

INTRAHOUSEHOLD EFFECTS OF NON-PRICE CREDIT RATIONING

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1. Introduction

Although poverty, in itself, is a very serious obstacle for rural women attempting to get credit, there are also imperfections of the financial markets that may specifically constrain women's access to credit. These obstacles stem from legal, social, cultural, and economic restrictions, and can make traditional financial programs unsuitable for women even when they belong to a segment of the market actually served by the formal financial sector.

Arguably, these non-price rationing mechanisms affecting women's direct access to credit may not be of concern if, as much of the economic literature assumes, resources are efficiently distributed within the household and policies and programs benefiting (male) heads of households trickle down to the rest of the family. However, mounting empirical evidence shows that this is usually not the case. Family dynamics tend to be complex: spouses may hold conflicting preferences and they may not fully share their labor, assets, or information (Frankenberg and Thomas, 2001; Haddad *et al*, 1997; Thomas, 1997). If non-price rationing mechanisms have a disproportionately negative effect on women's direct access to credit and the intermediation of funds within the family is not perfect, then there may be families where a spouse, and more specifically, given our interest, the woman, will be unable to meet her needs for capital even though her husband has adequate access to capital.

Economic agents who cannot meet their demand for capital at the market interest rate are unable to put their resources to their most efficient use. At their borrowing ceiling, their marginal productivity of capital exceeds the cost of borrowing. Denote \bar{r} the rate that equates their internal supply and demand for capital and r the market interest rate. We refer to the type of inefficiency that is generated when a family's shadow price of capital exceeds the market interest rate, $\bar{r} > r$, as *market-based inefficiency*.

Inefficiencies may also occur as a result of conflictive family dynamics. The economic literature is not conclusive as to the efficiency of household allocative decisions. Spouses make efficient consumption decisions when the basket of goods they each consume gives them the same level of marginal utility. Thomas and Chen (1994) and Bourguignon *et al.* (1993) found that households in Taiwan and France, respectively, were allocating their income efficiently. However, Duflo and Udry (2003) rejected the assumption of efficient consumption when they studied rural households in Côte d'Ivoire. More precisely, they found that, for a given level of expenditure, the composition of the basket of goods families purchased varied depending on the gender of the person whose field had received a rain shock.

Similarly, spouses make efficient production decisions when they allocate resources such that, for each factor of production, both spouses achieve the same marginal product. Jones (1983) and Udry (1994) found evidence that households in rural Cameroon and Burkina Faso made inefficient production decisions. In particular, families in Cameroon could have increased their overall production if women allocated more of their time to rice, a crop which income belonged to the men, while households in Burkina Faso could have increased their level of production by reallocating labor and fertilizer from men's plots to women's plots.

In this paper, we explore inefficiencies that can arise when imperfections in rural financial markets are compounded by conflictive family dynamics. Spouses may disagree on how

much they value household services over consumption goods. Or they may disagree on the kind of goods they would like for their families. Furthermore, if they differ in their preferences, spouses may be willing to withhold financial resources from each other as a way to influence household decisions, even when their decision results in a smaller basket of goods available to the whole family. If we cannot assume perfect financial intermediation between spouses, then a husband's shadow value of capital, \tilde{r}^m , may differ from that of his wife, \tilde{r}^f . We refer to the inefficiency that arises when spouses have different shadow values of capital, $\tilde{r}^m \neq \tilde{r}^f$, as *intrahousehold-based inefficiency*.

In order to gain insight into these issues, we use data from Paraguay, where we organized focus groups and collected data from 215 households in which men and women were interviewed simultaneously but far enough from each other that they could not influence each other's responses. Field observations and survey results indicate that the three main sources of loans in the area were State banks, cooperatives, and wholesalers. However, women only received loans from the cooperatives. Although State banks and wholesalers do not openly discriminate against women, they tend to fund production activities such as cotton and livestock enterprises that are entirely run by men. The cooperatives, on the other hand, tend to also offer financing for enterprises run by women, such as vegetable market gardens, small kiosks, tailoring businesses, and small animal enterprises. Moreover, the cooperatives are the only financial institutions that have women as clients. In fact, the survey clearly shows that most women do not know where the State bank is located, what the bank's lending requirements are, and whether they would qualify for a loan from this bank. These results are consistent with the commonly accepted notion that women are more constrained than men in their credit options (Morris and Meyer, 1993; Buvinic and Berger, 1990).

