Rural Credit Markets in Vietnam: Theory and Practice*

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Abstract

Rural credit markets in many developing countries are characterized by imperfect information and the co-existence of formal and informal credit institutions. Lenders, especially informal lenders, use indirect or direct screening mechanisms to address problems of incentives and enforcement. Based on this understanding, this study develops a theoretical model for the determination of the interest rate on loans from informal sources. Utilizing data from a World Bank-sponsored Vietnam Living Standard Survey of 1997-98, I also investigate the empirical determinants of interest rates on informal loans, as well as the factors underlying the decision by households to utilize informal credit sources. Results indicate that both loan terms and household characteristics significantly affect borrower's choice of which sector to borrow from and lender's choice of interest rates.

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I. Introduction

Rural credit markets in developing countries are full of imperfections. The imperfections manifest in the generally accepted fact that, despite numerous government policies to increase household's access to credit, many rural households remain credit-constrained. The formal banking sector does not satisfy the growing demand for credit, and many borrowers turn to informal loan sources (relatives, private moneylenders, etc.) to meet their production and consumption needs. It has been estimated that only five percent of the farmers in Africa and about fifteen percent in Asia and Latin America have had access to formal credit; and on an average across developing countries five percent of the borrowers have received eighty percent of the credit.[1] The questions that arise are: Why do these imperfections exist? Can the government of developing countries do anything to remove them? If yes, what are the roles for public policy? These questions are relevant especially from the perspective of economic development. Access to affordable agricultural credit enables farmers, who constitute the majority of population in most developing countries, to adopt new technology and take advantage of new economic opportunities to increase production and income.

Yet agricultural credit is lacking where it is most needed. Credit markets in developed countries generally function more smoothly than those in developing ones. Does this imply that the natural course of development will eventually remove market imperfections, or would these imperfections have to be eliminated before development can take place? Amartya Sen, in his book "Development as Freedom", gave the answer. According to Sen, "economic facilities," which refer to "the opportunities that individuals respectively enjoy to utilize economic resources for the purpose of consumption, or production, or exchange," constitute one type of the "instrumental freedoms" that act as both *the primary end* and *the principal means* of development. Thus, the final goal of development should be expanding the economic facilities of the people, and giving people these economic facilities by actively removing market imperfections is conducive to the development process.

To effectively remove market imperfections requires correctly identifying the reasons why they exist. A major source of imperfections in rural credit markets is the lack of information that facilitates borrowing/lending transactions. The information asymmetries arise from the fact that, many have argued, institutions for the protection of property rights and contract enforcement in developing countries are either absent or underdeveloped. De Soto in "The

[1] Bali Swain (2001).

Mystery of Capital" argues that without a formal property rights system that promotes trust and security in transactions, any assets are "dead capital" in the sense that they cannot be converted into surplus value. As a personal anecdote, my parents bought our current house in Vietnam in 1997. At that time they also wanted to invest in my human capital by sending me to study abroad. Yet borrowing the necessary money from the banks was out of the question, because for five years they could not obtain the "red paper" – a formal house ownership certificate. In this sense, people like my parents live outside what De Soto calls the "Braudel's bell jar,"[2] ostracized by the inaccessibility of the formal property rights system that serves a privileged few. Olson (1991, 1998) also posits that without a properly defined and enforced property rights system, people do not have the incentive to produce and accumulate wealth. He found empirical evidence that shows that the quality of institutions and governance, which has been left out of both the neoclassical and endogenous growth models, explains the diverse pattern of growth among developing countries.

This thesis is premised on this theoretical understanding of rural credit markets. More specifically, it applies this framework to investigate aspects of rural credit markets in Vietnam. Despite empirical work that has established the link between financial sector development and a country's economic growth, Vietnam has proved an exception to the rule by managing to grow at a consistently (though not necessarily sustainably) high rate even without a developed credit market. It is a capital-scarce economy, with substantially lower public savings rate than other Asian counterparts. Only 4% of those eligible to open a bank account actually have one, and only 25% of total savings is held in the banking system.[3] The country also has a low rate of financial intermediation – the ratio of domestic bank credit to GDP is 20% compared to over 100% in China.[4] The weakness of the banking system is further testified by the finding that 6% of all Vietnamese households are financial intermediaries, who borrow and re-lend at higher interest rates.[5] Meanwhile, demand for rural credit has been growing since the 1986 reforms brought new economic opportunities to farmers, who make up 80% of the total population. The consequence is the existence of an informal credit market that provides loans to rural households for various purposes, at interest rates normally higher than that charged by the formal sector.

[2] De Soto (2000), pp 66: Fernand Braudel, a French historian, asked the puzzling question of why, at its inception, Western capitalism served only a privileged few, just as it does elsewhere in the world today.
[3] IMF Report (1999)
[4] O'Connor (2000)
[5] Haughton (2000)

In this context, this paper asks two basic questions. First, what are the factors that affect Vietnamese households' decision of which credit sector to borrow from? Second, within the Vietnam's informal credit market, what determines the interest rates on informal loans? Answers to these questions will have profound policy implications if the government aims to improve poor people's access to affordable credits. The paper is organized as follows. Section II reviews the previous literature on rural credit markets. Section III describes the data and the pattern of formal/informal borrowing in rural Vietnam. In section IV, I estimate a probit model of households' sectoral choice of borrowing. In section V, I present a theoretical model that formalizes informal lenders' choice of the interest rate, followed by an empirical investigation of the determinants of interest rates on informal loans. Section VI draws policy implications and concludes the paper.

II. Review of Literature

In this section, I first present the theories that have been advanced on rural credit markets and propose that the imperfect information approach be the theoretical basis of my analysis. Second, I review the theoretical literature on imperfect credit markets. Last, I survey some of the previous empirical work on rural credit markets in several developing countries.

II.1. Theory of Rural Credit Markets

Hoff and Stiglitz (1996) suggest three competing theories of the rural credit markets in developing countries. The first theory posits that village moneylenders in the informal market are usurious monopolists, charging as high an interest rate as they can to maximize profits. Although a certain degree of monopoly power is present in the sense that there are often high transaction costs of switching lenders, this characterization is not complete if we are to obtain a thorough understanding of this highly complicated market. Further, the monopoly theory does not explain the coexistence of the formal and informal credit markets despite the fact that formal interest rates are substantially below those charged in the informal sector.

The second theory perceives the rural credit market to be approximately perfectly competitive with market-clearing equilibrium, where high interest rates indicate high risk of borrowers. Again, this theory is not fully supported empirically, given the widespread observation of *credit rationing* in the rural market. Credit rationing refers to the phenomenon in which among loan applicants who appear to be identical, some receives a loan and others do not,

and the rejected applicants would not receive a loan even if they offered to pay a higher interest rate[6].

The third approach is likely to be the most promising in facilitating our understanding of the rural credit market. This imperfect information school postulates that the informal credit market is characterized by uncertainty, high transaction costs, and information asymmetry, which typically leads to moral hazard and adverse selection. In order to overcome the informational asymmetry, lenders use *indirect* (passive) or *direct* (active) screening mechanisms[7] to reveal the quality (risk level) of borrowers. In the indirect screening case, the interest rate can take on the *dual* function as both price and an indirect screening device. Indirect screening, therefore, often leads to credit rationing – a combination of price and quantity of credit that is below the market clearing level. This is directly related to Stiglitz and Weiss's *price-quality theorem*, which says that when the expected quality of a commodity is a function of its price, as in the case of credit, equilibrium may be represented by quantity rationing. The reasons behind this will be further discussed in the next section.

Credit suppliers can also use direct screening mechanisms such as geography, kinship, and interlinkages with other markets to solve the problems of information, incentives and enforcement. In this case, the market will be monopolistically competitive. The costs of screening and obtaining information, which might well vary for heterogeneous borrowers, are incorporated into market prices, and therefore there is no "unitary" or "market clearing" interest rate. The resulting equilibrium interest rates, in contrary to the indirect screening case, are often higher than the clearing rate due to high informational costs. Table 1 summarizes the three basic theories and the market outcomes they imply.

