

CONCEPTUAL FRAMEWORK FOR
ANALYZING THE ROLE OF CREDIT
IN SMALL FARM HOUSEHOLDS

by

Calvin J. Miller*
Warren F. Lee*
Leroy J. Hushak*

Agricultural Finance Program
Department of Agricultural Economics and Rural Sociology
The Ohio State University
2120 Fyffe Road
Columbus, Ohio 43210

*Calvin Miller is a former research associate in the Department of Agricultural Economics and Rural Sociology, The Ohio State University and is currently serving as an agricultural economist with the Mennonite Central Committee in Bolivia. Warren Lee and Leroy Hushak are Professors, Department of Agricultural Economics and Rural Sociology, The Ohio State University and The Ohio Agricultural Research and Development Center.

CONCEPTUAL FRAMEWORK FOR ANALYZING THE
ROLE OF CREDIT IN SMALL FARM HOUSEHOLDS

Calvin J. Miller, Warren F. Lee and Leroy J. Hushak*

INTRODUCTION

Agricultural credit is considered an important instrument for achieving economic and social integration of small farm households. Yet, in spite of the large increases in the volume of agricultural credit in low-income countries, evidence suggests that the present credit systems have not succeeded in providing credit assistance to these producers.

Small farmers tend not to borrow funds. In Bolivia, for example, it is reported that only 3.5 percent of the institutional credit goes to small farmers (World Bank). This could imply that they are not lacking funds (Schultz). They may be constrained by a lack of profitable investments, especially if accessible markets and services are not available. Another explanation is that small farmers are constrained by the costs of borrowing. When the costs of obtaining credit are added to interest charges, credit use may be unprofitable since these costs may represent the major costs of borrowing (Bhatt). Social, economic and cultural conditions also affect implicit borrowing costs. In addition, small farm households may want funds but are

*Calvin Miller is a former research associate in the Department of Agricultural Economics and Rural Sociology, The Ohio State University and is currently serving as an agricultural economist with the Mennonite Central Committee in Bolivia. Warren Lee and Leroy Hushak are Professors, Department of Agricultural Economics and Rural Sociology, The Ohio State University and The Ohio Agricultural Research and Development Center.

constrained by the risk involved with using credit (Baker, 1973, Lipton, Wharton). Thus, an understanding of the affect of each of these factors that may impede credit use provides a foundation for improving the research on rural financial market performance.

This paper provides a theoretical analysis of the role of credit in the small farm household and the factors affecting its use. The analysis is divided into three sections: (1) the role of financial intermediation, (2) the capital resource allocation framework of the farm household, and (3) an excess demand for funds framework is used to analyze the factors associated with credit use. Previous empirical studies and theories are integrated into the discussions.

Role of Financial Intermediation

Financial intermediation provides for the transfer of funds between households or firms. The existence of financial intermediation provides firms and households with flexibility in selecting investments and expenditures that best suit their needs. This intermediation makes it possible for some firms and households to spend their expected income before they receive it and for others to earn a return on funds that they want to hold for future expenditures.

The supply of and demand for funds within a farm household are commonly not in equilibrium. Spending needs are not perfectly synchronized with cash flows. In a given time period, some households demand more funds than they currently have while others have an excess supply of funds. Excess supply is defined as that

amount of funds which are not productively or fully employed by the firm or household in such a way as to gain a reasonable rate of return in comparison to the returns which could be gained from savings activities through the financial markets, such as bank deposits. Thus, households with a funds supply greater than that demanded at the market interest rate have an excess supply of funds. Stated explicitly, excess supply is:

$$Q_{SX} = Q_{SF} - Q_{DF}$$

where

Q_{SX} is the excess supply of funds,

Q_{SF} is the total funds supply, and

Q_{DF} is the total quantity of funds demanded.

Excess demand is when the household demand for funds at the market interest rate is greater than its currently available supply of funds from its own resources. Excess demand for funds is:

$$Q_{DX} = Q_{DF} - Q_{SF}$$

where

Q_{DX} is the excess demand for funds.

Without financial intermediation, those households with an excess demand for or supply of funds are prevented from producing or consuming at their desired level.

Farm households, and especially those of small farmers, simultaneously make production and consumption decisions (David and Meyer). The farm firm and farm household are intertwined into one unit for decision making. Hence the supply of or demand for funds of each household is jointly determined. In this analysis the term "farm household" is taken to include all the production and con-

sumption activities of the farm firm and household, including off-farm activities.

The rational economic allocation of resources of any household occurs when the marginal value product (MVP) of a resource in one use is equal to the MVP of that resource when employed in alternative uses. When no financial intermediation exists, households having an excess supply of funds receive low marginal returns or value from the funds that are not productively employed. The opposite holds for those with an excess demand for funds. The MVP of funds is high for a household lacking funds in comparison with those households having an excess supply of funds.

Financial intermediation allows for the systematic transfer of funds between those having excess supply and those demanding additional funds. In a situation of perfect intermediation, the supply and demand are in equilibrium, and economic optimality with regard to capital allocation is achieved. However, financial intermediation is not perfect and recent studies document the unsatisfactory performance of rural financial markets in many low-income countries (Adams, 1979). Imperfections, legal mechanisms and the costs involved with financial intermediation have major effects on household participation in financial markets.