The data we gathered indicates that 20% of the families in our sample experience non-price credit rationing. However, we are particularly interested in a different subset of families: those where women reported being unable to meet their demand for capital even though their husbands claimed to have sufficient access to capital. With 16% of the families falling into this category, it is problematic to assume perfect financial intermediation among spouses.

We propose a household decision-making model which, by individualizing spouses' preferences and decision-making spheres, provides the theoretical underpinnings for understanding how imperfections in the financial market permeate into families' behavior. More specifically, the model provides an analytical explanation of how family characteristics may lead to allocative decisions that leave one spouse constrained and give rise to intrahousehold-based inefficiency. For the sake of clarity, we introduce the problem in Section 2 by using a simple Unitary Household Model to examine family responses to constraints in the capital market. We do so by following the approach first developed by Singh *et al.* (1986) that models rural households as economic units which decide how to best allocate their resources given their preferences. In Section 3, we describe the manner in which individual needs for capital are resolved within the family by adding a further level of complexity to the intrahousehold decision-making process: we individualize preferences and economic decisions and use game theory to represent the cooperation and conflicts that govern family dynamics.

In addition, we present empirical evidence supporting the notion that when women are non-price credit rationed their families are less efficient. Using data from rural Paraguay, we identify households' credit rationing regime in Section 4; we measure households' technical

efficiency in Section 5; and, we test the hypothesis that families in Regime II are less efficient than those in Regime I in Section 6. We present our conclusions in Section 7.

2. Non-Price Rationing in a Unitary Household

The literature on rural households has traditionally assumed that families can be treated as if they were single decision-makers. Models developed within this framework, commonly referred to as Unitary Household Models, depict the family as a microeconomic unit holding a single set of preferences, where resources such as labor, assets, and information are fully shared. The constraints and preferences of two spouses, m and f , in a rural Unitary Household can be characterized as:

- *Technology*: Men dedicate all their labor to the production of marketable goods that can either be exchanged or used for the family's subsistence. Women divide their time between production of marketable goods and provision of household services.¹ The marketable output produced by family i can be written as $Q(K_i, L_i)$, where K_i represents their capital, L_i their labor, and Q their production function, assumed to be continuously differentiable, increasing, and strictly quasi-concave. In the rural setting covered by this study production spheres are noticeably gender-specific² and total household production can be represented as the sum of spouses' production: $Q^m(K_i^m) + Q^f(K_i^f, L_i^f)$. The provision of household services can be represented by $Z(\bar{L} - L_i^f)$.³

¹ This gender-based distinction in the use of their time is in accordance with the consistent empirical finding that in peasant families, household services such as cooking, childcare, laundry, and cleaning are solely performed by women (Fletschner and Ramos, 1999; Quisumbing, *et al* 1995; Restrepo and Reichmann, 1995).

² Men are in charge of tilling, plowing, fumigating, and selling crops to wholesale traders. Women, on the other hand, are responsible for vegetable gardens, most of the animal husbandry, and the processing of agricultural or animal products (Fletschner and Ramos, 1999).

³ Given that household services cannot be purchased, women must allocate at least a fraction of their time to those tasks, $L_i^f < \bar{L}$.

