typically against future crops but in rare cases also provide consumption loans. Landlords generally provide credit at nominal interest rates. There are only two instances in the data where loans taken from landlord are of an "interlinked" nature. Employers as a source of credit can be divided into two types. Firstly, there are households that are employed in 'regular' jobs and earn monthly salaries. These households have security of employment and can borrow from employer. The second type are landless households that are engaged in casual labor for a daily wage. The economics of these two types are very different. The third informal source of credit are friends, neighbors and relatives. In the data, this is a major source of credit. These loans are based on personal contacts and are generally interest free and without collateral.

One thing to note in figure 2 is that there is a huge variation in annual interest rate across lenders. When we compare interest rate across lenders based on loan characteristics such as nature of collateral, usage of loan and repayment frequency, we get similar results. There is enormous variation across lenders but not as much across loan characteristics. While conducting the survey, we got a sense that the interest rates are predetermined and commonly known across households.

Credit source	Typical Annual Interest	Typical Repayment frequency	*Collateral requirements (%)	Eligibility conditions
Bank	10 to 18	Half yearly	Land title (77) None (13)	Usually based on scheme; falling below "poverty line", "backward caste" or size of land holding
Co-operative society	12 to 15	Half yearly	Land title (50) None (25) Future crop (17)	Membership based on size of landholding; these are agr co-ops; all loans except 'crop loans' are in kind
Moneylender	60 to 120	Monthly	None (80) Gold, silver (9) Land title (7)	None, as long as collateral is provided; previous defaulters get credit against new collateral; (loan/collateral) value is 60%
Neighbors-Relatives	0	Not fixed	None (81) Land title (10) Gold, silver (4)	Social ties or personal relationship with lender
Employer-Landlord-Trader	0 to 60	Not fixed	None (50) Future crop (35)	Economics ties with lender

* Remaing forms of collateral: Provident Funds, Guarantor, Bank deposit, Labor hours and Livestock and land cultivatiob rights

Figure 2: Table 1.2a: Synoptic List of Credit Sources in Uttar Pradesh

Credit source	Typical Annual Interest	Typical Repayment frequency	*Collateral requirements (%)	Eligibility conditions
Banks	10 to 18	Half yearly, some annual	Land title (45) Gold, Silver (32) None (22)	Whether household falls in tartget group, against bank deposits, jewelry, immovable property
Co-operative societies	12 to 20	Depending on loan type; 'Gold loans'- monthly	Gold, Silver (59) Land title (33) None (6)	Membership, deposits, guarantor; some loan categories - self employment, education, marriage, house repair, religious rites, medical, job search in foreign countries
Moneylenders	60 to 240	Monthly	None (53) Gold, silver (36) Land title (8)	None, as long as collateral is provided; commonly addressed as "blade loans"
Neighbors-Relatives	0	Not fixed	None (60) Gold, silver (20) Land title (20)	Social ties or personal relationship with lender
Employer-Landlord-Trader	0 to 144	Not fixed	None (45) Gold, silver (30) Guarantor (10)	Economics ties with lender

* Remaing forms of collateral: Provident Funds, Guarantor, Bank deposit and Labor hours

Figure 3: Table 1.2b: Synoptic List of Credit Sources in Kerala

This was true not just for banks and cooperatives but also for moneylenders within the village and outside.

2.2 Type of loan by source

A loan is classified as a 'type' based on the purpose for which it was taken. There are many reasons why households borrow, but they can all be broadly classified into three major groups - consumption, production and medical reasons. Within 'consumption loan', the three major sub-categories for borrowing are a) ceremonies and marriages; b)purchase of durables like T.V. and bicycle; c) day-to-day consumption and d) education. The second type of loan, 'production loan' comprises of a) purchase of machinery and equipment; b) purchase of inputs like fertilizer and seeds; c) purchase of livestock d) business investment and d) construction. The third loan type is 'medical loan'. We look at this category separately because it is a type of 'emergency' borrowing when households behave differently and it is also a major category in the data.

Table 7 shows that in both U.P and Kerala, more than one third the total credit is borrowed for consumption and medical expenses. This is a sizeable amount and suggests that in order to study the borrowing behavior of rural households we need to also consider loans other than for production purposes. A careful look at the break-up reveals that in Kerala, most of the non-production loans

Village	Consumption		Production		Medical loan	
	Amount (Rs.)	Number	Amount (Rs.)	Number	Amount (Rs.)	Number
Alampur	51,000	5	362,900	10	0	0
Bahsuia	158,496	12	211,700	25	26,500	5
Balanpur	130,002	6	28,500	2	65,000	5
Ferozpur	32,304	16	70,004	11	42,588	13
Garaulli	208,800	16	29,205	9	129,000	10
Naurangpur	74,000	8	32,800	10	20,202	3
Nisthauli	62,000	8	317,508	12	14,000	2
Patti	85,704	8	112,005	9	10,000	4
Ramipurva	38,997	9	140,503	11	700	1
Sikrauri	23,200	4	294,789	33	46,503	9
Siyapur	23,500	4	410,004	12	9,800	2
Thathia	114,000	8	414,000	20	41,502	6
Uttar Pradesh	1,002,003	104	2,423,918	164	405,795	60
Alathur	304,000	20	569,997	27	0	0
Erimayur	349,998	6	532,004	22	5,000	2
Kannambra	607,992	28	339,003	9	185,999	11
Kavasseri	112,806	18	483,506	23	83,000	5
Kizhakencherri	188,689	19	567,996	26	22,500	5
Pudukode	355,500	18	550,706	26	5,000	2
Tharoor	187,250	35	351,696	16	27,000	4
Vadakkencherri	283,500	15	678,996	18	28,002	3
Vandazhy	317,604	14	272,704	16	5,000	2
Kerala	2,707,339	173	4,346,608	183	361,501	34

Figure 4: Table 1.3: Village-wise Break up of Types of Loan

are for consumption requirement, in U.P., one-third of this is to meet medical needs. In terms of number of loans taken, consumption and medical loans account for more than production loans, which suggests that amounts borrowed for consumption and medical purposes are lower, but are taken at greater frequency in both the regions.

3 Borrowing decision of household

In this section I analyze the borrowing decision of a household. I begin by setting out an equilibrium model of sorting in rural credit market. and describe the main components of this model. Following McFadden(1973, 1978), I use a discrete choice framework to study the household's choice of lender as this provides a natural way to estimate heterogeneous choices for different types of credit. The utility function specification is based on the random utility model developed by McFadden(1978) and the specification includes choice-specific unobservable characteristics. We treat each loan as a separate borrowing decision as is common in the literature.[4]

[4]Siamwalla et al.(1993) also treat each loan as a separate borrowing decision.