Capital Resource Allocation^{1/}

A farm household faces decisions of allocating its resources such that it may obtain the maximum utility or benefit possible from those resources. Its demand for capital resources or funds

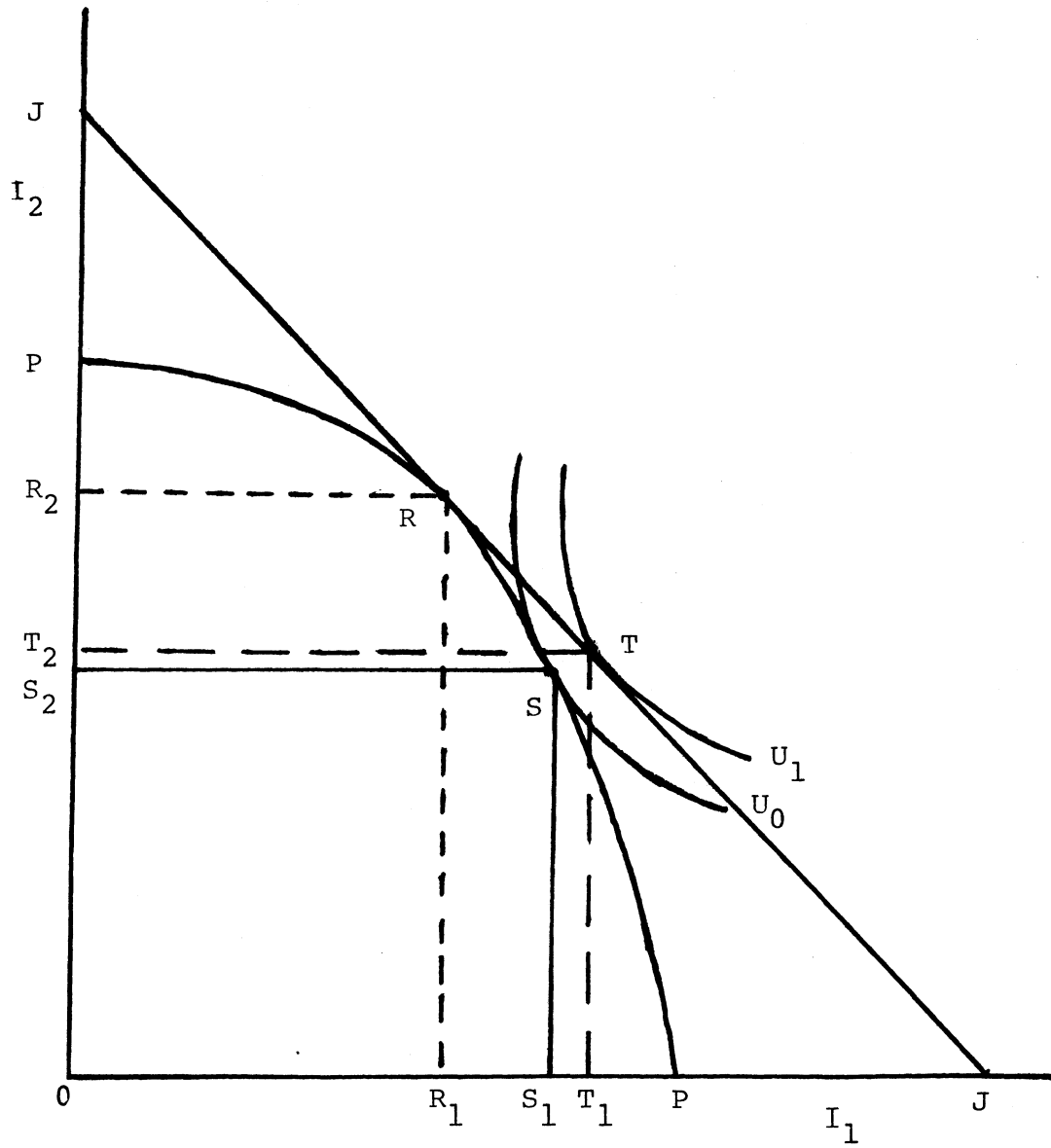
^{1/}This framework draws from the presentations of Hirschleifer, Smith and David.

in a given time period is a function of its consumption and investment preferences. Given the initial capital endowments, a household may prefer to consume or use up all or more of its funds at the present time, or it may prefer to invest many of those resources for consumption in the future.

Figure 1 shows the resource allocation possibilities of a farm household in a two-time period framework. The horizontal axis denotes the present time period and the future time period is on the vertical axis. The PP' curve portrays the income possibilities curve (IPC). It represents the maximum income combinations attainable for a household given its own level of capital resources and without financial intermediation. "Without financial intermediation" means with no financial market activities such as borrowing and saving. The household opportunity set is thus the area bounded by the curve. Within the opportunity set, the household can choose any combination of investment and consumption.

The size of the opportunity set and the shape of the IPC curve varies among households. For a richly endowed household the opportunity set is large and the IPC is moved outward from the origin and encompasses a larger set of feasible income possibilities. The slope of IPC is $-(1 + r)$ where r represents the marginal rate of return on investment. The concavity of the curve denotes the diminishing marginal rate of return on investment by the farm household. At low levels of investment, such as investing in seed for future income and consumption, r may be large, as reflected by the steepness of the curve near the horizontal axis. As investment increases, the marginal returns

Figure 1. Utility Maximization with Financial Markets



decrease causing the slope of IPC to diminish. The slope of IPC will diminish rapidly at higher investment levels for households with limited investment opportunities. Households with high marginal investment returns, due for example to superior management or improved technologies, would face a steep IPC schedule. Hence, for those households each unit of capital resources invested in the firm has a comparably large impact on future income.

The rational farm household strives to attain the highest level of utility or satisfaction possible given its income possibilities curve or IPC. The actual point of utility maximization along the curve is determined by the household's particular utility function or indifference curves, which in Figure 1 are designated by U_i . The shape (slope) of the indifference map for present and future consumption stems from factors associated with the farm household. These factors include income and asset levels, and personal characteristics such as lifestyle, life expectancy, foresight and risk aversion.

With no financial intermediation, the maximum level of utility is obtained at point S of Figure 1, which is the point of tangency between IPC and U_0 , the highest indifference curve that can be attained. In Figure 1, OS_1 is consumed in the first period. The quantity S_1P is invested in the first period which provides OS_2 income which may be consumed in the future. Without intermediation, any increase in consumption in the first period reduces consumption in the future.