- *Capital:* Denote $S_i(\cdot)$ the maximum lenders are willing to supply to agent i .⁴ This borrowing ceiling can be thought of as a function of collateral, guarantors, cooperative membership, etc. and may differ by gender, that is $S_i^m(\cdot) \neq S_i^f(\cdot)$. Family i 's borrowing ceiling is given by what the spouse with most ample access to funds can obtain given the family's pooled resources: $S_i(\cdot) = \max[S_i^f(\cdot), S_i^m(\cdot)]$.
The market interest rate, r , is uniform across households and agents. Family i borrows $(K_i^m + K_i^f)$ subject to the condition that $(K_i^m + K_i^f) \leq S_i(\cdot)$. Assuming no voluntary default, at the end of the year, the family pays back all loans plus the accrued interest, $(1+r)(K_i^m + K_i^f)$.
- *Consumption:* In this one-period model, family i 's revenue is calculated by valuing all production at market prices and by assuming that the wealth owned by the family, W_i , is sold at the end of the year.⁵ Loans are repaid and the remaining income is used for consumption. Goods consumed by the household, C_i , include both goods bought and subsistence goods produced by the family. Thus, the vector of produced or purchased goods available to family i for consumption is given by:
$$C_i \leq Q^m(K_i^m) + Q^f(K_i^f, L_i^f) - (1+r)(K_i^m + K_i^f) + W_i$$
- *Preferences:* The family's well-being depends on the goods available for consumption and the household services provided, and can be represented by a continuously differentiable and quasi-concave utility function $U(C_i, Z_i)$.

Combining all this, family i 's economic decision-making process can be modeled as:

$$\begin{aligned} & \underset{K_i^m, K_i^f, L_i^f}{\text{Max}} \quad U(C_i, Z_i) \\ & \text{subject to} \\ & \quad C_i \leq Q^m(K_i^m) + Q^f(K_i^f, L_i^f) - (1+r)(K_i^m + K_i^f) + W_i \\ & \quad K_i^m + K_i^f \leq S_i(\cdot) \\ & \quad Z_i = Z(\bar{L} - L_i^f) \end{aligned}$$

Spouses will share the capital they borrowed so that they equalize their marginal productivities:

⁴ For a theoretical review of the literature on how lenders deal with information asymmetries see Besley (1995). For empirical studies of the determinants of credit rationing see Boucher (2000), Kochar (1998), Barham *et al* (1996), Conning (1996) and Mushinski (1996).

⁵ To simplify the presentation, we assume that all wealth can be sold and/or offered as collateral. The main conclusions are not affected by this assumption.

$$\frac{\partial Q^m(K_i^m)}{\partial K^m} = \frac{\partial Q^f(K_i^f, L_i^f)}{\partial K^f}$$

If the family has an *adequate supply of capital*, spouses will demand the amount of capital at which their returns to additional capital are exactly offset by the cost of borrowing:

$$\frac{\partial Q^j(K_i^j, L_i^j)}{\partial K^j} = (1+r) \quad j = m, f$$

If not, they will borrow as much as they possibly can, $K_i^m + K_i^f = S_i(\cdot)$, they will have an *excess demand for capital*, and the family's shadow value of capital will be larger than the market interest rate and equal to:

$$\tilde{r} = \frac{\partial Q^m(K_i^m)}{\partial K^m} - 1$$

In this context, *market-based inefficiency* is the difference between the welfare of a family with an excess demand for capital and the welfare of a family with comparable preferences and endowments but with an adequate supply of capital. As long as there are families with an excess demand for capital, policies aimed at relaxing credit constraints can reduce market-based inefficiencies, increase economic growth and improve welfare.

Note that if the Unitary Household model correctly captures families' decision-making behavior, the extent to which women have direct access to capital is irrelevant. Unless, that is, women's supply of capital is greater than that of their husbands—an unlikely case [see, for instance, Kabeeer (2001), Fletschner and Ramos (1999), Ospina (1998)].

The growing literature on intrahousehold decision-making, however, makes the case for a more complex representation of the family by challenging two basic premises. First, preferences may actually be different across family members, in particular between men and women, and may not be able to be aggregated in a simple fashion. Second, individuals' assets and income may not be fully shared within the family. A broad array of family decision-making models has been proposed to address these issues. These models portray the economic behavior of households as the outcome of interactions between two agents who bargain to resolve differences in their preferences.