3.1 Borrower's optimization problem

The structure considered is as follows: agents decide whom to borrow from. Not borrowing is one of the options available. The utility from borrowing a loan is V_l^i which is given by:

$$V_l^i = \alpha_l^i L_l - \alpha_r^i r_l + \eta_l + \varepsilon_l^i$$

In the model, a borrowing household chooses a lender l to maximize it's utility, which depends on the observable and unobservable characteristics of his choice. Let L_l represent the observable characteristics of loan L taken from lender l, other than the rate of interest that vary with the households borrowing decisions and let r_l denote the rate of interest. Observable characteristics of a loan include loan amount, collateral offered, type of loan (whether consumption, production, medical etc.), repayment frequency and when it was taken. Household i's optimization problem is given by :

$$\underset{l}{Max}\ V_l^i = \alpha_l^i L_l - \alpha_r^i r_l + \eta_l + \varepsilon_l^i \tag{1}$$

where η_l is the unobserved quality of lender corresponding lender. This could include reputation of the lender, enforcement techniques, renegotiation possibilities, time spent in procuring the loan, bribe, travelling time and expense etc. The last term ε_l^i is an idiosyncratic error term that captures unobserved variation in household i's preference for a particular lender.

Each household's valuation of choice characteristics is allowed to vary with it's own characteristics H_i including landholding, income, occupation, education, age households composition and sex of household head. The parameters associated with loan characteristics and rate of interest α_j^i for $j \in \{L, r\}$ are allowed to vary with households own characteristics,

$$\alpha_j^i = \alpha_{0j} + \sum_{x=1}^{X} \alpha_{xj} H_x^i. \tag{2}$$

Equation (2) describes household i's valuation for choice characteristics j. The first term captures the taste for the choice characteristics that is common to all households and the second term captures observable variations in the valuation of these choice characteristics across households with different socioeconomic characteristics. This heterogeneous specification of the coefficients allows for variation in preferences across different types of households.

The above specification of the utility contains two stochastic components that allow flexibility in explaining the observed data. The first component is the lender specific unobservable η_l. This term captures the common value of unobserved aspects of a particular lender that is , value shared by all households. Because many loan and lender attributes are likely to be unobserved in any data set, the specification avoids biases due to unobserved lender characteristic.

The second stochastic component of the utility function is the idiosyncratic term ε_l^i , which

is assumed to be additively separable from the rest of the utility function. We assume a Weibull distribution, which gives rise to the multinomial logit model. With this assumption, the probability that household i selects lender l , P_l^i is given by

$$P_l^i = \frac{\exp(\alpha_l^i L_l - \alpha_r^i r_l + \eta_l)}{\sum_k \exp(\alpha_L^i L_k - \alpha_r^i r_k + \eta_k)} \tag{3}$$

where k indexes all possible lenders.

The multinomial logit assumption implies that the ratio of the probabilities between any two choices is independent of the characteristics of the remaining set of alternatives (Independence of Irrelevant Alternatives assumption). This is usually not a very good assumption to make but in this specification of the utility function the impact of IIA is weakened since there are heterogeneous coefficients.

3.2 Equilibrium Concept

The random utility specification is not only flexible from an empirical point of view, but also has a relevant theoretical interpretation. Without the idiosyncratic error component ε_l^i this specification would suggest that two households with identical characteristics would make identical borrowing decisions. This is unlikely to be true, a useful interpretation of ε_l^i is that it captures unobserved heterogeneity in preferences across the otherwise identical households. Thus, for a set of households

with a given set of observed characteristics, the model predicts not a single choice but a probability distribution over the set of borrowing choices. We use Nash equilibrium concept.

Household i chooses lender l if utility that it gets from this exceeds the utility from all other possible loan choices.

$$V_l^i > V_k^i \Longrightarrow W_l^i + \varepsilon_l^i > W_k^i + \varepsilon_k^i \Longrightarrow \varepsilon_l^i - \varepsilon_k^i > W_k^i - W_l^i \quad \forall\ k \neq l \tag{4}$$

where W_l^i includes all the non-idiosyncratic components of the utility function V_l^i. As this shows the probability that a household chooses a particular lender will depend on the characteristics of all the possible loans. In this way , the probability that household i chooses lender l can be written as a function of loan characteristics, both observed and unobserved, prices and households characteristics:

$$P_l^i = f(H_i, L, r, \eta). \tag{5}$$

3.3 Estimation

Having specified the theoretical framework, we now move on to the estimation procedure of the model. Let us rewrite the equation function as described in equation (1) and (2) as the following:

$$V_l^i = \phi_l + \theta_l^i + \varepsilon_l^i \tag{6}$$

where, ϕ_l is the choice specific constant, θ_l^i is the interaction term that includes all parts of the utility function that interact household and choice characteristic and ε_l^i is the idiosyncratic error term. Therefore,

$$\phi_l = \alpha_{0l} L_l - \alpha_{0r} r_l + \eta_l \tag{7}$$

and

$$\theta_l^i = \left[\sum_{x=1}^{X} \alpha_{xl} H_x^i\right] L_l - \left[\sum_{x=1}^{X} \alpha_{xr} H_x^i\right] r_l. \tag{8}$$

Here, choice specific constant ϕ_l denotes the portion of utility provided by lender l that is common to all households. The unobservable component η_l of this constant denotes the unobserved preferences for lender l that is correlated across households while ε_l^i represents unobserved idiosyncratic preferences over and above the shared component.

3.4 Estimation procedure

For any combination of interaction parameters and loan specific constants, the model predicts the probability that each household i chooses lender l

$$P_l^i = \frac{\exp(\phi_l + \theta_l^i)}{\sum_k \exp(\phi_k + \theta_k^i)}. \tag{9}$$

Maximizing probability that each household makes a correct borrowing decision, conditioning on the full set of observed household characteristics, H^i and choice characteristic $\{L_l, r_l\}$, gives rise

to the following log-likelihood function

$$\varrho = \sum_i \sum_l I_l^i \ln(P_l^i), \tag{10}$$

where I_l^i is an indicator variable that equals 1 if household i chooses lender l in the data and 0 otherwise. The first order condition is the derivative of the log likelihood function above with respect to ϕ_l and θ_l^i.[5]

3.5 Results: Access to Credit

Before we look at the results, it is helpful to see the variables that are included in the analysis. We have three sets of controls. Household characteristics, loan characteristics and variables that capture household's credit relations. Household characteristics include various demographic, occupation and income asset details. Loan characteristics include size, length, usage and collateral details. The credit relations variables include whether there is a cooperative society in the village, whether the household has any savings deposit in a formal institution, whether the household has ever borrowed to repay old debts, or has repaid late, number of moneylenders in the village and the distance to

[5] The derivative of the log likelihood function with respect to ϕ_l :

$$\frac{\delta \varrho}{\delta \phi_l} = \sum_{i=l} \frac{\delta \ln(P_l^i)}{\delta \phi_l} + \sum_{i \neq l} \frac{\delta \ln(P_l^i)}{\delta \phi_l} = \sum_{i=l} \left(1 - P_l^i\right) + \sum_{i \neq l} \left(-P_l^i\right) = 1 - \sum_i \left(P_l^i\right)$$

the nearest bank. In order to estimate access we will also control for whether the household has applied at least once in the last 2 years.

From table 4, we can see that while Kerala households have higher annual income, households in U.P. have larger asset holdings. Assets include household and agricultural assets, and value of house. The average land holding is significantly higher in U.P. In terms of years of education, Kerala, on average, has 2.3 more years of education. Kerala households are smaller with fewer dependents. Occupational distribution indicates that most U.P. households are cultivators while half of Kerala households are casual laborers. Kerala has higher unemployment levels. Loan characteristics indicate that Kerala borrows larger loans for longer periods, most likely against collateral and for consumption purposes.