With financial intermediation, the farm household may be able

to increase its level of utility by borrowing or lending. In Figure 1, JJ' represents the optimal market opportunity line when the lending and borrowing rates are equal. This line represents the price of exchanges between present and future consumption in the market. The slope of the line is given by $-(1 + s)$ where s represents the rate of interest on borrowing and on saving when they are equal to each other.

Since the rational economic allocation of a resource occurs where its marginal value in one use is equal to its marginal value in alternative uses, the household will optimally invest its capital resources in the firm-household enterprise to the point where its marginal value is equal to the market interest rate. At point R, the savings and borrowing interest rate, s , and the marginal rate of return from investment in the enterprise, r , are equal, and thus the economic optimal investment level in the enterprise is obtained, given the household's utility function. The quantity R_1P will be invested in the enterprise. To the left of point R along the PP' curve, the marginal return from investment, r , is less than s , the return that could be gained by investing the funds in the financial market as savings deposits. To the right of point R along PP', r is greater than s , and therefore the household could benefit by borrowing at rate s and would receive a return of r .

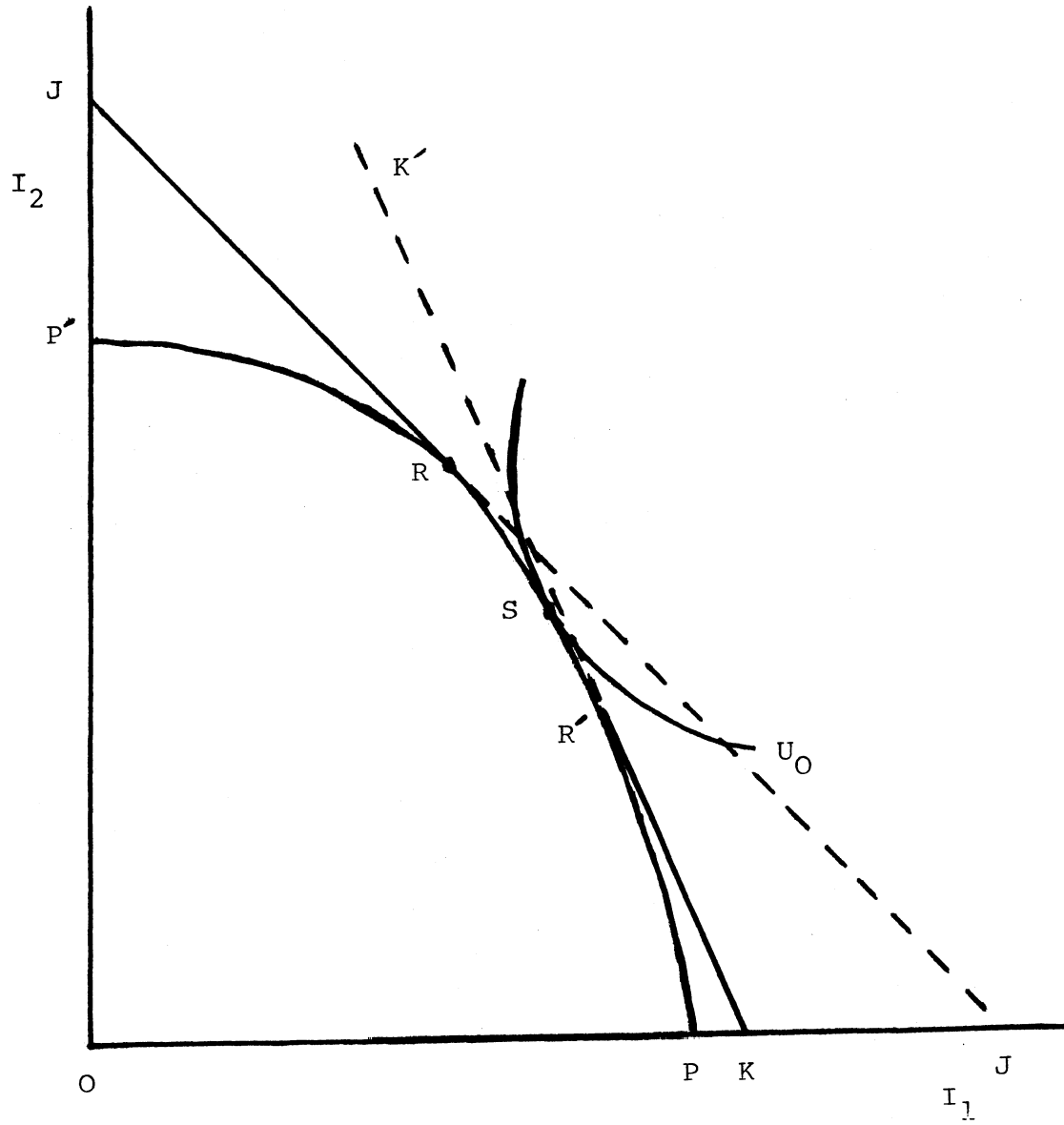
Given an indifference curve schedule of a household as shown in Figure 1 and the market interest rate, the household would borrow in order to maximize its level of utility. Borrowing allows a higher utility function, designated U_1 , to be attained. At

point T the highest utility level is attained. The household will consume OT_1 in the first period and OT_2 in the future. The optimal level of investment, R_1P , in the first period allows for the higher consumption level to be achieved. The household will borrow R_1T_1 and will repay R_2T_2 in the future.

A household with an initial preference favoring future consumption such that it is tangent to the income possibilities curve PP' to the left of point R will benefit from participating in savings activities through financial intermediation. That portion of the curve to the right of point R represents a borrower's gain from intermediation.