[6] Stiglitz and Weiss (1981)

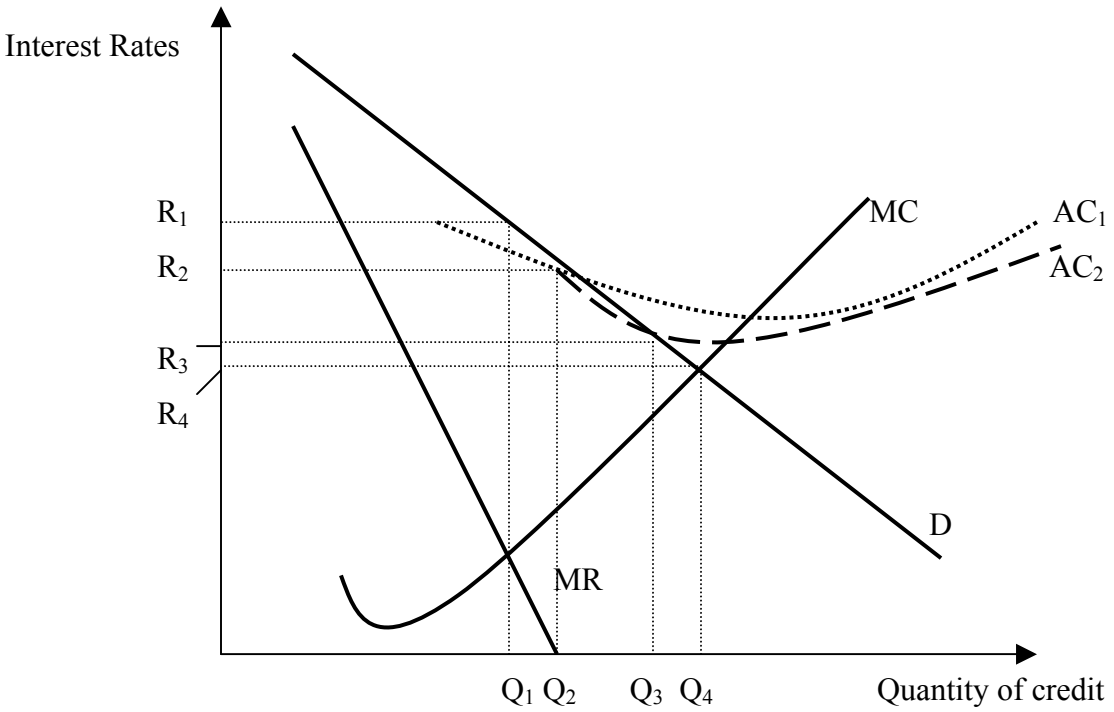
[7] *Indirect mechanisms* rely on the design of contracts by lenders such that, when a borrower responds to these contracts in his own best interests, the lender obtains information about the riskiness of the borrower, and induces him to take actions to reduce the likelihood of default and to repay the loan whenever he has the resources to do so. *Direct mechanisms* entail lenders (a) expending resources in actively screening applicants and enforcing loans and (b) limiting the range of their lending activity to members of a particular kinship group, residents of a given region, or individuals with whom they trade.

Table 1

Theory	**Monopoly theory**	**Competitive theory**	**Imperfect Information**	
			Indirect Screening	***Direct Screening***
Market Outcome	Monopoly market P > MC = MR	Perfect competition P = MC	Credit rationing $P^* < P_{equilibrium}$ $Q^* < Q_{equilibrium}$	Monopolistic competition P = AC > MC Multiple equilibria

Figure 1 visually illustrates the outcomes.

Figure 1: Theories of Informal Credit Market Structure



* Equilibrium $\{Q_1,R_1\}$ corresponds to the view that moneylenders charge monopoly rates to maximize profits. Equilibrium $\{Q_4,R_4\}$ will occur if informal credit market is perfectly competitive. The imperfect information paradigm (with direct screening) predicts multiple equilibria, with $\{Q_2,R_2\}$ and $\{Q_3,R_3\}$ corresponding to two possible outcomes for two different borrowers A and B. A (with AC_1) is more "risky" than B (with AC_2), thus A faces a higher interest rate and lower quantity of credit than does B, assuming identical demand function.

It is important, from a public policy perspective, to determine the most appropriate approach to understanding the economics of rural credit institutions. Each theory of rural credit markets implies a very different path for public policy. The concern of the government in developing countries, which we assume to be rational, is to provide cheap and adequate credit to small and poor farmers since credit is viewed as a production input, and accessible and affordable inputs are essential to increasing production and incomes. Therefore, if the

government perceives the rural credit market to be characterized by lack of funds and the presence of monopolist moneylenders leading to sky-high interest rates, a rational response would be to inject credit into the market, increasing the supply of funds, thereby hoping to drive interest rates down. Yet if the problem lies elsewhere, this credit subsidy policy will not achieve its objectives. This has been the case in Thailand[8]. On the other hand, the imperfect information approach implies that the key role for government intervention should be to create the "externality-like effects"[9] by reducing the cost of enforcement and information. This can be done, for example, by enforcing property rights (land titling, etc.), and undertaking investment in rural infrastructure to make agriculture less risky, thereby reducing asymmetric information between lenders and borrowers.

II.2. Review of the Imperfect Information Literature

Credit Rationing and Indirect Screening

The theoretical credit rationing literature, starting from as early as the 1950s, generally seeks to develop an economic rationale for the allocation of credit by some means other than the price (interest rate). The most influential early theoretical studies are Jaffee and Russell (1976) and Stiglitz and Weiss (1981). Jaffee and Russell (1976) were the first to develop a model of rationing in imperfect loan markets where borrowers have more information about the likelihood of default than lenders. Their model suggests that in competitive markets a single-contract equilibrium (i.e. equilibrium with a single set of terms) will tend to occur at a point of rationing. Stiglitz and Weiss (1981) built on this work to show why such an equilibrium might occur. The interest rate a lender charges may itself affect the riskiness of the pool of loans by either sorting potential borrowers (the *adverse selection effect*) or affecting the actions of borrowers (the *incentive effect*). Through either of these effects, an interest rate that is set too high will inevitably cause the riskiness of the applicant pool to increase. Thus, there is an optimal interest rate, which is often below the market-clearing rate, that maximizes the returns for lenders. Also, because the interest rate influences the nature of the transactions, it can act as an indirect screening device, sorting out "good-risk" from "bad-risk" borrowers: those who are willing to pay high interest rates may, on average, be worse risks because they perceive their probability of

[8] Siamwalla et al. (1996): Thailand has sought to increase farmers' access to credit by government intervention. In 1966 it created the BAAC, a government agricultural bank to lend solely to farm households, and beginning in the mid-1970s it required commercial banks to lend heavily in the rural sector. Despite this enormous expansion of credit, the informal credit sector continues to thrive and charge interest rates many times higher than the formal sector.

[9] Hoff and Stiglitz (1996)

repaying the loan to be low. As Adam Smith put it some two hundred years ago: "If the legal rate of interest … was fixed so high …, the greater part of the money which was to be lent would be lent to prodigals and projectors, who alone would be willing to give this high interest."[10]

Stiglitz and Weiss (1981) (and later others) established that collateral requirements can also be used as an indirect screening device: an increase in collateral requirements, like an increase in the interest rate, potentially leads to a decrease in the lender's expected return on loans because of resulting adverse selection and incentive effects. According to Bester (1985) and Besanko and Thakor (1987), high-risk borrowers can be identified because they prefer loan contracts with lower collateral and a higher interest rate. Thus, by designing credit contracts with inversely related interest rates and collateral requirements, lenders can sort borrowers into risk classes.

The discussion above of credit rationing can be applied both to the formal and informal credit sectors, although reliance on collateralization is more popular in the former than the latter. In fact, credit rationing in the formal sector is one main reason for the existence of the informal credit market. This is the view taken by the so-called "residuality approach"[11], which maintains that the informal sector exists to satisfy the unmet demand for credit resulting from credit rationing in the formal sector. Bose and Cothren (1997) show that credit rationing will persist as the equilibrium in the formal credit market until the cost of information falls below a threshold level, at which point the economy will move to a *screening equilibrium*, where lenders choose to acquire costly information to separate borrowers as to type.

Direct Screening

Lenders in a credit market with imperfect information can utilize certain direct screening mechanisms to sort out borrowers as well as monitor and enforce loan repayment. Direct screening can take on diverse forms. In northern Nigeria, for example, credit markets are almost completely segmented along geographic and kinship lines, and information asymmetries between borrowers and lenders within these markets appear to be negligible[12]. Collateral is seldom used, and credit terms implicitly provide for direct risk pooling between creditor and debtor. Similar evidence for the informal credit markets is reported in a case study of rural China[13].

[10] Adam Smith, "The Wealth of Nations"
[11] Floro and Yotopoulos (1991)
[12] Udry (1996)
[13] Feder et al. (1996)

Another widely used mechanism is interlinked credit contracts. Participation of the borrower and lender in a market other than the credit market reduces the lender's costs of contract enforcement and increases the borrower's ability to assure the lender of his creditworthiness. Therefore, loans can be interlinked to transactions in those markets, alleviating screening, incentive and enforcement problems. When an economic relationship entails transactions in several markets, there is scope for greater surplus. The most widespread form of interlinkage is provided by traders. Lenders-traders generally require that their clients sell all their crops to, or through, them. This type of trade-credit linkage has been seen in India, Pakistan, Thailand, among many other countries[14].

Direct or active screening entails the cost of obtaining information and therefore is often more costly than indirect screening, which works through a process of self-selection. Further, a direct screening device may be available to a group of borrowers and lenders but not others. This suggests that the informal credit market may be segmented and characterized by monopolistic competition. Each lender faces a downward sloping demand curve from borrowers tied to him, so that he can price at above marginal cost, but entry of new moneylenders keeps pure profits close to zero by driving price down to average cost[15] (see Figure 1).