As specified before, an unit of observation here is a loan. So households that do not borrow or borrow at most once, appear once, but households that borrow more than once are included for each loan. I haven't differentiated across these two types. [6]. Now we will look at results for all types of lenders simultaneously. Following our specification we run a multinomial logit for lender choice. Here the dependent variable takes 5 discrete values from 1 to 5, for each lender type. Based on the formal-informal break up of lenders, the predicted probability of a formal

[6] Siamwalla et. al. (1993) also have the same strategy.

	Uttar Pradesh			Kerala		
	Mean	Std.Dev.	Sample size	Mean	Std. Dev.	Sample size
Household Characteristics						
Logarithm of annual income	9.73	1.65	332	10.3	0.98	359
Logarithm of total assets	11.76	1.61	332	11.6	1.35	359
Total landholding	1.8	2.38	332	0.62	1.24	359
Number of years of education	5.2	0.9	332	7.4	0.73	359
Age of household head	49.9	14.32	332	55.44	12.2	359
Total number of members	7.6	4	332	4.8	2.2	359
Number of dependents	2.9	2.11	332	0.57	0.92	359
Female headed household	0.11	0.311	332	0.15	0.34	359
SC_ST	0.18	0.38	332	0.22	0.42	359
Muslim	0.18	0.38	332	0.15	0.32	359
Farmer	0.68	0.46	332	0.14	0.34	359
Self employed	0.04	0.19	332	0.11	0.31	359
Casual labor	0.22	0.41	332	0.51	0.49	359
Regular salaried job	0.06	0.23	332	0.2	0.4	359
Unemployed	0.01	0.09	332	0.03	0.17	359
Loan characteristics						
Logarithm of size of loan	8.45	1.3	341	9.1	1.22	397
Length of loan	1.95	2.9	341	2.02	2.59	397
Use of collateral to secure loan	0.41	0.49	341	0.79	0.4	397
Collateral==land	0.12	0.32	341	0.22	0.42	397
Collateral==jewelry	0.03	0.155	341	0.32	0.47	397
Collateral==future crop	0.03	0.15	341	0	0	397
Collateral==guarantor	0.015	0.12	341	0.02	0.14	397
Loan use =production	0.48	0.47	341	0.4	0.44	397
Loan use=consumption/medical	0.49	0.43	341	0.6	0.49	397
Credit relations						
Co-operative society in village	0.1	0.3	332	0.97	0.14	359
Savings account in formal institution	0.33	0.47	332	0.38	0.47	359
Borrow to repay old debt	0.23	0.43	332	0.1	0.3	359
Late repayment	0.36	0.48	332	0.2	0.4	359
Number of moneylenders in village	1.9	6.9	332	6.4	4.8	359
Distance to nearest bank	3.9	2.5	332	2.3	1.4	359
Dummy (applied but got no loan)	0.06	0.24	332	0.02	0.14	359
Dummy (No apply)	0.15	0.35	332	0.21	0.41	359
Lender						
Friends-relatives	0.4	0.48	341	0.05	0.22	397
Bank	0.16	0.37	341	0.22	0.43	397
Co-operative society	0.04	0.19	341	0.54	0.5	397
Moneylender	0.33	0.47	341	0.16	0.36	397
Employer-trdaer-landlord	0.07	0.25	341	0.03	0.16	397

Sample size - 691 households and 738 loans

Figure 5: Table 1.4: Details and Summary Statistics of Variables in Regression

source is 0.76 in Kerala and 0.2 in U.P. Coefficients of a multinomial logit regression are difficult to interpret. This is because there are multiple equations and the coefficients are relative to the base category. In our estimation, we keep 'not borrow' as an option and all coefficients are relative to this outcome. Rather than concentrate on the structural interpretations of the estimated coefficients, we concentrate instead on the predictions of the model Figure 2 shows the predicted probabilities for each lender from this estimation. I have presented the predicted probabilities against the log of total wealth of a household. Wealth includes the annual income and total asset owned, both of which affect access to credit significantly, as the coefficients of the multinomial logit suggest.

Figure 2 shows the predictions from our model controlling for household characteristics, loan characteristics and households credit relation characteristics. It clearly shows the difference in existing credit arrangements between the two samples. Across wealth levels, Kerala households rely primarily on cooperative societies for credit, while in Uttar Pradesh, they depend on informal ties with neighbors and relatives. Equally remarkable, however, are the similarities between the two states. When we compare the two most studied sources of credit - banks and moneylenders, we note that the predicted probability of borrowing from a bank increases with total wealth in both states. The probability of borrowing from a moneylender decreases with wealth in both states.

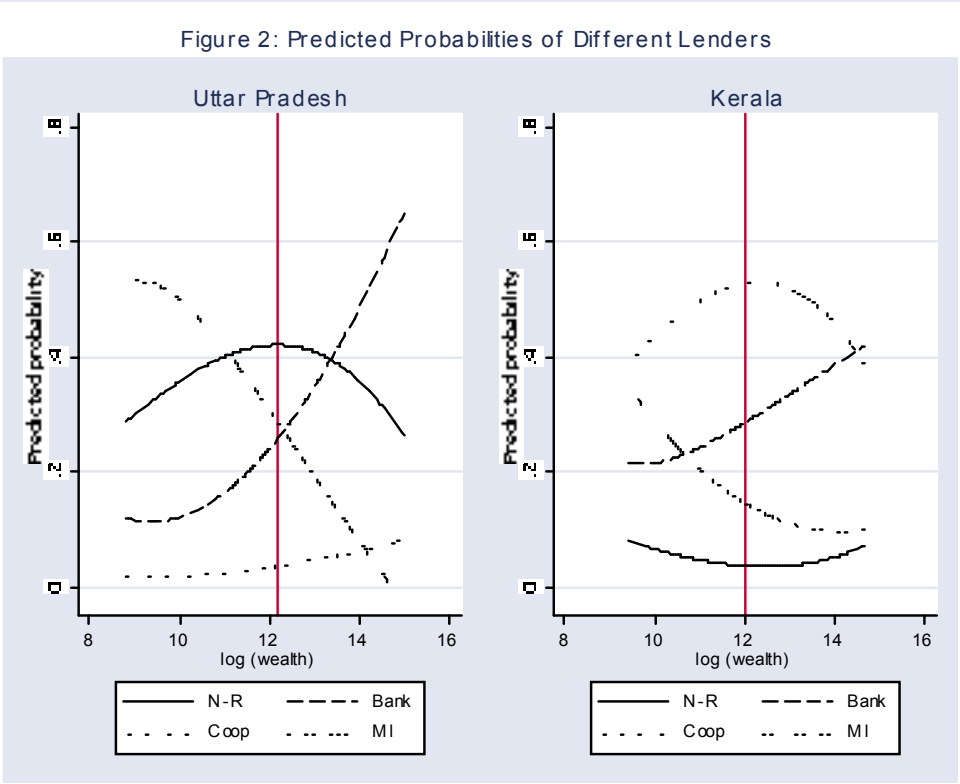

Figure 6: Figure 1.1: Predicted Probability of Lenders

4 Credit Through Cooperation

The results imply that despite the presence of specialized rural banks and local moneylenders, households largely depend on credit arrangements based on cooperation within the community. In Kerala, its takes an institutionalized form while in U.P., this remains informal between neighbors and relatives. I will now compare these two forms of cooperation to answer the following question: Are there any benefits to institutionalizing cooperation rather than borrowing and lending informally?