In particular, Carter and Katz's Conjugal Contract Model reformulates a peasant household economy as "a site of independent preferences and resource allocation decisions bound together by various forms of interdependence—what Sen (1990) calls cooperative conflict." (Carter and Katz, 1997: 97). In Carter and Katz's model of the household: *i*) spouses do not fully share their resources and income;⁶ and *ii*) spouses hold individual, possibly conflicting, preferences and family decisions are the outcome of a bargaining process. The Semi-Cooperative Household model proposed in the following section builds on Carter and Katz's by incorporating imperfections in the capital market and sheds light on how imperfections in the capital market, in the form of borrowing ceilings, permeate intrahousehold decision-making.

⁶ This added flexibility is more in tune with the vast diversity of family budgeting patterns encountered by several empirical studies in developing countries (Frankenberg and Thomas, 2001; Thomas, 1997; Hoddinot and Haddad, 1994).

3. Non-Price Rationing in a Semi-Cooperative Household

The Semi-Cooperative Household model differs from the Unitary Household model in:

- *Capital*: spouses have two sources of capital. They can borrow directly from the market, with individual borrowing limits of $S_i^m(\cdot)$ and $S_i^f(\cdot)$, or from their spouses, through intrafamily loans of capital, q_i . If agents are constrained in their direct access to capital, the size and direction of the intrafamily loans can influence how they allocate their resources and their contributions to the family. As will be described below, the process by which intrafamily loans are decided can be modeled as a negotiation between spouses where q_i depends on their preferences, bargaining power, and borrowing ceilings. The resulting spouse-specific capital constraints are determined by the resources they can borrow directly from financial institutions, plus or minus the net intrafamily loans:

$$K_i^m \leq S_i^m(\cdot) - q_i \text{ and } K_i^f \leq S_i^f(\cdot) + q_i.$$

We assume a unique market interest rate and no voluntary default to lenders or spouse.⁷ By lending capital to their spouses, they are only acting as intermediaries, compensating for their partners' lack of access to capital without assuming any additional risk.⁸ At the end of the period, spouses repay $(1+r) K_i^m$ and $(1+r) K_i^f$, respectively.

- *Consumption*: Agents sell their own products and collateral and repay all their loans to lenders and spouse. They have individual control over their income and they allocate it

⁷ The assumption of perfect intrafamily repayment could be justified on the grounds that spouses interact closely and possess precise information about their partners. However, this may not always be the case. Furthermore, the enforcement of intrafamily-agreements and the consequences of intrafamily-defaulting may differ across gender. Women are more likely to hold their wealth in assets that can be readily seized and marketed (hogs, chicken, or jewelry as opposed to land, large animals, or large pieces of equipment). The repercussions of non-compliance with intrafamily agreements may be greater for women than men: intrafamily loans are more likely to be women's only source of capital than men's, cultural norms may sanction women more severely for this kind of behavior, and women are more commonly subjected to domestic violence (see Tauchen, et al, 1991).

A more complex version of this model incorporates gender-specific punishment functions in which the severity of the punishment is based on loan size and repayment level. Given that spouses are assumed to always be able to repay their loans, the repayment level acts as an indicator of their good (or bad) faith. However, this simplified version of the model allows us to focus on the best-case scenario, one in which agents do not assume additional risks by lending to their spouses.

⁸ In other words, we limit the exercise to cases in which women (or men) own enough collateral to guarantee total repayment, but in which restrictions on their gender-specific supply of funds limit their own direct access to credit. This is the case, for instance, when women hold their wealth in assets that are not traditionally accepted by financial institutions, when loans are unavailable for activities commonly pursued by women, or when women lack the knowledge to apply for loans. Not addressed here is another factor that may constrain women's direct access to credit: intrafamily distribution of collateral may be biased against women (see Fletschner, 2000, Ospina, 1998, Deere and Leon, 1997).

according to their own individual preferences, but what they buy is available to the entire family. That is, their individual budget constraints are given by:⁹

$$C_i^m \leq Q^m(K_i^m) - (1+r)K_i^m + W_i^m$$

$$C_i^f \leq Q^f(K_i^f, L_i^f) - (1+r)K_i^f + W_i^f$$

and the family consumes $C_i = C_i^m + C_i^f$ goods.