Other Parameters in the Informal Loan Contract

From the discussion thus far, we have established that if lenders utilize direct screening mechanisms, then the informal interest rate varies to reflect informational costs. The informal credit market literature has also specified other factors that contribute to determining the price of a loan. Basu (1989) proposed that the interest rate is influenced by the size and maturity of the loan. Shorter-period loans are subject to higher interest rates because those who take loans closer to the repayment date have relatively more inelastic demand for credit. Basu also maintains that loans of larger size command lower interest rates. On the other hand, the larger the loans relative to the borrower's income, the more susceptible the borrower becomes to default.[16] Basu's view is consistent with that of Sarap (1986), who argued that interest rates vary with the purpose of lending.

[14] Aileem, Siamwalla et al., and Bell provided these case studies in Hoff et al. eds. (1996)
[15] Aileem (1996)
[16] Floro and Yotopoulos (1991)

II.3. Previous Empirical Research

In contrast to the large volume of theoretical research on credit markets, the empirical literature is surprisingly sparse, partly due to the lack of reliable micro-level data on borrowing and lending in developing countries. Even fewer researches examine the rural credit market. One main theme in the empirical literature is to identify characteristics of the borrowers with a high probability of being rationed out of the formal credit market (Zeller 1994, Kochar 1997, Pham and Izumida 2002, etc.). Others investigate determinants of the terms of the informal credit contract, among which the interest rate and loan size are important elements (Floro and Yotopoulos 1991, Yadav et al. 1992, Siamwalla et al. 1996, Nagarajan et al. 1998, etc.). Geographically, most recent empirical studies focus on Asian countries, where agricultural credit is crucial for the majority of population and yet government policies of subsidized interest rates and credit expansion have generally not been effective. Table 2 provides a summary of selected empirical work.

Table 2: Previous Empirical Studies

Study	*Data*	*Model and Method*
Floro and Yotopoulos (1991)	The Philippines Survey of 111 households, 1984	Loan size/interest rate = f(income, default incidence, regional dummies) Log-linear OLS regression
Zeller (1994)	Madagascar Survey of 189 households in 3 regions, 1992	Determinants of application and credit constraints in formal/informal sectors Probit regressions
Siamwalla et al. (1996)	Thailand Survey of borrowers in 6 regions, 1987	Interest rate = f(contract terms, loan purpose, borrowers' & lenders' characteristics, relationship and interlinkages, socioeconomic environment) Hedonic regression
Nagarajan, Meyer and Hushak (1998)	The Philippines Survey of 127 households in Central Luzon, 1989-90	Estimate equation of loan demand (measured as sum of all loans) Type-three Tobit model
Pham and Izumida (2002)	Vietnam Survey of 300 households in 3 provinces, 1997	Formal/Informal borrowing decision = f(loan purpose, production capacity, age & education, regional dummies) Probit/tobit regressions

III. The Rural Credit Market in Vietnam

This section provides a background picture of Vietnam's rural credit markets, followed by some descriptive evidence from survey data.

III.1. Background

Since the decollectivization of agriculture in Vietnam in 1986, the demand for credit from family farms has risen sharply, spurring the development of a robust rural credit market. In this market, formal and informal finance exists side by side. The formal sector is led by the Vietnam Bank for Agriculture and Rural Development (VBA), which, as of the end of 1998, accounted for about 84% of the total outstanding loans provided by formal lenders[17]. Most of the loans issued by VBA are short-term and for agricultural production purposes, with interest rates prescribed by the State Bank. The VBA prefers to make group loans, which go directly to groups such as Women's Unions (WU) and Farmers' Associations (FA)[18], because peer monitoring between group members helps reduce monitoring and transaction costs. But even in the case of group loans, the bank normally requires collateral in the form of houses and land-use rights.[19] This presents a challenge for rural households due to the lack of well-defined and enforced property rights. According to the 2003 World Bank's "Vietnam Development Report", in 1998 only 24% of agricultural households were issued land-use right certificates. However, to spur rural development, the State Bank does allow rural households to borrow up to ten million *dong*[20] without collateral from the VBA.

Other formal institutional lenders, such as the Vietnam Bank for the Poor[21] (VBP), People Credit Funds[22] (PCF), People Savings Cooperatives[23] (PSC), and a few small semi-private rural share-holding banks, have a smaller influence on rural financing[24]. They have so far been able to mobilize only a small volume of savings capital, principally because of the State Bank's restrictive interest rate policy (interest rate ceilings), and therefore depend on refinancing funds from the State Bank or the VBA. These financial institutions have less stringent collateral

[17] Pham and Izumida (2002)
[18] These are semi-administrative mass organizations under the influence of the ruling party. These unions have a nationwide network both at the commune and national level. They are relatively better organized in the north, reflecting the tradition of village autonomy.
[19] Formal land titles that can be used to exchange, transfer, inherit, lease and mortgage.
[20] Vietnamese currency
[21] VBP is a government-owned, non-profit bank established in 1995 with a mandate to provide credit to the rural poor. Loan purposes are mainly crop cultivation and animal husbandry. Its lending rates are heavily subsidized.
[22] Primary purpose is to promote savings in rural areas. Membership is voluntary. Interest rates are determined by market mechanism.
[23] This institution provides loans on collateral to the villagers in remote areas.
[24] Wolff (1999)

requirements, being closer to their clients. However, considerable confidence-building efforts are needed to regain people's trust after the collapse of a large number of credit cooperatives in the early 1990s.

Thus, in rural Vietnam there is significant scope for the existence of an informal credit market, which consists of private moneylenders, revolving credit associations (RCA), relatives, friends, and other individuals. RCA is an institution that has a long history in many developing countries (called *ho* in Vietnam, *hui* in China, *tontines* in Africa, etc.). In traditional Vietnamese villages, a revolving credit association was typically formed by a group of people with pre-established social ties, who pool a small sum of their savings periodically so that each, in rotation, can receive one large sum. This practice has now changed, in the sense that the modern RCA is often organized with the assistance of an NGO and/or a formal credit institution, operating in a link with that institution. Membership is no longer restricted to socially connected people, but more often is encouraged for members of commune-based organizations such as WU and FA. For example, the Vietnam Women's Union encourages women members to save in groups and utilize this money to provide credit. It also channels outside credit, such as funds from the VBA. The Vietnam Farmers' Association promotes two types of funds. One is to pool idle money as a fund and in turn on-lend to farmers for agriculture and off-farm activities. The second is a farmers' pension fund which totaled 20 billion *dong* in 1996[25]. Finally, there are voluntary groups promoted by the VBA, which provides training on accounts. Overall RCA has been a successful institution, where peer monitoring between members helps reduce enforcement and transaction costs.

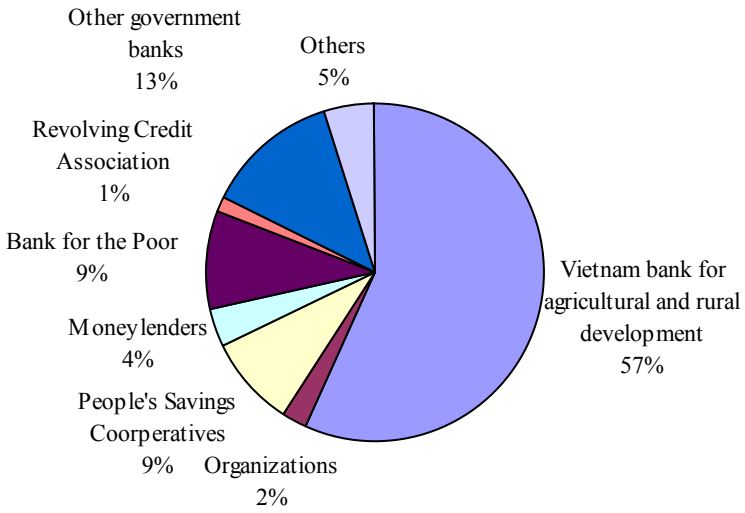
III.2. Patterns of Formal and Informal Borrowing in Rural Vietnam

The 1997/98 Vietnam Living Standards Survey (VLSS) is a nationwide, multi-topic household survey with modules covering numerous aspects of living standards. The VLSS series[26] is part of the World Bank's Living Standards Measurement Study (LSMS), which started in 1979, collecting information about household living standards for several developing countries. The 1997/98 VLSS covered 6,000 households living in 194 communes[27]. It gathered data on education, health and employment status of household members, household economic activities, income and expenditures, as well as community characteristics and commodity prices.

[25] 1998 report by the United Nations Economic and Social Commission for Asia and the Pacific
[26] The first survey was conducted in 1992/93, covering 4,800 households
[27] A commune is the smallest administrative unit in Vietnam's rural area. It normally consists of two or three villages, with population averaging between 3,000 and 8,000 per commune, depending on the region.