Borrowing rates are normally higher than savings rates. The marginal cost of borrowing includes not only the cost to the saver for the use of his resources, but also the transaction costs and the return to the financial intermediaries for their services. In Figure 2, the utility function, IPC and market savings line are the same as in Figure 1. The market line for borrowing is KK' with a slope of $-(1 + b)$, where b represents the marginal costs (MC) of borrowing and b is greater than s . For simplicity in this model, the per unit costs of borrowing are depicted as constant. With differential savings and borrowing rates, the effective market line becomes $J'RSR'K$. To the left of point R, the market line follows JJ' since that is the market line for savings. To the right of R' , the effective market line is KK' , which is the borrowing line. Between points R and R' , the PP' curve becomes the effective market line since $s < r < b$ and thus neither lending nor borrowing will occur.

Figure 2. Financial Markets with Differential Borrowing Rates



In Figure 2, a household with indifference curve U_0 will neither borrow nor lend given the effective market line shown. A household will only borrow when its initial indifference schedule is tangent to the PP' curve at a point below R' . As the spread between borrowing and savings rates widens, more households are excluded from the benefits of financial markets.

The shape of the income possibilities curve of each household is an important factor affecting the point at which one would benefit from borrowing. With low investment returns and possibilities, r is small (i.e., the IPC is flatter). For a given borrowing cost, the IPC would intersect the borrowing line closer to the horizontal axis causing fewer households to borrow. Households with low investment returns would only borrow when they have a relatively high preference for present consumption over future consumption of income.

As shown in Figure 2, a household's use of financial markets depends on (1) the investment opportunities it faces, (2) its indifference preference for present versus future income, and (3) its returns and costs of saving and borrowing. Improved investment opportunities, a preference to consume more now and lower costs of borrowing all contribute toward increasing the utility from borrowing.

Excess Demand for Funds

An optimizing firm or household operates at a point where the marginal costs of a resource are equal to marginal returns. Capital resources or money will be demanded until the point where the value gained from an additional unit of funds is equal to

the costs associated with acquiring those funds. The funds of a farm household consist of both its internal equity supply and its external, or borrowed funds. The demand for borrowed funds or credit is a residual of the demand for funds minus the supply of equity funds available.

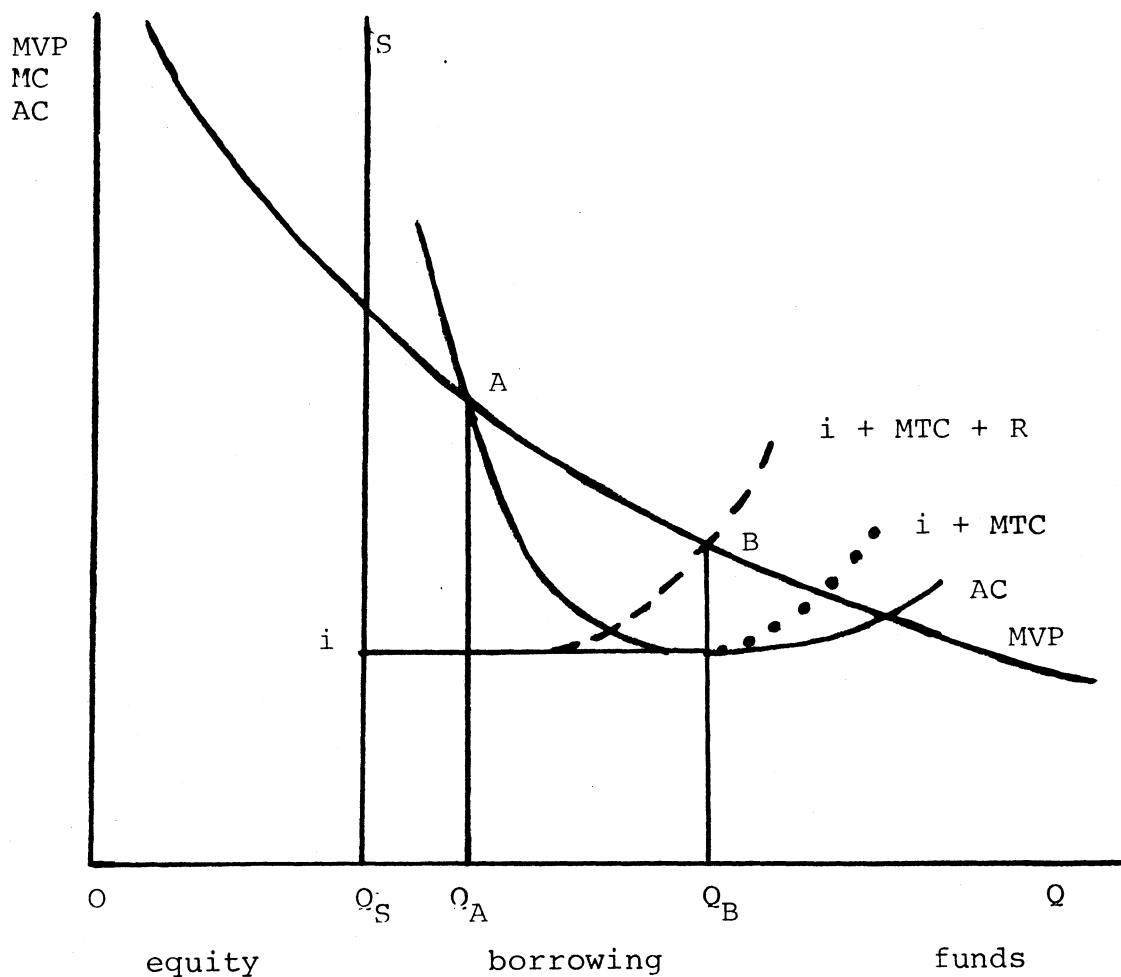
In the framework portraying credit demand as an excess demand for funds, the supply of equity funds is treated as a fixed amount for each household. However, this framework, shown in Figure 3, is valuable in complementing the resource allocation model by relaxing the previous constraint of constant marginal costs of credit. Many costs and often a major portion of the per unit costs of borrowing are not constant for rural households. Moreover, the effect of differences of supply of equity funds and marginal value product of funds (MVP) schedules on credit demand among households may be analyzed with this framework.