Making use of local information and enforcement, cooperatives diminish the adverse selection and moral hazard problems that institutional lenders such as banks face. Given private information, low monitoring costs and enforcement possibilities, the same is true for informal arrangements between friends and relatives. On comparing credit contracts from cooperative and informal sources, we note that there are many similarities. The repayment schedules of loans from both sources are flexible and subject to revisions. The 'types' of loans are similar and varied. Access depends on membership and network within a community. But there is one crucial difference between informal financial ties and cooperatives. It is that while a cooperative can charge a non-zero optimal interest rate, social norm restricts interest to zero within informal ties. We will exploit this difference to

explain why institutionalization can lead to better outcome.

I develop a very simple two period model to analyze the two mechanisms of cooperation within a community. Households live for two periods. The wealth level of household i in both time periods is w_i which is distributed $W(w)$. In the beginning of period 1, there is an income shock η_i which is iid. and households choose how much to borrow/lend and consume. In the second period, there is repayment of debt and consumption decision. At the end of period two everybody dies.

So a household's decision is to choose consumption levels in two periods, c_1, c_2 and amount to borrow/lend, l, in order to maximize intertemporal utility:

$$u(c_1) + \beta u(c_2) \tag{11}$$

subject to the budget constraints in the two periods,

$$\begin{aligned} c_1^i &\leq w_i + \eta_i + l_i \\ c_2^i &\leq w_i - (1+r)l_i \end{aligned} \tag{12}$$

Solving this we get :

$$u'(c_1) = \beta(1+r)u'(c_2) \tag{13}$$

which is the Euler equation of intertemporal optimization. This implies that the marginal rate of substitution between consumption in the two periods reflects the relative opportunity cost of

funds in the two periods. We also get the optimal amount that households borrow/lend,

$$l_i = f(w_i, r, \eta_i) \tag{14}$$

If there are no restrictions on rate of interest and people are allowed to borrow and lend freely, we will get the optimal rate of interest, r,from the market clearing condition

$$\int l(w, r, \eta) d\eta = 0 \tag{15}$$

Denote this market clearing rate of interest by r^*. At this interest rate, household are able to lend and borrow L^* amount. If we assume $\beta = \frac{1}{1+r^*}$, there is perfect consumption smoothing. In our model, this would be the rate of interest charged in the cooperative where there are no restrictions on rate of interest.

Now, to compare this with informal lending and borrowing within the community, we will restrict the rate of interest to be zero, by social norm. This follows from the data where informal borrowing is largely interest free. Now, when we restrict the rate of interest to zero or some low level r_{inf}. , there is excess demand for credit and market doesn't clear. And household consumption level is affected by the shock. This can explain why in Kerala, where there are cooperatives present in villages, there is almost no informal lending and borrowing amongst households. This is because the opportunity cost of informal lending is the cooperative interest rate. Household then only want

to lend through the cooperative and not informally.

4.1 Estimation: Benefits of Institutionalizing Cooperation

In this section, I estimate household response to income shock and measure the impact of access to different sources of credit. I exploit unique household data for this purpose. There is information on whether a household faced an income shock in the last 3 years. I also know whether it was an idiosyncratic shock or common to all households in the village. As a consequence of this shock, the household undertook various measures to mitigate the impact of the shock. These can be broadly grouped into the following: cut consumption expenditure, cut input expenditure, dissaving, postponement of certain expenditure, taking children out of school, getting an additional job, borrowing from different sources, getting non-monetary assistance and government help. Figure 5 lists the various responses to an idiosyncratic income shock and the frequencies of households within each response.

I will separately analyze three of the responses to income shock - cut consumption expenditure, cut input expenditure and get an additional job. I want to measure if access to credit is an insurance against an income shock. And if so, does the source of credit matter? Are households with access to local institutional credit better insured than households that rely on moneylenders of informal

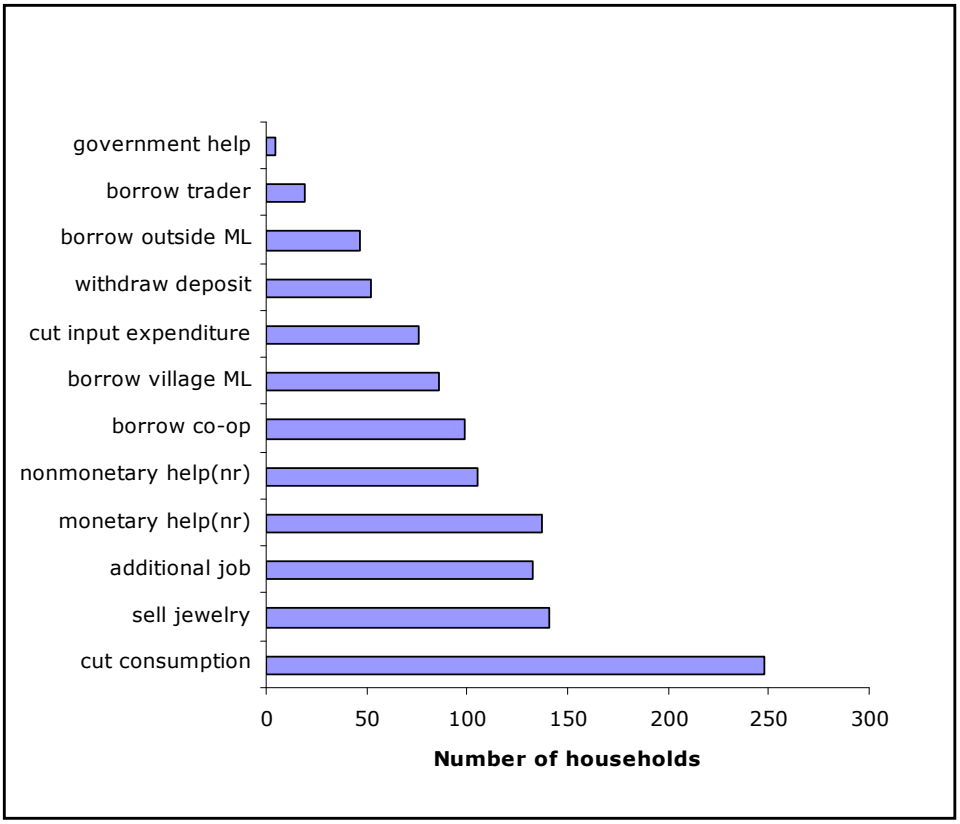

Figure 7: Figure 1.2: Household Responses to Income Shock

financial ties? The regressions are specified as following:

$$R_i = \alpha C_i + \beta H_i + \epsilon_i \tag{16}$$

where, R_i is the binary response to income shock - cut consumption, cut input expenditure, seek additional job. C_i is a vector of lender dummies for all possible sources of credit that the household has access to and H_i includes a vector of household characteristics control. R_i is a binary variable which will take values 1 or zero depending on the response we are analyzing. C_i takes values 1 or zero depending on the source of credit, for example, bank, cooperative, neighbors-relatives, moneylender or none. The error term in the above equation collects all the unobserved determinants of R_i.There are clear problems of endogeneity in the above specification as the household i's choice of source of credit C is likely to be correlated with the household response to the income shock through the unobserved determinants. I will therefore use as proxy variable for the choice of lender C. The proxy variable is the predicted probability of access to different lenders, that we generated from the multinomial logit regressions in the last section, $\widehat{P}_l^i$.