- *Preferences*: Spouses hold individual preferences over the bundle of goods and services that the family consumes: $U^m(C_i, Z_i)$ and $U^f(C_i, Z_i)$.¹⁰ Spouses' relative preferences can be compared through their marginal rates of substitution. If, for example, $MRS_{C_i, C_j}^m > MRS_{C_i, C_j}^f$ then, other things being equal, in family i the husband prefers good C_i over another good C_j more than his wife does; or, if $MRS_{Z, C_i}^m > MRS_{Z, C_i}^f$ then, other things being equal, in family i the husband prefers household services Z over good C_i more than his wife does.

In the Semi-Cooperative Household model, family decision-making combines elements from two largely autonomous and yet interdependent economies. Spouses have individual preferences, individual constraints, and individual control over resources. Yet their decisions are linked by intrafamily loans of capital and by the consumption goods and family services the family shares. The behavior of family i is thus characterized as the equilibrium of a non-cooperative game where he solves:

$$\begin{aligned} & \underset{K_i^m}{\text{Max}} \quad U^m(C_i, \bar{Z}_i) \\ & \text{subject to} \\ & C_i = C_i^m + \bar{C}_i^f \\ & C_i^m \leq Q^m(K_i^m) - (1+r)K_i^m + W_i^m \\ & K_i^m \leq S_i^m(\cdot) - \bar{q}_i \end{aligned}$$

and she solves:

⁹ We assume no gender-based pricing. Men and women face the same prices when they sell their products, when they purchase goods, and when they borrow capital. This may or may not be an appropriate assumption depending on specific characteristics of each of the markets. Consideration of this issue, however, is beyond the scope of this study.

¹⁰ Since the utility function is defined over goods and services available to the whole family it may implicitly include consideration for other family members' needs and preferences.

$$\begin{aligned}
& \text{Max}_{K_i^f, L_i^f} U^f(C_i, Z_i) \\
& \text{subject to} \\
& C_i = \bar{C}_i^m + C_i^f \\
& C_i^f \leq Q^f(K_i^f, L_i^f) - (1+r)K_i^f + W_i^f \\
& K_i^f \leq S_i^f(\cdot) + \bar{q}_i \\
& Z_i = Z(\bar{L} - L_i^f)
\end{aligned}$$

For a given level of \mathbf{q} , she will distribute her time so that, for her, the marginal benefit of providing household services equals that of dedicating her efforts to producing marketable goods:

$$\frac{\partial U^f}{\partial C^f} \frac{\partial Q^f(K_i^f, L_i^f)}{\partial L^f} = - \frac{\partial U^f}{\partial Z} \frac{\partial Z(L_i^f)}{\partial L^f}$$

and both spouses will demand capital at the level where their marginal returns equal their marginal costs, or until they reach their own borrowing ceilings:

$$\frac{\partial Q^m(K_i^m)}{\partial K^m} = (1+r) \quad \text{or} \quad K_i^m = S_i^m(\cdot) - \mathbf{q}_i;$$

and,

$$\frac{\partial Q^f(K_i^f, L_i^f)}{\partial K^f} = (1+r) \quad \text{or} \quad K_i^f = S_i^f(\cdot) + \mathbf{q}_i$$

The process by which spouses decide how much capital they will loan to each other can be modeled as a Nash bargaining game. When male and female spouses cooperate, they both enjoy $C_i = C_i^m + C_i^f$ and achieve utility levels $U^m(C_i, Z_i)$ and $U^f(C_i, Z_i)$, respectively. When they do not cooperate, however, they can only achieve V_i^m and V_i^f , where V denotes the maximum utility that each spouse can obtain when their partners' contribution to the family is limited to the minimum, C_{\min}^m , C_{\min}^f , and Z_{\min} dictated by social norms.¹¹ Therefore, by cooperating, spouses gain $(U_i^m - V_i^m)$ and $(U_i^f - V_i^f)$. Their negotiation of intrafamily loans of capital can thus be represented as:

$$\begin{aligned}
& \text{Max}_{\mathbf{q}_i} N_i = [U^{m*}(\mathbf{q}_i) - V_i^m] * [U^{f*}(\mathbf{q}_i) - V_i^f] \\
& \text{subject to} \\
& -S_i^f(\cdot) \leq \mathbf{q}_i \leq S_i^m(\cdot)
\end{aligned}$$