The conditions associated with the excess demand for funds framework as shown in Figure 3 are:

1. Each input is infinitely divisible.
2. Costs of capital inputs are those costs of the inputs which are attributed to the given period, in order to overcome the lumpiness of many inputs.
3. The demand for funds is the demand for a given time horizon, such as annualized demand for funds.

In figure 3, the amount of credit demanded by a household is a function of the marginal value product of funds, the supply

Figure 3. Excess Demand for Funds



- S = supply of equity funds
- i = interest rate
- AC = average cost of credit
- MTC = marginal transactions cost of credit
- R = borrower risk from loss of credit reserves per unit of credit
- MC = marginal cost of credit. After the initial transactions cost, the MC curve = $(i + MTC + R)$.

of equity funds and the cost of credit. The demand curve is the MVP of capital funds schedule. Its shape reflects a diminishing marginal utility of funds at a decreasing rate. The S line depicts the supply of funds or liquidity from equity or internal sources. The MVP of funds curve to the right of the S line represents the demand for credit. The costs of credit are shown in Figure 3 by the average cost (AC) and marginal cost (MC) curves. Because of initial transaction costs, the average cost of the first units of credit are extremely high. After the initial costs, the MC curve follows the $(i + MTC + R)$ curve, where R and MTC begin to become significant costs at higher levels for borrowing. The fixed initial costs are also reflected by the rapidly decreasing AC curve at lower levels of borrowing. The rapidly decreasing portion of the AC curve reflects economies of scale in borrowing, since the per unit cost of borrowed funds decreases with quantity borrowed. Yet at high levels of borrowing, the cost of obtaining credit increases as additional credit becomes harder to obtain.

A household will not demand credit when the expected average costs are greater than the expected average returns. The quantity Q_A represents the borrowing threshold and thus a household will never want to borrow a quantity less than $Q_S Q_A$. When the average costs of credit are less than the average returns (i.e., when the quantity of credit is greater than $Q_S Q_A$), the household will borrow $Q_S Q_B$ funds since at point B the marginal costs of obtaining additional funds $(i + MTC + R)$ are equal to the marginal value product of those funds. Hence, the household will demand OQ_B of funds, of which OQ_S will be supplied from its own resources and $Q_S Q_B$ will be borrowed.

The MVP curve, the S line and the cost curves of credit are each determined by a set of factors associated with the household. The factors affecting each component of the excess demand for capital funds framework are discussed individually, holding constant other factors, and then joint effects are discussed in turn.

Marginal Value Product for Capital Funds

The MVP curve for funds of an individual household varies with its investment opportunities and capabilities. A household with many productive investment opportunities would be expected to have a large demand for funds, as reflected by a high position of the MVP curve relative to the origin, a less rapidly decreasing MVP curve, or both, resulting in a high demand for credit. The level of technology and the managerial capabilities of the household are also important factors in determining the MVP of funds. Households having superior technology or management would be expected to have a higher MVP curve since they have higher marginal returns from the use of the funds. However a new, more advanced technology does not imply that it is a superior technology for a given household. The expected marginal value of returns to funds are consistent with the contention by Schultz that the returns to capital are low on farms which use traditional technologies (p. 28). Empirical studies in Brazil lead to similar conclusions. Rao concluded that the use of credit is very limited in traditional farming and Nehman found that small farmers got the smallest gain from capital inputs (Rao, p. 148; Nehman, p. 111).

The educational level of the household may be a causal factor or be correlated with the level of management and the technology used. Education is to increase one's awareness and understanding and thus should benefit a farmer's management and selection of technology. Technical assistance would be expected to have a similar effect. A household's language and accessibility to market and information centers may also affect awareness and understanding.

The productivity level of the household enterprise is a crucial factor in determining the MVP of capital and thus the use of funds. Higher output levels per unit of input contribute toward raising the MVP of using capital resources or funds. Cordova found there were not consistently higher output levels among small farmer borrowers than non-borrowers in the Philippines (p. 7). Tinnermeier and Finn also observed few productivity increases with credit use in Peru (p. 34). However, Colyer and Jimenez reported increases in productivity levels by those in credit programs in Columbia (p. 641). David and Meyer suggest that the apparent differences in production coefficients may be due to omission of other variables.

The type of enterprise and the market integration are important to the value of funds. An enterprise that requires high capital inputs has a higher MVP curve for funds than one requiring few purchased inputs. Moreover, enterprises with different levels of market integration would have different demands for capital funds. A high level of market integration and a high demand for purchased inputs are expected to be associated, and consequently the use of

funds is high. This is exemplified in many studies which show operating and investment expenses to be highly associated with credit use. Rao found operating expenses to be the most important variable in explaining credit use (p. 148). In two other Brazilian farm level studies borrowers were found to be associated with higher operating and investment expenses per hectare and higher farm income and asset levels (Singh, Araujo). This would suggest that credit use is positively associated with the market integration of the household enterprises. Among low-income households in Korea, Nyanin found there was a positive correlation between credit used, total revenue, debt load at the beginning of the year, operating expenses, fertilizer used and farm size. Among all households, investment expenses was an important variable. However, between borrowers and non-borrowers, farm and household incomes, operating expenses and investment expenses were not shown to be different (p. 115).

The marketing system may be determined in large part by the location of the household. As the distance from market increases, the marketing costs for both buying inputs and selling output increase, causing the marginal return to capital from these activities to be less.

Supply of Equity Funds

The supply of internal or equity funds from the farm and household determines the potential demand for funds from external sources. If the amount of funds desired is greater than the household has available through its savings and other liquidity sources, it will want to borrow. A vertical equity supply line

depicting the available internal funds is depicted in Figure 3 since there is no reason to expect the level of equity funds to vary with the rate of return. The equity supply is affected by the set of characteristics particular to each household.