So, now the risk response regressions take the following form:

$$R_i = \alpha \widehat{P}_l^i + \beta H_i + \epsilon_i \tag{17}$$

where, $\widehat{P}_l^i$ is the predicted probability that household i has access to lender l. For each household

i we have a probability distribution across all lenders, l.

4.2 Result: 1)Benefits of Institutionalizing Cooperation

Let us now look at the results of the estimation of different household responses to income shock. Tables 5, 6 and 7 show the results for reducing consumption expenditure, reducing input expenditure and seeking additional job respectively, in response to an income shock. Results show the marginal effects from Dprobit estimation and are the change in probability of the dependent variable for an infinitesimal change in the explanatory variables. All regressions include a full set of dummies for other reported risk responses such as dissaving and non-monetary help as explanatory variables. First column, [1], shows the results of estimation with only household characteristics and the second column, [2] shows results for estimation that includes access to different sources of credit. I report z statistics from robust standard errors.

In Table 5, the dependent variable takes value 1 if the household reduced consumption in response to the income shock, and 0 if not. The first thing to note in Table 5 is that in column [1], household characteristics like income, education, number of members and occupation of head have significant powers in explaining the probability of a household reducing consumption in response to an income shock. When we include access to different credit sources in the regression, the

explanatory powers of household characteristics reduce. The marginal effects for household characteristics become smaller and so do the z statistics. This means that when a household is faced with an income shock, the household characteristics affect the probability of reducing consumption expenditure primarily through access to credit.

Studying individual marginal effects in column [2], we note that access to a bank has no effect on whether a household reduces consumption or not. This is interesting and might seem surprising at first. Banks, however, are not a common source of consumption credit and loans take on average more than two months to clear. An income shock, by very nature requires access to ready and available credit therefore households access to bank has little impact on household consumption expenditure. Household income and asset holdings reduce this probability, though these do not have significant impact after we control for access to credit.

Cooperative society and informal ties play significant roles as insurers against income shock. When a household's access to a cooperative increases by 1 percent, the probability that it reduces consumption falls by 18 percent. Households that borrow informally are also less likely to cut consumption but as the marginal effect indicates the strength of this source is 6 percent and nearly one third as that of a cooperative society in the village. This is as our model predicts. Test of equality of coefficients of cooperative and informal credit from corresponding probit, rejects

	[1]		[2]	
	Marginal effect	z-statistics	Marginal effect	z-statistics
Access to credit from N-R	-	-	-0.068	(2.25)*
Access to credit from bank	-	-	0.001	1.07
Access to credit from coop	-	-	-0.18	(2.89)**
Access to credit from mnylndr	-	-	0.039	(3.20)**
Logarithm_loan size	0.24	0.066	0.17	0.2
Logarithm_income	-0.31	(2.12)*	-0.18	-1.31
Logarithm_asset	-0.28	(2.32)*	-0.17	-1.26
Number household members	0.17	(3.14)**	0.08	1.53
Female	0.18	(2.10)*	0.03	1.78
Education	0.006	(4.14)**	0.001	(2.1)*
SC_ST	0.19	1.46	0.03	1.28
Farmer	0.38	(5.24)**	0.134	1.68
Self employed	0.63	(2.82)**	0.37	1.94
Labor	0.59	(3.46)**	0.26	1.89
Kerala dummy	-0.37	-1.62	-0.276	-1.49
Constant	-0.28	(2.12)*	-0.18	(3.03)**
Adjusted R Square	0.31		0.38	
Chi-squared	97.12		94.77	
Observations	523		523	

Absolute value of z statistics in parentheses, * significant at 5%, ** significant at 1%; Dprobit estimation with robust standard errors; 'Marginal effect' reports the change in probability of cutting consumption for an infinitesimal change in each independent variable. All regressions include a full set of dummies for other risk responses such as dissaving and non-monetary help.

Figure 8: Table 1.5: Probability of Reducing Consumption Expenditure in Response to Income Shock

the null hypothesis. Households that borrow from moneylenders are 4 percent more likely to cut consumption expenditure when faced with an income shock. This is not surprising. Given the cost of credit, households will recourse to reducing consumption rather than financing expenditure through expensive loans.

Table 6 shows the results of production response to income shock. Here, the dependent variable takes value 1 when household reduces input expenditure when faced with a shock, 0 otherwise. As in the consumption response results, here also household characteristics affect whether a household cuts input expenditure when it's faced with an income shock. For example, households with higher income are less likely to cut input expenses, farmers and self employed households are more likely to do so. In column [2], where we include access to credit, the marginal effects on household characteristics fall and so do the z-statistics implying that the explanatory powers of household characteristics in explaining response to income shock are low. The results again indicate that access to credit significantly affects the probability of a household cutting input expenditure. Note that households that when access to cooperative increases by 1 percent, the probability of reducing input expenditure falls by 27 percent. So access to cooperative is a good insurance mechanism. Households that borrow informally are also less likely to reduce input costs but the magnitude is less than half when compared to access to cooperative. Test of equality of coefficients from

	[1]		[2]	
	Marginal effect	z-statistics	Marginal effect	z-statistics
Access to credit from N-R	-	-	-0.12	(3.21)**
Access to credit from bank	-	-	0.004	1.42
Access to credit from coop	-	-	-0.27	(3.89)**
Access to credit from mnylndr	-	-	0.002	(3.20)**
Logarithm_loan size	0.19	1.27	0.15	1.68
Logarithm_income	-0.44	(1.99)*	-0.39	-1.28
Logarithm_asset	-0.24	-1.49	-0.18	-1.07
Number household members	0.12	1.77	0.121	1.56
Dependents	0.067	(2.16)*	0.049	0.107
Female	0.17	1.44	0.12	0.11
SC_ST	0.09	1.68	0.065	1.05
Farmer	0.88	(3.24)**	0.78	(1.99)*
Self employed	0.33	(2.82)**	0.22	1.59
Labor	0.28	(2.46)*	0.19	1.78
Kerala dummy	-0.83	-1.261	-0.81	-1.22
Constant	0.62	(2.92)**	0.59	(2.3)*
Adjusted R Square	0.16		0.21	
Chi-squared	98.92		93.29	
Observations	523		523	

Absolute value of z statistics in parentheses, * significant at 5%, ** significant at 1%; Dprobit estimation with robust standard errors; 'Marginal effect' reports the change in probability of cutting input expenditure for an infinitesimal change in each independent variable. All regressions include a full set of dummies for other risk responses such as dissaving and non-monetary help.