If the family has adequate access to capital, the observed intrafamily loan of capital \mathbf{q}_i^* is a function of spouses' preferences, productivity, and direct access to capital, that balances spouses' marginal benefits weighed by their partners' gains to cooperation so that:

¹¹ The characterization of spouses' threat points, V^m and V^f , as a non-cooperative equilibrium is based on Lundberg and Pollack's (1993) suggestion.

$$\frac{\partial U_i^{m*}}{\partial \mathbf{q}_i}(U_i^{f*} - V^f) + \frac{\partial U_i^{f*}}{\partial \mathbf{q}_i}(U_i^{m*} - V^m) = 0$$

Since the spouse for whom cooperation matters the least has stronger bargaining power, intrafamily loans of capital, and possibly household production decisions, will favor his or her preferences. In particular, when women are unable to meet their needs for capital by borrowing directly from financial institutions, their husbands may be able to use their access to credit to influence their decisions. This will be the case if, relative to their wives, men have a stronger preference for household services.

The Semi-Cooperative Household Model predicts three types of families, depending on whether or not spouses are able to meet their needs for financial resources:

REGIME I: Families in which both spouses have an adequate supply of capital

Spouses in this regime are able to meet their individual demands for capital. They either have adequate access to financial markets directly, or, if not, they are able to overcome those obstacles with their partners' assistance. These families are not affected by restrictions in the capital market.

REGIME II: Families in which men choose not to alleviate their wives' unmet need for credit

Women in this regime are unable to meet their demand for capital even though their husbands could intermediate funds to them. If they were able to borrow more capital, they would increase their production and contribute more marketable goods to the family. As a result, they would also provide fewer household services. For families to be in this regime, it must be the case that,

- 1) Men do not want to increase their loans to their wives:

$$\frac{\partial U_i^{m*}}{\partial \mathbf{q}_i} \leq 0$$

or, equivalently,

$$MRS_{Z,C^f}^m - MRS_{Z,C^f}^f > \left[\frac{\partial Q^f}{\partial K^f} - (1+r) \right] \left[\frac{(\partial^2 Q^f / \partial L^2 + MRS_{Z,C^f}^f \partial^2 Z / \partial L^2)}{(\partial Z / \partial L)(\partial^2 Q^f / \partial L \partial K^f)} \right]$$

Relative to their wives, men in these families must have a stronger preference for household services over the additional marketable goods their wives would provide if their access to capital improved. Moreover, the difference in their preferences must be sufficiently strong that the additional goods their wives would provide (first bracket) do not compensate them for the reduction in household services (second bracket).

and,

- 2) Men are able to impose their preferences:

$$\frac{\partial U_i^{m*}}{\partial \mathbf{q}_i} \leq - \frac{\partial U_i^{f*}}{\partial \mathbf{q}_i} \frac{GC^m}{GC^f}$$

where GC^m and GC^f are spouses' gains to cooperation. Or, equivalently,

$$MRS_{Z,C^f}^m - MRS_{Z,C^f}^f > \left[\frac{\partial Q^f}{\partial K^f} - (1+r) \right] \left[\frac{(\partial^2 Q^f / \partial L^2 + MRS_{Z,C^f}^f \partial^2 Z / \partial L^2)}{(\partial Z / \partial L)(\partial^2 Q^f / \partial L \partial K^f)} \right] \left[\frac{(\partial N / \partial C^f)}{(\partial U^m / \partial C^f) GC^f} \right]$$

where N is the family utility, $\frac{\partial N}{\partial C^m} = \frac{\partial U^m}{\partial C^m} GC^f + \frac{\partial U^f}{\partial C^m} GC^m$, and the third bracket

captures the family's preference for C^f weighed by the husbands' preferences given their bargaining power.