The asset level of the household is the primary factor affecting the amount of internal funds supplied. A more richly endowed household would be expected to supply more equity funds, shifting the S line in Figure 3 to the right. Araujo's study in Brazil supported this expectation as he found an inverse relation between the demand for credit and the volume of internal funds (p. 81). Nyanin also found borrowers to have lower asset levels and cash at the beginning of the year than non-borrowers (p. 114).

The position of the S line will vary between time periods. After a year of drought or bad crops or a year of high expenses such as from many purchases or from illness, the amount of funds which can be supplied by the household in the next period will be less and the S line will be shifted leftward, increasing the demand for borrowed funds. A good year would shift the S line to the right. In this manner, the supply of equity funds for a given period is expected to be inversely related to the net returns from the previous period or periods.

The age of the farm household affects the position of the S line. Older farmers generally have accumulated a larger supply of equity funds. Since the excess demand for capital funds is the total demand minus that which is supplied by the farm household, older farmers will tend to have less demand for external

funds and hence be less likely to borrow. Singh found that the mean age of borrowers was five years younger than that of non-borrowers (p. 102).

A World Bank policy paper states that "most farmers borrow only when their crop has been poor or if they are faced with unusual expenditures . . . (p. 27)" The World Bank paper agrees with Schultz that in traditional agriculture output of farmers is stable or expanding slowly and investment is low. Consequently many farmers have accumulated over time the amount of capital which is consistent with their technology, the size of their holdings and the number of their workers (Schultz, p. 24).

Cost of Credit

The third major component of the excess demand for funds framework is its cost. Quantity demanded for capital funds is expected to be inversely related to the cost, as confirmed in a study by Araujo (p. 81). The cost of credit is a function of interest costs, transaction costs and the costs associated with risk. This cost schedule defines the credit supply for each household.

Interest costs are relatively constant marginal credit costs. The interest rate for a farm household is constant until high levels of borrowing by a household are reached. At high levels of borrowing, relative to the asset and income levels of the household, the interest rate rises as more costly sources of credit are used. Interest rates are affected by the state of the economy, governmental policies and regulations, and by the policies and availability of funds of the lender. They generally

vary inversely with the money supply of the country and the lenders' supply of funds, and directly with the inflation rate. Policies which regulate the maximum interest rates which may be charged by the lender cause the quantity demanded of borrowed funds to be high while similar regulations on deposits may lower the lender's supply of loanable funds. Real interest costs when discounted for inflation may be negative as is often the case in many low-income countries (Adams, 1978).

Transaction costs depend on the ease of borrowing. Transaction costs include the paperwork involved in obtaining a loan, time involved, associated legal costs, loan fees, travel expenses and the psychological cost to the borrower resulting, for example, from not understanding loan procedures. In contrast to interest costs, transaction costs are largely a fixed cost of borrowing. The fixed initial transaction costs are those which must be incurred regardless of loan size. Loan transaction costs typically make up a very large part of borrowing costs for small and medium-sized borrowers. Hence the loan transaction costs may be an important factor discouraging small and new borrowers from using credit from formal sources (Adams, 1978, Bhatt).

The decision by a farm household of whether to borrow from formal or informal sources may hinge upon the quantity of credit demanded and the differences in the interest rates and the transaction costs between the two sources. Borrowing from informal sources may be easier and lower transactions costs are incurred than with formal credit, due to less paperwork, less time and lower transportation costs. For example, borrowing from a neighbor

may result in very low costs in obtaining a loan. However, the interest or payments in kind charged by informal lenders may be larger. Nehman found in Brazil that informal loans carried nominal interest rates of 29 to 40 percent while formal loan rates were 7 to 13 percent. A compensating balance was that formal loan applicants required an average of 3.0 visits to the lender for a loan as opposed to 1.1 visits for informal loans. In addition the formal applicants were required to pay appraisal and registration fees. The non-interest costs raised the cost for small formal loans close to the informal loan charges. Consequently, Nehman found that the majority of small loans were from informal sources while most large loans were from formal sources. Also, the smaller farmers were the holders of the smaller loans. Nyanin found that small farmers in Korea use proportionately less credit than larger farmers, and smaller farmers also use proportionately more informal credit (p. 113). These studies support the argument by Bhatt that the transaction costs of obtaining credit are important and inhibit small farmers' participation in applying for formal credit. He argues that high transaction costs keep the formal lending institutions from competing effectively with the money lenders in rural areas.

In Figure 3, the effect of initial transaction costs on average borrowing costs are shown by the position of the AC curve above the interest rate line. An increase in initial transaction costs is reflected as an upward shift of the AC curve, causing $Q_S Q_A$ to be larger. One factor in determining the position of the AC curve is the distance of the household from the

lender. It affects the potential borrower's time and travel costs. This cost is expected to be minimal for informal loans. A previous good borrowing record also affects the AC curve by lowering the initial transaction costs.

The level of education and the ability of the credit seeker to understand the language spoken in the business centers are other important factors concerning transaction costs for formal credit. A higher level of education and a better understanding of the business language would move the AC curve downward. Less time and effort presumably is required to communicate with the lenders and to understand the paperwork. Education and language affect the "psychological costs" of borrowing as well. Higher educational levels and better ability to communicate with the lenders are expected to reduce the fear of ignorance and inferiority. In conjunction with education is the literacy of the household, which can have a crucial effect on borrowing costs. Illiteracy can immensely raise the mental costs along with raising the time and paperwork costs.

The attitudes and values of the farm household similarly determine the psychological costs of borrowing. These attributes, which are not readily measured, may be associated with the cultural, ethnic and religious background, the education, the location and the lifestyle of the household and their trust and understanding of the lender. Gillette and Uphoff found attitudes and values, in addition to risk, to be leading factors in determining participation in credit programs. This includes attitudes and values relating to work and production as well as to credit

and lending institutions.