Figure 9: Table 1.6: Probability of Reducing Input Expenditure in Response to Income Shock

corresponding probit rejects the null hypothesis. Once again, production decisions of households that are not affected by access to banks. This might be due to the lengthy loan application period involved. Access to moneylender for credit is not a production insurance, the effect is very small but significant.

For robustness check of our earlier results, I also look at another risk response, whether a household got an additional job in response to the income shock. Table 7 presents the results. The dependent variable takes value 1 if the household got an additional job and 0 otherwise. The marginal effects of interest are similar to the earlier results. As explained in section 2, labor markets in Kerala are more organized and unionized. From, the results, we can see that Kerala dummy remains significant in both specifications of the estimation. Households that borrow from cooperatives are significantly less likely to get an additional job when faced with a shock. With an increase in access by 1 percent, the probability of getting an additional job goes down by 38 percent.

4.3 Result: 2) Consequence of loan rejection

To fully understand the role of access to credit as an insurance mechanism, it is crucial to look at the consequences of loan rejection. There are several reasons why households get rejected for a loan

	[1]		[2]	
	Marginal effect	z-statistics	Marginal effect	z-statistics
Access to credit from N-R	-	-	-0.08	(2.75)**
Access to credit from bank	-	-	0.007	1.71
Access to credit from coop	-	-	-0.38	(2.89)**
Access to credit from mnylndr	-	-	0.019	(2.20)*
Logarithm_loan size	0.08	1.22	0.01	1.34
Logarithm_income	-0.09	-1.12	-0.07	-1.65
Logarithm_asset	-0.23	(2.32)*	-0.18	-1.66
Number household members	0.27	(3.39)**	0.14	1.88
Dependents	0.38	(2.04)*	0.31	1.69
Female	0.05	(2.4)*	0.02	1.08
SC_ST	0.09	1.77	0.09	1.11
Farmer	0.22	(2.24)*	0.15	1.77
Self employed	0.89	(2.08)*	0.76	1.04
Labor	0.37	(2.42)*	0.29	1.41
Kerala dummy	0.37	(2.3)*	0.27	(2.14)*
Constant	0.82	(2.12)*	0.66	(2.09)*
Adjusted R Square	0.31		0.35	
Chi-squared	94.98		112.52	
Observations	523		523	

Absolute value of z statistics in parentheses, * significant at 5%, ** significant at 1%; Dprobit estimation with robust standard errors; 'Marginal effect' reports the change in probability of getting an additional job for an infinitesimal change in each independent variable. All regressions include a full set of dummies for other risk responses such as dissaving and non-monetary help.

Figure 10: Table 1.7: Probability of Additional Job in Response to Income Shock

application. Since I do not have detailed lender level information, I will look at what borrowers do when faced with a rejection. The data has detailed information on household responses to loan rejection. The most common responses were, "got a second loan, elsewhere at same cost", "got a second loan elsewhere as higher cost", "did not get second loan" and "did not apply for second loan". Table 8 and Table 9 present two such consequences of rejection. First I look at the probability of getting a second loan after the first is rejected. And secondly, I look at the cost of alternative credit.

I want to see if access to different sources of credit affects the probability of getting a second loan. After all a loan rejection from a neighbor is not at par with loan rejection from bank or from a cooperative. In Table 8, the dependent variable takes value 1 if the household gets a second loan and 0 if it does not or chooses not to apply for a second loan. The results indicate that probability of getting a second loan is significant and positive with greater access to banks, cooperative and informal ties. However, households that borrow from moneylenders are 20 percent less likely to get another loan when the first is rejected. Households that are rejected for loans from friends and family are very likely to get another loans as are households that have access to cooperatives. Test of equality of Cooperative and informal coefficient does not reject the null hypothesis that they are equal.

	[1]		[2]	
	Marginal effect	z-statistics	Marginal effect	z-statistics
Access to credit from N-R	-	-	0.32	(1.99)*
Access to credit from bank	-	-	0.16	(2.40)*
Access to credit from coop	-	-	0.27	(2.11)*
Access to credit from mnylndr	-	-	-0.2	(2.93)**
Logarithm_loan size	0.12	1.3	0.11	1.32
Logarithm_income	0.69	1.28	0.59	1.05
Logarithm_asset	-0.37	(2.04)*	-0.17	-1.62
Number household members	0.43	(2.14)*	0.25	1.39
Dependents	0.86	(2.10)*	0.36	1.69
Female	0.18	(2.14)*	0.13	1.06
SC_ST	0.25	1.39	0.11	1.42
Farmer	0.48	(2.24)*	0.41	0.84
Self employed	0.29	(4.82)**	0.24	1.65
Labor	0.66	(3.11)**	0.61	1.55
Kerala dummy	-0.93	-1.73	-0.81	-1.08
Constant	0.44	(3.12)**	0.36	(2.29)*
Adjusted R Square	0.26		0.36	
Chi-squared	125.93		120.63	
Observations	178		178	

Absolute value of z statistics in parentheses, * significant at 5%, ** significant at 1%; Dprobit estimation with robust standard errors; 'Marginal effect' reports the change in probability of getting a second loan for an infinitesimal change in each independent variable. All regressions include a full set of dummies for other risk responses such as dissaving and non-monetary help.

Figure 11: Table 1.8: Probability of Getting Second Loan after First Rejected

	[1]		[2]	
	Marginal effect	z-statistics	Marginal effect	z-statistics
Access to credit from N-R	-	-	-0.24	(2.92)**
Access to credit from bank	-	-	-0.03	(1.99)*
Access to credit from coop	-	-	0.85	(3.19)**
Access to credit from mnylndr	-	-	0.005	1.11
Logarithm_loan size	-	-	0.02	1.69
Logarithm_income	-0.13	-1.88	-0.18	-0.81
Logarithm_asset	-0.2	-1.23	-0.17	-1.05
Number household members	0.1	0.44	0.02	0.39
Dependents	0.04	1.88	0.009	1.06
Female	0.61	(2.14)*	0.34	1.79
SC_ST	0.04	1.46	0.01	1.28
Farmer	0.44	(2.24)*	0.14	1.88
Self employed	0.26	(3.28)**	0.127	1.05
Labor	0.317	(3.96)**	0.2	1.47
Kerala dummy	0.78	1.85	0.73	1.66
Constant	0.51	(3.2)**	0.69	(2.4)*
Adjusted R Square	0.23		0.26	
Chi-squared	100.56		125.63	
Observations	178		178	

Absolute value of z statistics in parentheses, * significant at 5%, ** significant at 1%; Dprobit estimation with robust standard errors; 'Marginal effect' reports the change in probability of paying a higher interest rate in second loan for an infinitesimal change in each independent variable. All regressions include a full set of dummies for other risk responses such as dissaving and non-monetary help.