Figure 2 shows the breakdown of credit institutions available for saving/borrowing in the 194 rural communes surveyed[28]. In most areas, the agricultural bank and other government banks constituted the main sources of credit supply to households.

Figure 2: Supply of credit by type of institutions



Out of 4,883 rural households participating in the 1997/98 survey, 49.7% had some debt outstanding, among which around 30% contracted multiple loans. Some borrowed exclusively from the formal/informal credit sector, some from both. The formal and informal sectors seemed to carry equal shares of loan transactions in 1998. Table 3 summarizes some characteristics of loan contracts by source.

[28] "Rural" area is here defined to include eight regions: minor urban areas, rural northern mountains, rural Red river delta, rural north central coast, rural south central coast, rural central highlands, rural southeast, and rural Mekong delta.

Table 3: Sample Means and Standard Deviations of Some Variables

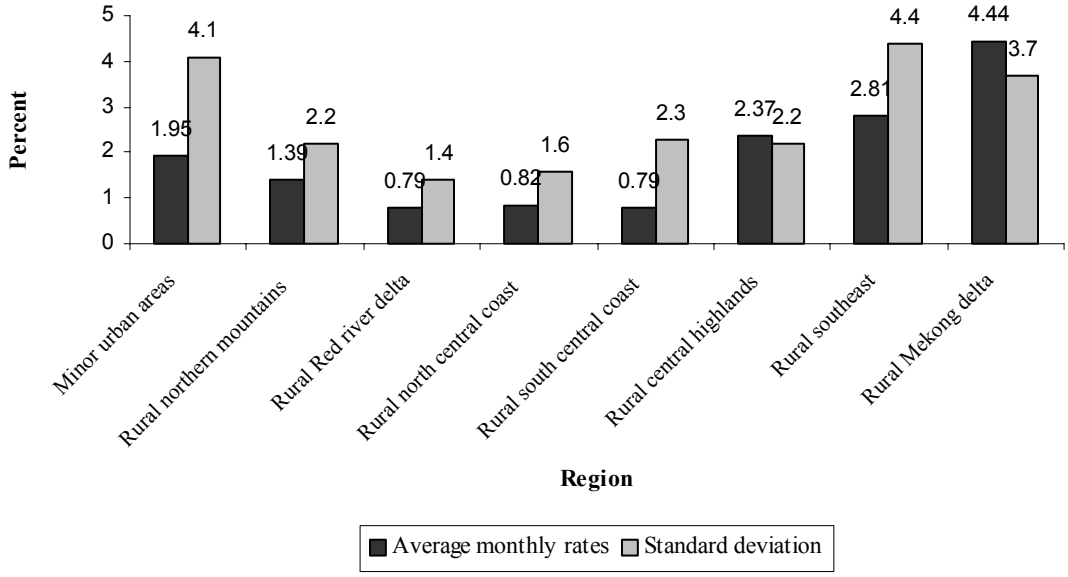
Selected Variables	Formal Borrowing	Informal Borrowing	
		Family lenders	*Non-family lenders*
Number of transactions in 1998	2,283 (50.1%)	912 (20%)	1,364 (29.9%)
Average monthly interest rates (%)	1.37 (1.2)	0.5 (1.57)	2.93 (3.5)
Average loan size (thousand *dong*)	3,652.8 (5741.0)	2,272.3 (3862.5)	2,420.1 (6567.4)
Average loan maturity (# months)	18.5 (18.4)	10.4 (8.1)	9.5 (14.7)
Collateral required (%)	61.2	0.1	1.6
Guarantor required (%)	41.2	0	1.6
Purposes of loans			
Production (%)	80.5	29.9	46.9
Consumption (%)	19.5	70.1	53.1
Average land holdings (M^2)	6,059.1 (8199)	3,903.9 (5562.6)	5,648.1 (8841.8)
Irrigation (% of total land holdings)	72.6 (38.9)	77.3 (34.3)	76.2 (37.9)
Non-land asset holdings (thousand *dong*)	31,767.4 (48593.3)	41,888 (174,043)	28,906.5 (40050.2)
Annual net income (thousand *dong*)	28,136.8 (127,813.7)	16,918.1 (39734.2)	26,606 (105,687.6)
Average household size	5.3 (1.9)	4.9 (1.6)	5.1 (1.8)
Age of household head	45.7 (11.9)	43.9 (12.8)	45.7 (12.6)

Source: Data from Vietnam Living Standard Survey 1997/98

It is worth noting the remarkable differences in the characteristics of loans contracted in the two sectors. Loans provided by non-family informal lenders commanded the highest average monthly interest rates (2.93%), and informal rates varied widely from zero to twenty percent per month. Formal loans were typically of longer maturity and larger size, and they were mostly contracted for production purposes (buying working capital, basic investment in agriculture/industry, trading, etc.) Households who borrowed from the formal sector tend to be relatively wealthier, i.e. have larger land holdings and net income.

Another interesting observation is that informal interest rates differed across regions. Average rates appeared to be lowest in the central parts, and increased as we move towards the south.

Figure 3: Informal interest rates by region



Source: Data from Vietnam Living Standard Survey 1997/98

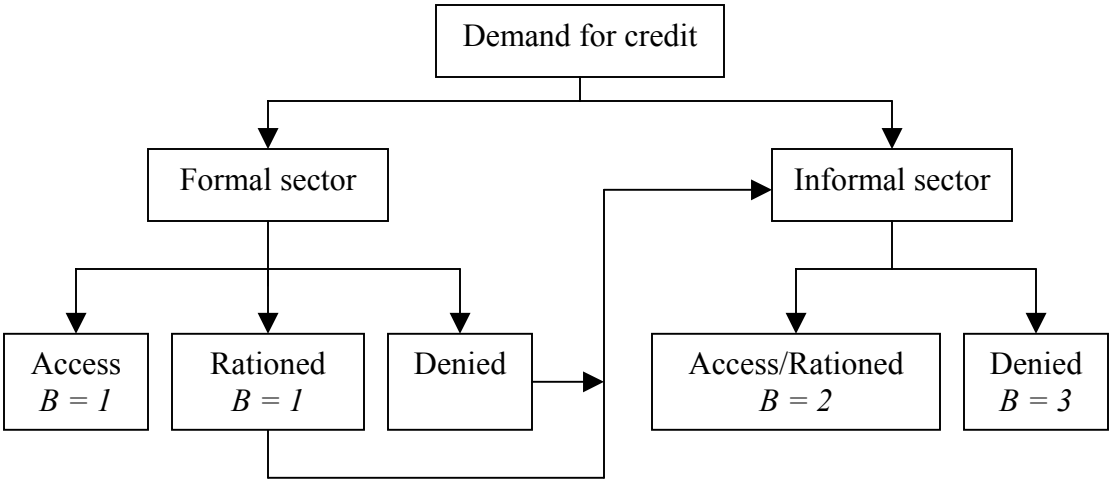
IV. Model of Sectoral Choice of Borrowing by Households

Further examination of households' decision of borrowing requires regression analysis. This section presents an intuitive model of households' choice of credit sector, followed by empirical investigation.

IV.1. Conceptual Framework

When there is a demand for credit, a household will choose to apply to either a formal or an informal credit institution, depending on their perceived relative probabilities of obtaining credit from each sector. These perceived probabilities are functions of the terms of credit demanded, borrowers' credibility, as well as the supply of credit available to them. Further, we assume, reasonably, that for an individual household *i* at a certain time period *t*, the probability of getting loans from informal sources is always greater than that for formal sources, and that the household always prefers formal credits because of lower interest rates. Figure 4 depicts the process through which different equilibrium outcomes are reached given an initial demand for credit, the outcomes being "*B=1*" (borrowing from formal sector), "*B=2*" (borrowing from informal sector), and "*B=3*" (no borrowing).

Figure 4: Decision Tree for Sectoral Choice of Borrowing



Whichever credit sector a borrower goes to, three mutually exclusive possibilities can occur: (1) being given access, (2) being rationed (not given the whole amount applied for), or (3) being denied credit. Those who face (2) or (3) would be expected to seek access in the informal market because the probability of getting loans there is greater. In the informal market, they again face one of the three possibilities. It is possible that a household will end up contracting multiple loans from both sectors (if they are first rationed in the formal sector and then get access or rationed in the informal one). The three final outcomes ("*B=1*", "*B=2*", "*B=3*") are results of various interactions between demand for and supply of formal and informal credit. Further, they are also results of creditors solving the informational problems, sorting out borrowers based on their "risk class".

The data used in this analysis are observed equilibrium outcomes in both credit markets, and thus, unfortunately, cannot be used to separately identify the demand and supply functions. Nevertheless, the above conceptual framework suggests that participation in a certain credit market is a function of credit demand/supply and borrowers' riskiness. We then formulate the participation equation:

$$P_i = f(S_i, D_i, R_i)$$

where P_i is the probability of contracting informal loans for household i, S_i and D_i are the supply of and demand for credits facing household i, respectively, and R_i is the risk factor. S and D are functions of geographical, social and economic characteristics of the household, including its physical and human capital endowments, "more rural" vs. "less rural" residence, ethnicity, etc. R depends on both loan terms (amount, duration, etc.) and household characteristics.