The stated use of credit can be another factor affecting the transaction and interest costs. A borrower may find it easy to obtain credit for fertilizer or cattle but hard to finance a bicycle or consumption needs. In order to lower borrowing costs for consumption and other purposes not preferred by lenders, a borrower may in some situations state one reason for borrowing and use the credit for another purpose. He may also allocate the capital resources such that he uses his own funds for purposes not preferred by lenders and borrows for those which lenders prefer. Von Pischke and Adams therefore suggest that due to such fungibility, agricultural credit should be viewed as additional liquidity rather than as a farm input.

Loan security is important to lenders. Asset and income levels are commonly used to secure loans. Assets are used as collateral, and incomes as a measure of cash flow and repayment capacity. When the credit supply of the lender is limited, the lender may use loan security as a means of rationing credit. Households that are able to provide high loan security are given priority for credit. The higher his security for a given household, generally the easier it is to borrow. For other households with less such loan security, credit is not as readily attainable, causing the cost of obtaining credit to be high. Hence, the farm household with few assets and a low income may face such high transaction costs associated with borrowed capital that the use of credit is not feasible.

Credit may also be apportioned on a friendship or a political

basis. In addition to loan security and repayment ability, such favoritism can be important in the apportionment of credit. Ladman and Tinnermeier show in Bolivia that credit is indeed subject to much political manipulation.

Risk is a major factor in determining the cost of credit because leverage increases the variance of net returns. The farm household will borrow up to the point where marginal costs of funds are equal to marginal returns. These costs include the implicit cost of risk, in addition to the interest and transaction costs. The cost of risk of using borrowed funds is expected to increase at an increasing rate as the financial leverage increases. While the household's particular aversion to risk is very important in determining the cost it assigns to risk, the measure of the household's willingness and ability to bear risk is primarily a function of its wealth both on and off-farm. In a credit-risk study by Schluter in India, farm size and non-farm income and assets were used to measure farmer's risk-bearing ability.

According to Baker, as one borrows he uses up credit reserves for future borrowing, which represents a cost to the borrower from loss of liquidity (Baker, 1968, p. 507). Each household has a limited amount of funds that it can reasonably expect to be attainable, which may be called its borrowing capacity. For a given household and borrowing capacity, the cost of using up one's credit reserves is a function of the risk associated with the loss of those reserves.

As borrowing increases to higher levels toward one's borrowing limit, the cost of risk (R) becomes more important

as a factor in increasing the cost of credit, as shown in Figure 3. For example, a household will not use up all its credit reserves to the point where it could not obtain financing for other investment opportunities, for machinery repairs or for medical assistance, if desired or needed. For a given level of reserve, the cost of R depends on the riskiness of the enterprise and the household aversion to risk. In riskier enterprises where the possibilities of loss are greater, a high cost is expected to be associated with the loss of credit reserves. A household that is very risk averse will attach a large cost to the loss of reserves.

Each component of the model is a function of a set of household characteristics or factors. The demand for funds is a function of the factors which determine the MVP of funds schedule for each particular household. The demand for credit is the excess demand for funds. It is that portion of the MVP of funds schedule that cannot be supplied by the internal or equity sources. The supply of credit is the cost schedule of borrowed funds. It is a function of the interest costs, transaction costs and the costs associated with risk. The quantity of credit demanded by a farm household is thus determined by the interaction of its excess demand for funds and its credit supply schedule.

Interactions of the Model

A household with little or no education may have low returns to the use of funds and high transaction costs of borrowing, such that the costs of credit outweigh the benefits. In Figure 3,

this situation is shown by a cost curve above the MVP of credit curve. Low returns would cause the MVP curve to be low and rapidly decreasing, and the high transaction costs of the poorly educated would push the cost curves far above the interest cost level. If the household did not speak the language used in financial centers, the transaction costs are even greater.

A farm household with few assets and a high demand for funds may also not borrow due to facing high transaction costs because of low equity. It would cause $Q_S Q_A$ to be large. The low equity may also increase the cost of risk for the household. This may be the case of a beginning farmer who cannot meet the collateral requirements a lender may request. Conversely, a household with many assets and a high capital demand may borrow a large amount of funds. The interest cost rather than the transaction costs would be the major cost for these households. The beginning farmer with few assets may, however, be a friend of a lender and thus be able to obtain funds at a low cost.

A farm household located far from financial and market centers would also be depicted by a large $Q_S Q_A$ due to high transaction costs. Not only would the household's time and transportation costs be high, but also the understanding of the formal credit system may be less. In addition, the location may cause the value of production to be heavily discounted for transportation costs and the costs of inputs to be higher. This in turn would lower the MVP curve. With high transaction costs and a low MVP curve the household would not be likely to borrow. Yet, if the household has superior management and technology, it may have a

strong desire to obtain funds for a profitable investment opportunity. The high MVP for funds curve could more than off-set the large transaction costs and the household would borrow. An alternative would be for the farm household to borrow the funds from informal credit sources, which would have lower transaction costs but presumably higher interest charges. This situation is reflected in Figure 3 by higher interest costs, but smaller $Q_S Q_A$ initial transaction costs.

Summary and Implications

The conceptual framework provides the structure for analyzing the role of financial markets on small farm households. Some households will neither borrow nor save. The number of these households is directly related to the cost of financial intermediation. This cost varies among households depending on the factors and conditions associated with each household. It is recognized that the interest charges are only one component of the intermediation costs, and hence credit policy must also focus on the non-interest costs of financial intermediation.

The important factors affecting households' borrowing behavior, and their implications are identified from the conceptual framework. Based upon this structure, the major factors expected to affect the farm household's demand for credit are the asset level, internal funds supply, location, education, age, enterprise, technology level, market integration, and production aspirations. On the supply side, education, language, location, previous borrowing experience, interest and other loan charges, psychological credit costs, loan size, collateral, and farmer's attitudes toward risk are expected to be important.