Figure 12: Table 1.9: Probability of Paying Higher Interest Rate for Second Loan

But what is the alternative source of credit to a household? This can be understood by comparing the cost of second loan. Table 9 shows results from a dprobit estimation where the dependent variable takes value 1 if the cost of second loan was higher than the first, and 0 otherwise. As shown in figure 1, the rate of interest depends on the source of credit. So, if a household was rejected for the first loan and got the second at a higher cost, we infer that it is from another source. Results indicate that households that borrow informally from neighbors and relatives are less likely to pay higher costs for second loan. Since informal loans are interest free, I conclude that these households get the second loan from another source informally. Households that borrow from banks are also less likely to borrow at higher costs. This is perhaps because the alternative source of credit to them are neighbors and relatives who charge lower or zero interest.

The surprising result here is that households with access to cooperatives are 85 percent more likely to pay higher interest for the second loan. From the interest data, we know that moneylenders are the only source to charge an interest higher than cooperatives. This implies that when households get rejected from a cooperative, their alternative source of credit is predominantly a moneylender. This can also explain why in Kerala, where there is a higher concentration of cooperatives within village communities , there is also a larger presence of moneylenders. This result reinforces the implication of our simple model - when a community institutionalizes cooperation,

that is when households have financial interactions through a cooperative society, there will be minimal informal financial interactions between households. This is because the opportunity cost of informal lending is the interest rate that they can earn by lending through the cooperative.

5 Policy Implications

This work has very important policy implications for governments in developing countries like India, Thailand, the Philippines and Bolivia. Since rural credit programs are an integral component of government policy in such countries, this work suggests the following: Firstly, government policies should target community level institutions such as cooperatives and informal credit groups rather than attempting to disburse credit through specialized banks which are plagued with moral hazard and adverse selection problems due to asymmetries in borrower information. This is specially relevant in light of the fact that highest rate of default is for bank loans and it's lowest for community level institutions. This research shows that access to credit works as an insurance mechanism to rural households. But the sources of credit that do provide insurance against income shocks are community level institutions such as cooperative societies despite the presence of specialized commercial and government banks. Secondly, credit policies of government should aim to provide consumption and medical credit along with production credit. We note that they comprise a

significant cause of rural debt.

6 Conclusion

One of the main advantages of having developed credit institutions is that there are better opportunities to dealing with risk. This is particularly relevant in rural communities. Opportunities for personal savings in lesser developed communities are often restricted. However, personal savings alone only offers limited potential for protection against risks of fluctuating income. Therefore, there is reason to believe that other credit arrangements within the community can be beneficial. A few examples of such mechanisms are informal lending and borrowing amongst friends and relatives and the second is more organized cooperative societies. A household's response to risk will depend on the nature of arrangement that is available. Households that rely completely on informal ties for financial assistance will respond differently to risk than a household that has access to institutional credit. This study is in two parts. In the first, I look at access to different sources of credit in rural India. In the second part, I compare household responses to an income shock and study how these are affected by access to different sources of credit. I am able to do this by comparing household level data from two states of India ,Uttar Pradesh and Kerala.

To measure a household's access to credit, I develop an equilibrium model of sorting based

on a random utility approach. Based on this model, I am able to generate for each household, a predicted probability distribution over all creditors. In the second part of this paper, I analyze the role of access to credit as insurance mechanism. I estimate the impact of credit access on different risk responses.

I find large disparities in access to credit and particularly access to formal credit across households. However, predominant sources of credit, across different wealth levels, are from informal ties with neighbors and relatives and from local cooperative societies. Both emerge through mechanisms of cooperation within the community. Cooperative is an institutionalized form of cooperation while financial ties with neighbors and relatives is informal cooperation. One main difference, however, across these two mechanisms is that while cooperatives can charge positive interest on loans, social norms restrict informal interest rate to zero. I exploit this difference and present a simple model to explain why the presence of a cooperative within a community can lead to better outcomes. One implication of this model is that the presence of community level institution such as a cooperative society, can discourage informal financial ties between households.

The main results indicate that access to credit is a significant insurance mechanism, however this crucially depends on the source of credit. Banks do not provide any insurance against idiosyncratic income shocks. Households that rely on moneylenders are the worst hit during such income shocks.

Credit from a cooperative society and from informal ties offer the best insurance against income shocks. The results show that a 1 percent increase in access to cooperative, lowers the probability of reducing consumption by 18 percent and cutting input expenditure by 27 percent, when a household is faced with an income shock. I also study the loan rejection data and find that when households form cooperatives within a community and have financial interactions through these cooperative societies, there is minimal informal financial interactions between households. This is because the opportunity cost of informal lending is the interest rate that they can earn by lending through the cooperative.

7 Data Appendix

7.1 Sampling Methodology

In this section, I describe the sampling methodology and some relevant summary statistics.

Kerala is an average income state with per capita income of $254 per annum, while Uttar Pradesh is a low income state with per capita income of $158 per annum.[7]. The distinction between these two states becomes more stark when done along social development indicators. U.P. is termed as one of the 'sick' states of India (BiMaRU) and Kerala is ranked the highest based on social indicators.

Districts covered in survey are primarily agrarian where the population depends either directly on cultivation or agriculture related jobs like daily wage labour and trading. The sample district from U.P. is Kannauj and sample district from Kerala is Palakkad.A district in India is divided into several development blocks, which are then subdivided into many villages. For our sample, we picked one representative block in each district, based on socioeconomic indicators provided by District Statistics Office of each district. Incidentally both sample blocks are also the largest in their respective districts. The sample block in Uttar Pradesh has a total population of 2,14,964 and comprises of 108 villages. All villages are grouped into 78 *panchayats*. *Panchayat* is the lowest

[7] Handbook 2001 - Select socio-economic indicators, Department of Statistics, Government of India.

Figure 1: Map of India - Outline of States

Figure 13: Figure 1.3: Map of India

rung in the democratic ladder with an annual budget and an elected governing body. In Kerala, the sample block has a total population of 2,37,679 and comprises of 94 villages (wards) that are grouped into 9 panchayats.

Villages from each block were chosen based on stratified random sampling. In U.P., to pick a representative sample of households we stratified all 108 villages into 6 groups along three categories: a) distance from nearest metallic road b) Muslim village c) scheduled caste village. While distance from nearest metallic road serves as a good instrument for access to organized credit market, it also is a very good proxy for access to organized labor market. Based on this distance parameter, we form 4 groups. The second category is an important one because interaction of Muslim households in the informal credit sector has several distinct characteristics. For example, borrowing and lending amongst Muslim households is done free of interest charges. This is similar to Udry's findings in northern Nigeria (1990). Stratification of villages along 'Scheduled Caste and other Backward Caste' is important because these are target villages for government programs. For example there are exclusive projects for employment, education, building roads, drainage system, housing and repair for these villages. From each of the six categories for stratification, we randomly picked two villages. We therefore have a total of 12 villages from U.P.. In Kerala, villages can not be distinguished based on religion and every village in the selected block is linked with metallic road.

There are, however, special grade *panchayats* based on the population of scheduled caste and other backward castes. There are two such panchayats in our selected block. We decided to include all the 9 *panchayats* in the block to get the most representative sample of households. We therefore, randomly picked one village from each of the 9 *panchayats*. The total number of villages covered in our sample is thus 21.