IV.2. Empirical Results

I estimate the participation equation using the probit method, where the dependent variable is coded "1" if the loan is contracted from informal sources and "0" if formal. After missing observations are discarded, the sample consists of 1,207 loan transactions that occurred or were outstanding in 1997/98 in the rural regions of Vietnam. Multiple loans contracted by one household are treated as separate transactions. Loan term variables include loan duration, relative loan size (loan size adjusted for land holdings), and loan purpose. The household's asset holding is a proxy for its physical capital endowment. Human capital variables consist of household size and employment status of the household head. The latter reflects the skill level and to some extent the social standing and connection of the household. To account for the availability of formal credits, I control for the average distance from the commune to the main formal credit institutions. Finally, the household's ethnicity and informal borrowing history are also included. Definition of variables and probit results are shown in Table 4.

Most coefficient estimates are statistically significant and have the hypothesized signs. Loans with shorter maturity have a higher probability of coming from informal sources. The effect of changes in loan duration on the predicted probability is especially dramatic for less-than-one-year loans (see Figure 5b). Loans that are large in size relative to the borrower's land holdings are more risky, and thus more likely come from informal sources. This is consistent with theory, which says banks will not raise interest rates for fear of potential adverse selection and incentive effects; they simply deny or ration risky loans. Figure (5a) plots the predicted probabilities of borrowing from informal sources against relative loan size.

Those who borrow for consumption are more likely to seek informal credits. This is probably due to restrictions on the supply side: most banks only give loans for production purposes given the higher risk of consumption loans. Being able to provide collateral, ceteris paribus, reduces the probability of informal borrowing by almost 30%. Figure (5c) shows that the effect of having collateral on the probabilities is substantial. The marginal effect of collateral is the vertical distance between the two curves, which ranges from zero at extremely large loan size to as much as 0.75 at small-to-medium loan sizes. This effect shows that the probability that a household without collateral borrows from the informal market is far greater for small-to-medium loan sizes than for extremely small or large loan sizes. The simple derivative calculation given in Table 4 (0.2974) does not show the wide range of differences displayed in Figure (5c).

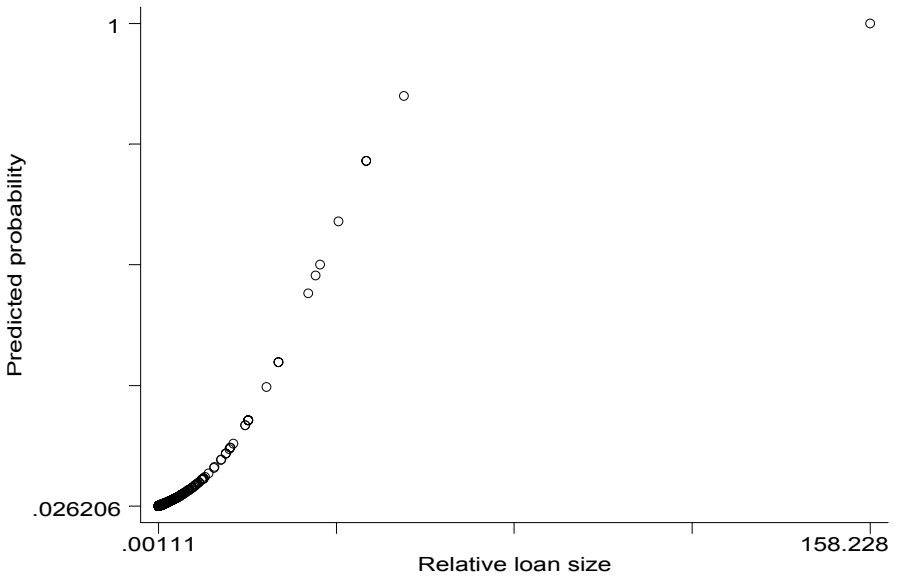
Table 4: Probit Estimates for Households' Choice of Credit Sector

(Dependent variable = "1" if loan is from informal sources)

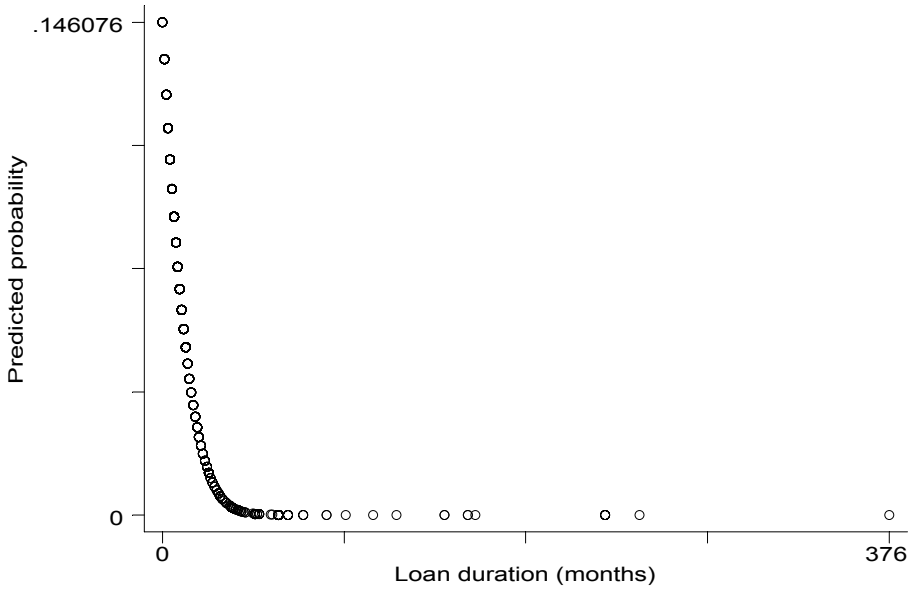
Variables	*Coefficients*	*Marginal Effects*	*Variable Definition*
Loan duration	-0.0495 (-8.685)***	-0.0031	Number of months loan for which was contracted
Relative loan size	0.0548 (2.251)**	0.0035	Loan amount (thousand *dong*) per squared meter of land holdings
Consumption purpose	0.3776 (2.732)***	0.0302	Dummy variable = 1 if loan is contracted for consumption use
Collateral	-2.6355 (-12.653)***	-0.2974	Dummy variable = 1 if borrower provided collateral
Guarantor	-1.7343 (-8.961)***	-0.1040	Dummy = 1 if borrower had a guarantor for the loan
Liquid assets	-5.75E-06 (-1.171)	-3.66E-07	Total value of livestock, farm equipment, tools, machinery, and business assets
Household size	0.1069 (2.871)***	0.0068	Number of household members
Formal sector employment	-0.1373 (-0.756)	-0.0079	Dummy = 1 if household head works for government/private sector/foreign joint ventures, etc.
Agricultural employment	0.4022 (2.303)**	0.0336	Dummy = 1 if household head works in fields/raises livestock/ aquatic products, etc.
Self employment	0.4742 (1.963)**	0.0446	Dummy = 1 if household head works as independent merchant/ fisherman/ lawyer/trader, etc.
Distance	0.0155 (1.782)*	0.0010	Average distance from commune to main formal credit institutions
Kinh ethnicity	-0.2795 (-1.518)	-0.0217	Dummy variable = 1 if main ethnicity in village is Kinh[29]
Past informal borrowing	0.1629 (1.247)	0.0099	Dummy variable = 1 if household borrowed from informal sources in 1992/93 survey
Number of observations	**1,207**	***Pseudo R^2***	**0.5728**
% Correct prediction	**90.47%**	***Log likelihood***	**-271.93**

*Notes: *, **, *** denote significance at 10%, 5% and 1% level, respectively.*
z-score in parentheses

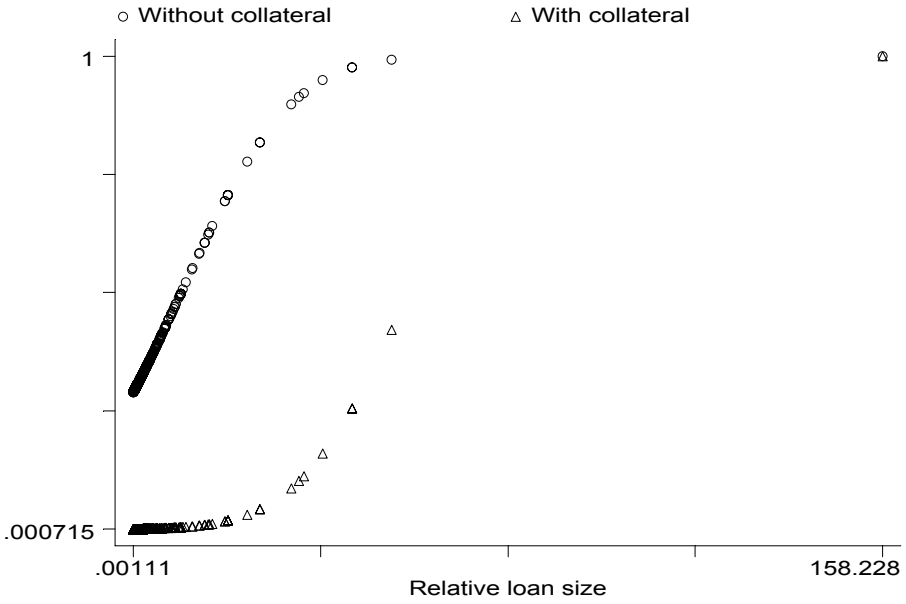
[29] Kinh is the major ethnicity in Vietnam (around 90% of population)