BIBLIOGRAPHY

- Adams, Dale W. "Recent Performance of Rural Financial Markets in Low Income Countries." ESO Paper No. 596, The Ohio State University, Columbus, Ohio, April 1979.
- Adams, Dale W., and G. I. Nehman. "Borrowing Costs and the Demand for Rural Credit." Unpublished paper, The Ohio State University, Columbus, Ohio, 1978.
- _____ "Agricultural Credit in Latin America."
Report on Seminar of Agricultural Credit for Small Farmers in Latin America, Quito, Ecuador, November 1974.
- _____ "Agricultural Credit: Sector Policy Paper."
World Bank. Washington D.C., May 1975.
- Araujo, P. F. de. "An Economic Study of Factors Affecting the Demand for Agricultural Credit at the Farm Level." Unpublished M.S. thesis, The Ohio State University, 1967.
- Baker, C. B. "Credit in the Production Organization of the Firm." American Journal of Agricultural Economics. Vol. 50, No. 3, August 1968.
- Baker, C. B. "Role of Credit in the Economic Development of Small Farm Agriculture." Small Farmer Agricultural Papers, Vol. XIX: A.I.D. Spring Review of Small Farmer Credit, June 1973.
- Bhatt, V. V. "Interest Rate, Transaction Costs and Financial Innovations." Domestic Studies, No. 47, World Bank, January 1978.
- Colyer, D. and G. Jimenez. "Supervised Credit as a Tool in Agricultural Development." American Journal of Agricultural Economics. Vol. 58, No. 4, November 1971.
- Cordova, V., P. Masicat and R. W. Herdt. "Use of Institutional Farm Credit in Three Locations of the Philippines. 1975-77." Unpublished Paper, International Rice Research Institute. Los Banos. Laguna, Philippines, October 1978.
- Daines, Samuel. "Guatemalan Farm Policy Analysis: The Impact of Small Farm Credit on Income, Employment and Food Production." USAID, Washington D.C., April 1975.
- Daines, Samuel. "Small Farm Credit and Rural Poverty in Developing Countries." Agricultural Cooperative Development International, Washington D.C., December 1975.

- David, Cristina C. "Conceptual Issues in Analyzing Impact and Demand for Agricultural Credit." ESO Paper No. 610, The Ohio State University, Columbus, Ohio, August 1979.
- David, Cristina and Richard L. Meyer. "Measuring the Farm Level Impact of Agricultural Loans in Low Income Countries: A Review Article." ESO Paper No. 602, The Ohio State University, Columbus, Ohio, May 1979.
- Donald, Gordon. Credit for Small Farmers in Developing Countries. Boulder, Colorado: Westview Press, 1976.
- Gillete, Cynthia and Norman Uphoff. "The Credit Connection: Cultural and Social Factors Affecting Small Farmer Participation in Credit Programs." Small Farmer Analytical Papers.
- Hirschleifer, J. Investment, Interest and Capital. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970.
- Hirschleifer, J. "On the Theory of Optimal Investment Decision." Journal of Political Economy. Vol. 66, No. 4, August 1958.
- Ladman, Jerry, and Ronald Tinnermeier. "The Political Economy of Agricultural Credit in Less-Developed Countries: The Case of Bolivia." in John Brasch (ed.), Proceedings, Rocky Mountain Council for Latin American Studies Meeting, 1978, Lincoln, Nebraska: College of Business Administration, University of Nebraska, 1978.
- Ladman, Jerry, Ronald Tinnermeier and Isaac Torrico. Agricultural Credit Flows and Use in Bolivia. DD/USAID, La Paz, Bolivia, 1977.
- Lipton, Michael. "Agricultural Finance and Rural Credit in Poor Countries." World Development. Vol. 4, No. 7, 1976.
- Long, M. F. "Why Peasant Farmers Borrow." American Journal of Agricultural Economics. Vol. 50, November 1968.
- Nehman, Gerald. "Small Farmer Credit Use in a Depressed Community of Sao Paulo, Brazil." Unpublished Ph.D. dissertation, The Ohio State University, Columbus, Ohio, 1973.
- Nyanin, Ohene O. "Credit and Small Farmers in South Korea, 1968-70," Unpublished M.S. Thesis, The Ohio State University, Columbus, Ohio, 1978.
- Rao, P. B. "The Economics of Agricultural Credit Use in Southern Brazil." Unpublished Ph.D. dissertation, The Ohio State University, Columbus, Ohio, 1970.

Rice, E. P. "Problems and Results in Evaluating Agricultural Credit Projects." Paper presented at the conference on Rural Finance Research, San Diego, California, 1977.

Riordan, James T. "An Assessment of the Target Region for USAID/Bolivia's Agricultural Sector Loan II." A.I.D., Washington D.C., July 1977.

Schluter, Michael G. "The Interaction of Credit and Uncertainty in Determining Resource Allocation and Incomes on Small Farms, Surat District, India." Paper No. 68, Employment and Income Distribution Project, Cornell University, New York, February 1974.

Schultz, Theodore W. Transforming Traditional Agriculture. Yale University Press, New Haven, Connecticut, 1964.

Singh, G. "Farm Level Determinants of Credit Allocations and Use in Southern Brazil, 1965-69." Unpublished Ph.D. dissertation, The Ohio State University, Columbus, Ohio, 1974.

Smith, Paul F. Money and Financial Intermediation: The Theory and Structure of Financial Systems. New Jersey: Prentice-Hall, Inc., 1978.

Tinnermeier, Ronald and Michael Finn. "The Impact of Small Farmer Credit in Peru." World Bank Empirical Studies of Small Farm Agriculture in Developing Nations, Purdue University, West LaFayette, Indiana, November 13-15, 1972.

Von Pischke, J. D. "When is Small Farmer Credit Necessary." Development Digest. Vol. 16, No. 3, July 1978.

Von Pischke, J. D. and Dale W Adams. "Fungibility and the Design and Evaluation of Agricultural Credit Projects." ESO Paper No. 644, The Ohio State University, Columbus, Ohio, August, 1979.

Wharton, Clifton Jr. "Risk, Uncertainty and the Subsistence Farmers." The Agricultural Development Council, Inc., New York, December 1968.