Village wise details of demographic and socioeconomic characteristics are available in table 10. Ferozpur and Bahsuia are the two 'schedule caste' villages in U.P. sample. The two muslim villages are Garaulli and Nisthaulli. In Kerala the sample block has two schedule caste villages and we have surveyed both, Vadakkencherry and Alathur.

To select households within a village, we obtained the voters' list from the last election, which was held in 2000. This is a reliable and exhaustive list that has names of every member of a household above 18 years of age in the village. From the list we randomly chose 30 households from each selected village in U.P. and 40 households from each selected village in Kerala. Therefore we have a total of 720 households in our sample, 360 each from Kerala and U.P.

The data provides detailed household level information on several variables. Member-wise household demographic details, primary and secondary occupation and wage details are available. We also have detailed account of landholding, cultivable land, usage, housing and asset holding

Village name (distance to metallic road)	Main occupation	Per-capita landholding (acres)	Per-capita Income (Rs/year)	Highest education per household	Percentage of household with atleast one regular job
Alampur (2)	F, RJ	0.46	6,234	12th grade	13
Bahsuia* (3)	F,CL	0.19	4,352	10th grade	3
Balanpur (0)	F, CL, SE, RJ	0.155	5,440	10th grade	27
Ferozpur* (6)	CL, F, SE	0.1	1,997	8th grade	3
Garaulli** (4)	F, CL, SE	0.45	4,820	8th grade	13
Naurangpur (5)	F	0.27	5,564	10th grade	11
Nisthauli** (2)	F, CL, SE	0.33	4,276	8th grade	3
Patti (5)	F, CL, SE, RJ	0.22	5,880	8th grade	10
Ramipurva (0)	CL,F	0.23	2,872	10th grade	0
Sikrauri (4)	F, RJ, CL	0.27	3,758	10th grade	23
Siyapur (2)	F, SE	0.24	5,601	10th grade	11
Thathia (0)	F, RJ, SE, CL	0.21	6,923	12th grade	28
Uttar Pradesh		**0.26**	**4,810**		**12**
Alathur* (0)	CL, SE, RJ, F	0.09	7,398	10th grade	43
Erimayur (0)	CL, RJ, SE, F	0.17	13,489	12th grade	45
Kannambra (0)	CL, RJ, SE, F	0.12	9,631	10th grade	48
Kavasseri (0)	RJ, SE, CL, HW, F	0.14	8,426	12th grade	45
Kizhakencherri (0)	CL, RJ, F, SE	0.31	11,584	12th grade	44
Pudukode (0)	CL, RJ, SE, HW	0.14	10,083	10th grade	33
Tharoor (0)	CL, SE, RJ, F	0.08	7,401	10th grade	35
Vadakkencherri* (0)	RJ, CL, SE, HW	0.06	11,401	10th grade	45
Vandazhy (0)	RJ, CL, SE, F	0.12	12,336	10th grade	55
Kerala		**0.14**	**10,194**		**44**

* Schedule caste; ** Muslim; F=farmer; CL=casual labour; SE=self employment; RJ="regular job" (with montly salary and security of employment); HW=headload worker (with permit)

Figure 14: Table 1.10: Village Demographic and Socio-economic Characteristics

- agricultural and household assets. The data primarily focuses on the borrowing information of households. Lending and saving data is available. Details of monthly expenditure and annual income by source is also available.

Household response to risk looks at the household behavior in 'the worst period in last 4 years'. The cause of the shock is known, in order to differentiate whether it's an aggregate or idiosyncratic one. We gathered information on household's response to overcome this shock. We have detailed information on whether the household cut consumption expenditure, input expenditure, sell jewelry, get an additional job, migrate for work etc. Besides these, we also have data on whether the household sought any financial help. The sequence in which they approached different lenders. We have lender-wise details on number of loans applied and approved. Also, consequence of not getting a loan or sufficient amount.

For the purpose of this study, the household survey data has been supplemented by panchayat and district level data provided by the Department of Economics and Statistics, governments of U.P. and Kerala.

7.2 Indebtedness at a glance

Indebtedness information by village is available in table 11. There is higher indebtedness in Kerala, measured in terms of amount borrowed per loan, debt to income ratio per household as well the number of households per village that have at least one current outstanding loan.

Table 11 also shows the break-up of debt by source. On comparing different sources of credit, we note that while households in both regions borrow large loans from banks, these are fewer in number.

Village name (distance to metallic road)	Current debt per household	Percentage of indebted household	Ratio of current loan to Income	Distribution of outstanding debt by source (%)				
				Bank	Cooperative	Moneylender	Neighbor-relative	Employer-trader-landlord
Alampur (2)	18,648	43	43.6	78.0	8.2	4.9	8.0	1.0
Bahsuia* (3)	13,223	83	55.8	37.9	1.5	40.0	20.5	0.0
Balanpur (0)	7,450	33	23.6	15.7	1.3	31.4	36.0	15.7
Ferozpur* (6)	4,830	73	38.4	24.8	10.4	40.0	23.2	1.4
Garaulli** (4)	12,633	60	35.5	18.0	0.0	0.0	81.4	0.4
Naurangpur (5)	6,789	63	17.6	14.0	3.1	38.8	22.5	21.7
Nisthauli** (2)	13,117	43	38.8	72.4	0.0	2.9	24.7	0.0
Patti (5)	6,923	40	19.7	33.2	2.9	10.0	53.8	0.0
Ramipurva (0)	9,010	55	44.6	59.7	0.0	17.9	22.5	0.0
Sikrauri (4)	12,150	73	36.0	51.0	0.0	24.7	18.8	5.5
Siyapur (2)	28,683	72	55.2	83.3	0.8	4.6	3.0	8.3
Thathia (0)	14,238	55	23.0	36.0	2.5	5.6	28.0	28.0
Uttar Pradesh	**12,308**	**58**	**36.0**	**43.7**	**2.6**	**18.4**	**28.5**	**6.8**
Alathur* (0)	21,850	70	57.5	52.8	28.3	10.8	7.6	0.6
Erimayur (0)	22,425	60	30.0	62.8	26.9	7.6	2.8	0.0
Kannambra (0)	28,700	70	78.0	29.4	64.0	1.0	4.8	1.0
Kavasseri (0)	16,983	75	51.0	38.6	47.6	9.5	0.6	3.7
Kizhakencherri (0)	19,555	68	40.0	20.6	65.0	12.0	2.3	0.0
Pudukode (0)	22,830	83	61.6	17.2	59.3	20.4	2.6	0.3
Tharoor (0)	14,149	75	32.7	3.5	76.0	15.4	1.2	3.9
Vadakkencherri* (0)	24,763	63	54.0	49.3	40.5	6.7	3.5	0.0
Vandazhy (0)	15,895	63	30.6	49.0	32.5	1.3	4.4	12.6
Kerala	**20,794**	**70**	**48.4**	**35.9**	**48.9**	**9.4**	**3.3**	**2.5**

* Schedule caste; ** Muslim

Figure 15: Table 1.11: Village-wise Current Outstanding Debt

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