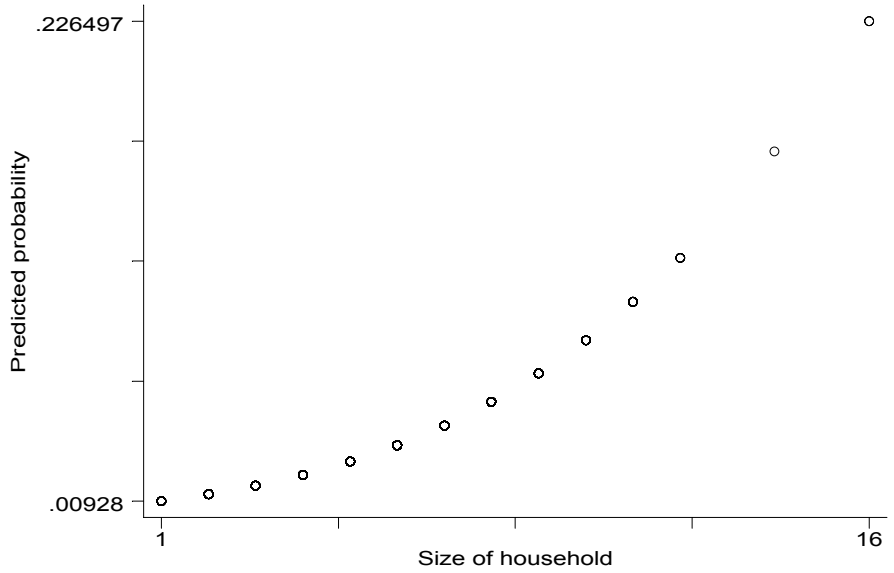
(a)



(b)



(c)



(d)

Figure 5: Predicted Probability of Informal Borrowing as Functions of Some Variables

The coefficient estimate for the household size variable is positive and significant at 1% level. Household size reflects the household's life cycle stage and its expected future income: a large family is likely to expect a large flow of income in the future as the children grow up and begin to work, thus they are likely to demand more credit. Yet, large household size tends to imply smaller per capita income. The combined effect is that the amount of credit demanded per household member is large relative to his/her income, which lowers the probability of repaying. This in turn increases the probability of borrowing from the informal sector. Another hypothesis is that this variable might be picking up some of the omitted regional effects: households that live in "more rural" areas tend to have bigger family size. The more rural an area is, formal credit supply becomes more limited, and information asymmetries become more severe. Figure (5d) shows that the predicted probability of borrowing from informal sources increases exponentially as household size increases.

Last but not least, the coefficient estimate of distance from formal credit institutions is also positive and statistically significant. Borrowers who live further away from formal lenders have higher probability of borrowing from informal sources. This is expected because traveling expenses increase the relative cost of obtaining formal credits.

Overall, the probit model generates good prediction (90.5%) compared to the naïve rule (80%) and linear prediction (89%). However, hit percentages vary considerably by region, ranging from 85% for rural Red river delta to 100% for rural southeast. This indicates that some region-specific variable (climate, regulation, etc.) is possibly omitted.

V. Model of Interest Rate Determination in the Informal Credit Market

Once a household decides to utilize informal loan sources, the logical question to ask next is: what determines the interest rate on informal loans? In this section, I first derive a formal model that relates the interest rate on informal loans to various parameters, most importantly loan size and loan duration. Second, I test the model using data on informal interest rates in rural Vietnam. Discussion of empirical results and policy implications follows.

V.1. Theory

As outlined in previous literature, the interest rate in the informal market can take on dual functions as loan price and an indirect screening mechanism that can affect the quality of loans. The imperfect nature of the credit market causes the interest rate to become endogenous to various transaction and informational costs. The theoretical model that follows is a modification

of the model in Siamwalla et al. (1996). I added two components: (1) loan duration and (2) borrowers' characteristics in order to investigate their effects on interest rate variation.

First, assume that borrowers are homogeneous, i.e. they all face the same opportunity set, have similar characteristics, tastes, and credit demand schedule. We will relax this assumption later. Each borrower has a borrowing requirement $b(r,\alpha)$, where r is the rate of interest and α is a shift variable. Let subscripts denote partial derivatives and define α so that $b_\alpha > 0$. Also, assume $b_r < 0$, that is, the desired transaction level between borrower and lender falls as the interest rate rises. Further, each borrower also has a desired length of time for which the loan is contracted – denote this m.

The lender's costs consist of two components: the cost of funds, denoted i, and transaction cost, i.e., the cost of obtaining full information about the prospective borrower. Assume that the supply of credit is perfectly elastic at the cost of funds i. The lender's transaction cost depends on the number of borrowers that he has to deal with (denoted n), a vector of borrowers' characteristics ($\boldsymbol{x}$), and the total number of lenders in the market (N). Thus the cost function is: $C = C(n, N, \boldsymbol{x})$.

The lender's problem is to solve:

$$\max_{n} n[r - i + 1]^m b(r,\alpha) - C(n, N, \boldsymbol{x})$$

The first term in the maximand is the before-transaction-cost profits that the lender can make after m periods of time from a clientele of n borrowers. The cost of funds is captured in this term, and is treated separately from the transaction cost C. An intuitive interpretation of the maximand is that the function of the lender is to arbitrage between the formal and informal markets, and the extent of the arbitrage is limited by the transaction cost incurred by the lending activity.

The first-order condition from the maximization problem is:

(1) $[r - i + 1]^m b(r,\alpha) = C_n(n, N, \boldsymbol{x})$

The two equilibrium conditions are:

(2) $nN = B$, where B is the total fixed number of borrowers.

(3) $n[r - i + 1]^m b(r,\alpha) = C(n, N, \boldsymbol{x})$ (zero-profit condition)

r, n and N are the endogenous variables. In an environment characterized by imperfect information, the interest rate becomes endogenous to various transaction and informational costs.

A comparative statics exercise yields the following results, where ϵ_{br} denotes the elasticity $d\ln b/d\ln r$:

(4.1) $$\frac{dr}{d\alpha} = \frac{-(r-i+1)b_r / b}{m + \frac{r-i+1}{r}\varepsilon_{br}}$$

(4.2) $$\frac{dn}{d\alpha} = 0$$

(4.3) $$\frac{dN}{d\alpha} = 0$$

(5.1) $$\frac{dr}{dm} = \frac{-\log(r-i+1)}{\frac{m}{r-i+1} + \frac{\varepsilon_{br}}{r}}$$

(5.2) $$\frac{dn}{dm} = 0$$

(5.3) $$\frac{dN}{dm} = 0$$

Using the requirement for stability $|\varepsilon_{br}| < \frac{rm}{r-i+1}$ [30], we obtain:

$$\frac{dr}{d\alpha} < 0 \qquad \frac{dr}{dm} < 0$$

Thus, equation (4.1) says that an increase in the size of the credit transaction (captured by a shift in α) leads to a decline in the rate of interest. Another important result from equation (5.1) is that there is also an inverse relationship between duration of loans (*m*) and the interest rate.

Neither of these results depends on the assumption of identical borrowers. In the heterogeneous-borrower model, the lender's problem becomes:

$$\underset{n_1,\ldots,n_k}{\text{Max}}\ n_j[r_j - i + 1]^{m_j} b_j(r_j,\alpha_j) - \text{C}(n_j, N, \boldsymbol{x_j})$$

where there are *k* different classes of borrowers. First-order and equilibrium conditions become:

(6) $$[r_j - i + 1]^{m_j} b_j(r_j,\alpha_j) = \text{C}_{\text{nj}}(n_j, N, \boldsymbol{x_j}) \qquad j = 1,\ldots, k$$

(7) $$n_j N = B_j \qquad j = 1,\ldots, k$$

(8) $$\sum n_j[r_j - i + 1]^{m_j} b_j(r_j,\alpha_j) I = \sum \text{C}(n_j, N, \boldsymbol{x_j}) \qquad j = 1,\ldots, k$$

where B_j is the total number of borrowers in class *j*.

Comparative static results are the same as when homogenous borrowers are assumed, with the addition of relevant subscripts. This heterogeneous-borrowers model can be used to explain the observed inverse relationship between loan size/loan duration and the interest rate.

[30] See Appendix A for detailed derivation of the stability condition.

For example, assume two classes of borrowers who are at first identical, then let one of the classes increases its demand for borrowing. That is, let $d\alpha_{j1}<0$. Class j_1 will then obtain loans at a lower rate of interest than the other class, j_2, whose demand does not increase. The same applies for loan duration. This means that the lender has completely segmented the market so that the demand of each class of borrowers affects the interest rate for that class only.

Another result that the model by Siamwalla et al. does not produce is that, with the inclusion of the vector of borrower's characteristics $\boldsymbol{x}_j$, the lender's transaction cost is different for different classes of borrowers due to not only the *quantity* but also *quality* of borrowers.

V.2. Empirical Results

I test the model above using data on informal interest rates in Vietnam's rural credit markets. Only observations with positive rates are included in the linear regressions. The estimation sample consists of 243 (245 in specification II) informal loan transactions that occurred or were still outstanding in 1997/98.

There are three sets of variables that theory says have influence on the rate of interest charged by informal lenders. The first set consists of loan term variables, of which loan size and loan duration are the most important. Our theoretical framework predicts inverse relationships between both variables and the interest rate. Lenders will charge lower rates to borrowers who can provide collateral or a guarantor for their loans, since they are relatively better risk. Purposes of loans, according to Basu (1989) and Sarap (1986), also set the rate of interest. Production loans, having greater expected returns, are more likely to be repaid and therefore tend to command lower interest rates. Fungibility of loan purpose is possible but unlikely to be common. If a borrower claims that his loan will be used for production but ends up using it for consumption instead, it is not hard for the lender, being geographically close to the client, to find out and impose a penalty on the borrower.

The second set of variables pertains to household characteristics, which affect the demand for credit as well as the credibility of households. The dependency ratio is calculated as the proportion of children to the total number of household members. A high dependency ratio, just as large family size, is expected to increase the risk of loans and thus to have a positive effect on the interest rate. A male-headed household is likely to be perceived more "stable" financially, and hence lower risk, relative to a female-headed family, which often indicates single parenting. Age of the household head is anticipated to be negatively related to the interest rate: as age increases, it is expected that the accumulated experience and the practical and professional

wisdom of the household increase its income generating capability (Bali Swain 2001). Further, in the context of Vietnamese rural villages, seniority often comes with reputation and power, which entail higher credibility. Total asset is calculated by adding up the value of household-owned housing, livestock, farm equipment, machinery and tools, and other business assets. The higher wealth endowment a household has, the higher the expected probability of repaying debt. The amount of irrigated land owned by a household is a proxy for its production capacity, which in turn could affect its repaying ability as well as borrowing requirement. Finally, "bad loan" is a dummy variable that equals "1" if the borrower reported difficulty or impossibility in repaying the outstanding debt.

The third set of variables includes what I term region-specific variables. There is evidence that informal interest rates differ across regions (see Figure 3). One possible explanation is that different regions vary in terms of formal credit policy and availability, and the extent to which "substitutes" for informal credit are accessible affects its price, i.e. the informal rate of interest. Further, to the extent that people in different parts of the country have different history, values and traditions regarding inter-household borrowing/lending, geographic difference might also explain variations in the informal interest rates. The first regression controls for ethnicity of household and proximity to main formal credit institutions, while the second introduces eight regional dummies. Least squares results are reported in Table 5.

In specification I, most explanatory variables are highly significant and yield the expected signs. Production loans and loans backed by some kind of collateral face significantly lower informal rates of interest. There is indeed evidence to confirm the hypothesis that lenders design loan contracts with inversely-related collateral and interest rates in order to sort borrowers into risk types. Results from our theoretical framework are also confirmed: there is an inverse relationship between loan size/duration and the interest rate. This makes intuitive sense. The fact that the loan is taken out near repayment date (e.g. harvest time) implies that the interest rate elasticity of demand is relatively low. A profit-maximizing lender will certainly increase the interest rate on such loans. Other things being constant, and assuming all borrowers have equally good credit, a lender would prefer to lend out a big loan to one borrower rather than several small loans to several borrowers had he the choice, because his transaction cost would be lower in the former case. In the context of our theoretical model, $C(n, N, \boldsymbol{x})$ is smaller with fewer n, assuming borrowers have similar characteristics (same $\boldsymbol{x}$).

Table 5: OLS Estimates for Determinants of Informal Interest Rates

(Dependent variable is informal monthly rate of interest)

Variables	*Regression I*	*Regression II Regional dummies*
Loan term variables		
Log of loan size	-0.3799 (-2.605)***	-0.5270 (-3.744)***
Loan duration	-0.0299 (-1.941)*	-0.0107 (-0.744)
Production purpose	-0.8379 (-2.792)***	-1.0119 (-3.761)***
Collateral	-2.1685 (-3.038)***	-2.2518 (-3.388)***
Guarantor	0.2418 (0.418)	0.1192 (0.227)
Household characteristics variables		
Household size	0.3325 (3.143)***	0.1931 (1.958)*
Dependency ratio	-1.2161 (-1.537)	-1.0441 (-1.421)
Head of household is male	-1.1155 (-3.090)***	-0.9361 (-2.852)***
Age of household head	-0.0310 (-2.543)**	-0.0343 (-2.993)***
Total asset excluding land	-0.00002 (-3.679)***	-0.00001 (-2.298)**
Irrigated land holdings	0.0001 (4.272)***	0.00005 (2.250)**
Bad loan	0.2956 (0.946)	0.3379 (1.016)
Region-specific variables		
Kinh ethnicity	-0.4495 (-1.046)	---
Distance from formal lenders	0.0167 (0.896)	---
Regional dummies		
Minor urban areas	---	-1.6322 (-1.925)*
Rural northern mountains	---	-0.237 (-0.307)
Rural Red river delta	---	-1.6776 (-2.265)**
Rural north central coast	---	-1.1481 (-1.574)
Rural south central coast	---	1.2459 (0.969)
Rural central highlands	---	0.0511 (0.067)
Rural southeast	---	---
Rural Mekong delta	---	1.1517 (1.678)*
Number of observations	**243**	**245**
Adjusted R^2	**0.2842**	**0.4109**

*Notes: *, **, *** denote significance at 10%, 5% and 1% level respectively*
t-statistics in parentheses
"Rural southeast" variable was dropped

The household size coefficient is positive and significant at 1% level. Having a bigger family, ceteris paribus, considerably increases the interest rates charged on loans. This could be because per capita income is smaller for big households and hence lower probability of repaying. Again, it is also probable that the household size variable picks up some omitted geographical effects. Larger family size may imply "more rural" residence, hence higher costs of monitoring and enforcing loan repayment. The coefficient for dependency ratio does not have the expected sign but fails to be statistically significant. There is strong statistical evidence to support the hypothesis that male-headed households, households with older head, as well as wealthier households enjoy lower interest rates in the informal market, because their expected repaying probability is higher and/or the lender's costs of verifying their credibility are lower. The puzzling variable remains irrigated land holdings, whose coefficient estimate turns out to be significantly positive. Higher production capacity brings higher expected returns, which should, theoretically and ceteris paribus, raise the probability of loan repayment and debt service. It should also reduce the risk caused by weather variations in crop production, and therefore one would expect the interest rate charged to be lower. One can only venture to suggest that in this case informal lenders might be extracting some of the consumer surplus from wealthy landlords. Neither of the region-specific variables in the first regression is significant, although they both have the expected signs.

The coefficients and significance of most loan term and household characteristic variables are robust across specifications. An examination of the regional dummies in specification II reveals interesting results. The coefficients for "minor urban areas" and "rural Red river delta" are significantly negative, while that for "rural Mekong delta" is positive and significant at 10%. This means that other things being constant, borrowers in the northern delta areas enjoy lower informal interest rates than those in the southern delta. There are several possible explanations, the relative merit/truth of which cannot be determined without further information. For one, it could be that in the two northern regions it is relatively easier to obtain formal credit, be it because there is better formal credit facility available or because banks' lending requirements are more lax. It could also be the case that there exist institutions in the north that significantly reduce information asymmetries between borrowers and lenders, such as better-organized women's and farmers' unions that facilitate group-lending. Further, there are remarkable north-south climatic variations, which might have implications on the relative riskiness of agricultural production. Especially, in December 1997 (when the 97/98 VLSS survey

started), there was a severe, widespread typhoon in the Mekong delta region, which caused significant losses of livestock, harvests, homes, and even human lives. While results for the survey are for a twelve-month reference period which should help to even out the impact of this natural disaster, this event might nevertheless explain the significantly higher informal interest rates observed in the southern delta. Finally, historians and/or sociologists could point out the "capitalist" traditions and values that are relatively more prevailing in the south as a legacy of the pre-1975 pro-American government, as opposed to the long-standing socialist norms in the north.

Overall, both models seem to be consistent with theory and explain a fair amount of variation in the informal rates of interest. It is possible, however, that there is an endogenous relationship between loan size and the interest rate: borrowing requirement should depend on the price of loans and vice versa. This is true if the loan market is perfectly competitive. But as outlined in previous literature, the informal credit market is characterized by imperfect information, and lenders solve the informational problems by individualizing the loan packages so as to minimize the probability of default. In other words, they will set the rate of interest based on other parameters of the loan contract. Further, borrowers in the informal market most likely face relatively inelastic demand for credit. They are not the ones with the best credit, because otherwise they would have sought credit from formal sources where the interest rate is much lower. Informal credit supply to these borrowers is more limited than it might seem since information and trust, which are crucial in a borrowing/lending relationship, take time to build up. Thus, one would expect the transaction cost of switching lenders is considerably high and therefore shopping around for the best informal interest rate is rarely an option for informal borrowers. All this combined help alleviate the endogeneity problem between borrowing and the interest rate, and any estimation bias from this source would be of little significance.

VI. Conclusion

This thesis adds to the existing theoretical and empirical literature on rural credit markets in several ways. First, it develops a profit-maximization model that formalizes the relationship between interest rates on informal loans and various contract parameters. Second, the paper utilizes the most comprehensive household data from Vietnam to empirically investigate borrowers' decision to borrow from informal sources and lenders' choice of informal interest rates. Throughout this analysis, the imperfect information framework is presupposed. This framework perceives that the rural credit markets do not function smoothly; they are full of

uncertainties, informational asymmetries and transaction costs. Informal lenders, nevertheless, overcome these problems by actively adopting various screening devices, especially direct screening. The empirical results fit in this framework in the sense that they exhibit features of a monopolistically competitive credit market (product differentiation/segmentation and multiple equilibrium prices).

The empirical analysis provides important insights into the working of Vietnam's rural credit markets. Households' decision of which credit sector to borrow from depends on an array of factors including contract terms such as duration and size of loans, household characteristics such as family size, as well as the accessibility of formal credit institutions. The same sets of variables determine the rates of interest on informal loans. The informal interest rates incorporate lenders' costs of solving the informational problems for heterogeneous borrowers.

Another critical finding is that the lack of collateral significantly increases the probability of borrowing from the informal market as well as the interest rate charged on informal loans. This is probably the area with greater scope for potentially effective government action. Currently in Vietnam, according to the 1993 Land Law, households and individuals can utilize land-use rights certificates as collateral to obtain credits from banks. However, foreign banks are not allowed to take land-use rights as collateral. The value of the land as collateral is limited to the amount of land rent already paid, thus only insignificant amounts can be borrowed against such collateral. Also, while the collateral value of the land-use right increases over the period of the right, the closer to the end of the period the less willing a bank will be to accept the collateral, because there is no certainty that the allocation will be renewed.[31] Further, until recently land/house titles were only registered under the name of the household head, who is often a male, and this restricted women's opportunities to obtain credit and take part in economic activities. Removing these restrictions will increase the collateralizability of assets and improve households' access to formal credits.

This thesis no doubt has limitations. Data availability remains a big issue. More detailed information on households' borrowing/lending activities would allow us to examine the phenomenon of credit rationing. We would also be able to specifically identify the existence (if any) of certain direct screening mechanisms such as market interlinkages. Further, it would be possible to estimate credit demand and supply functions separately.

[31] *World Bank*, Report for the Consultative Group Meeting for Vietnam, December 1998

Overall, the paper demonstrates the importance of theoretical understanding in solving policy-related questions. It also raises the need for better-quality micro-level data if we are to obtain a profound understanding of factor markets in developing countries.

APPENDIX A

The stability conditions arise from the following dynamic specification:

(i) $\frac{dn}{dt} = k_1[(r-i+1)^m b(r,\alpha) - C_n(n,N,x)]$

(ii) $\frac{dr}{dt} = k_2(B - nN)$

(iii) $\frac{dN}{dt} = k_3[n(r-i+1)^m b(r,\alpha) - C(n,N,x)]$

where all the k_i's are positive. The corresponding Hessian matrix is of the form:

$$d\begin{pmatrix} n \\ r \\ N \end{pmatrix} = \begin{pmatrix} -k_1 C_{nn} & k_1(r-i+1)^m b_r + k_1 mb(r-i+1)^{m-1} & -k_1 C_{nN} \\ -k_2 N & 0 & -k_2 n \\ k_3(r-i+1)^m b - k_3 C_n & k_3 n(r-i+1)^m b_r + k_3 nmb(r-i+1)^{m-1} & k_3 C_N \end{pmatrix}\begin{pmatrix} n \\ r \\ N \end{pmatrix}$$

For this system to be stable, it is required that the principal minors alternate in sign (Siamwalla et al. 1996). The relevant determinant for our purpose is:

$k_1 k_2 N[(r-i+1)^m b_r + mb(r-i+1)^{m-1}] > 0$

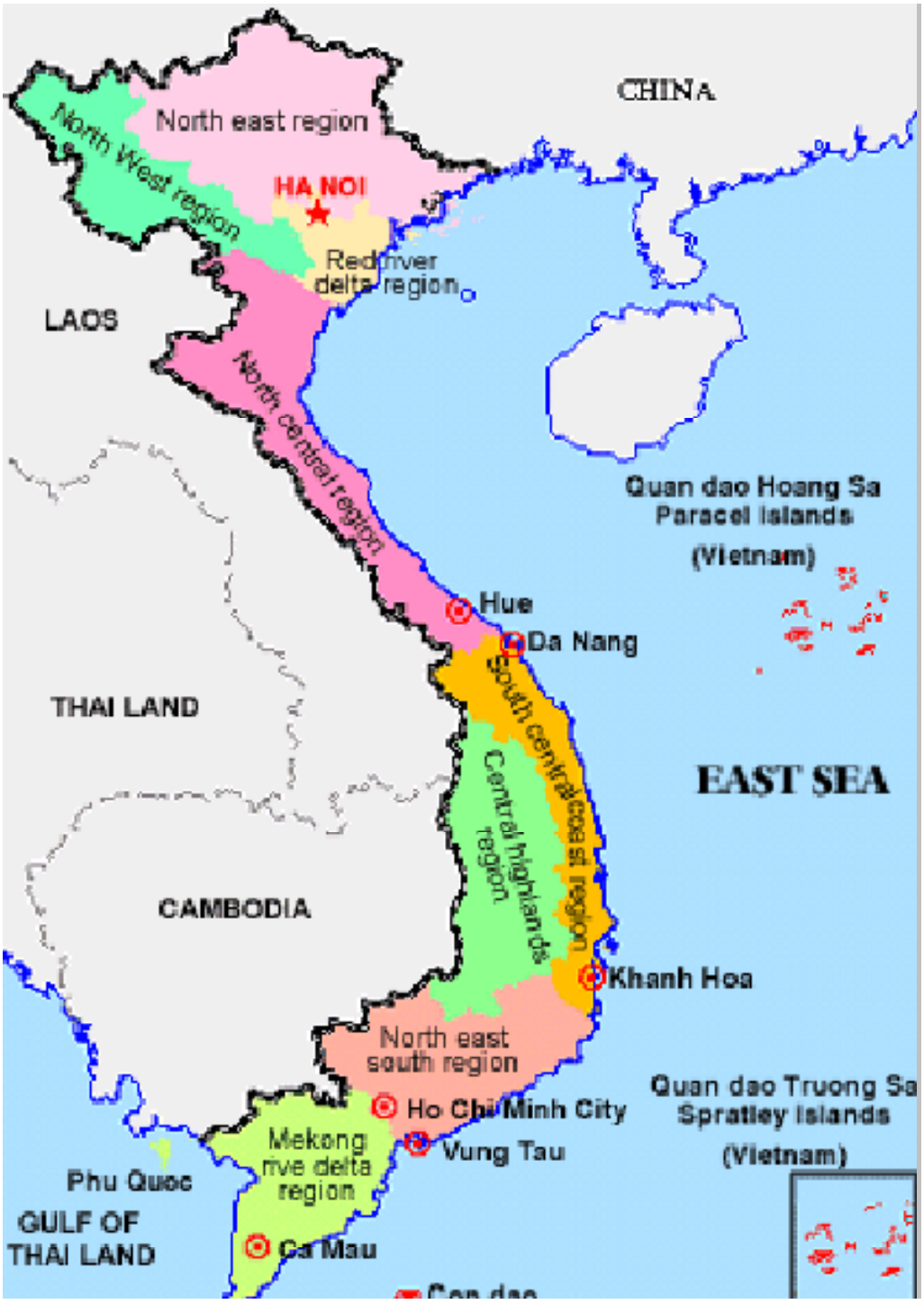
or

$mb + b_r(r-i+1) > 0$

Given that $\varepsilon_{br} = b_r\left(\frac{r}{b}\right)$, we obtain an alternative elasticity version of the same inequality:

$|\varepsilon_{br}| < \frac{rm}{r-i+1}$

APPENDIX B: Administrative Map of Vietnam



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