In other words, women in these families are unable to rely on their husbands to overcome their limitations in the financial markets. Their husbands would rather see them providing household services and, because they have sufficient power, they will not intermediate more funds to their wives. Unlike their husbands, women in these families cannot meet their financial needs—their shadow value of capital is higher than the market interest rate and equal to:

$$\tilde{r}_i^f = \frac{\partial Q^f(K_i^f)}{\partial K^f} - 1$$

and this gives rise to intrahousehold-based inefficiency, with $\tilde{r}_i^f > \tilde{r}_i^m = r$.

REGIME III: Families in which both spouses are unable to meet their needs for capital¹²

Families in this regime are unable to meet their demand for capital. Spouses have exhausted their borrowing capacity and lenders will not provide them with any additional capital. The family experiences market-based inefficiency since both spouses are non-price rationed and their shadow value of capital are higher than the market interest rate: $\tilde{r}_i^m > r$ and $\tilde{r}_i^f > r$. Because of their credit constraints, the intermediation of capital between spouses—the size and direction of intrafamily loans—will affect the level of household services provided, Z , as well as the size of the basket of goods available to the family, C , and its composition C^m and C^f . Spouses with similar preferences will pool their resources and allocate their limited funds to the most productive use, maximizing C . However, spouses may disagree.

If they have conflicting preferences, spouses may prefer a smaller bundle of goods that reflects their own preferences for goods and household services over a larger basket of goods more in accordance with their partners' preferences. In particular, women will be willing to loan additional funds to their husbands only if the returns their husbands can obtain compensate them for their own loss, once their differences in preferences for goods have been taken into consideration:

¹² Although one could think of another regime, one in which husbands are constrained and their wives choose not to loan more capital to them, this would not occur under the Semi-Cooperative Household Model. If women are able to obtain sufficient funds, they will always choose to channel loans to their husbands since that increases the basket of goods available to the entire family without requiring any compromises. If they have access to capital, women will increase their intrafamily loans until their husbands are able to meet their needs for capital, or until women reach their borrowing ceiling. In the first case, families will be in Regime I, in the second case, families will belong to Regime II.

$$\left(\frac{\partial Q^m}{\partial K^m} - (1+r) \right) > MRS_{C^f, C^m}^f \left(\frac{\partial Q^f}{\partial K^f} - (1+r) \right)$$

Similarly, men will choose to increase loans to their wives only if they are compensated for what they are giving up. Like their spouses, men take into consideration their relative productivity and their differences in preferences for consumption goods. Unlike their spouses, men also have to account for the decrease in household services that will result from their wives' increased involvement in market-oriented activities. Men will choose to loan additional funds to their wives only if:

$$\left(\frac{\partial Q^m}{\partial K^m} - (1+r) \right) < MRS_{C^f, C^m}^m \left[\left(\frac{\partial Q^f}{\partial K^f} - (1+r) \right) - \frac{(\partial Z / \partial L)(\partial^2 Q^f / \partial L \partial K^f)}{(\partial^2 Q^f / \partial L^2 + MRS_{Z, C^f}^f \partial^2 Z / \partial L^2)} (MRS_{Z, C^f}^m - MRS_{Z, C^f}^f) \right]$$

Whose preferences will prevail in the negotiation depends on the extent of their disagreement—how strongly they will dislike their partners' investment of capital and labor—and on their power—how strong is their influence in the bargaining process. More specifically, among families in this regime, men will be able to retain control over the family's limited capital as long as:

$$\left(\frac{\partial Q^m}{\partial K^m} - (1+r) \right) > \left(\frac{\partial Q^f}{\partial K^f} - (1+r) \right) FRS_{C^f, C^m} - \left[\frac{(\partial Z / \partial L)(\partial^2 Q^f / \partial L \partial K^f)}{(\partial^2 Q^f / \partial L^2 + MRS_{Z, C^f}^f \partial^2 Z / \partial L^2)} \right] \left[\frac{MRS_{Z, C^f}^m - MRS_{Z, C^f}^f}{MRS_{C^f, C^m}^m \partial N / \partial C^m} \right] \left[\frac{\partial U^m}{\partial C^f} GC^f \right]$$

or, equivalently, as long as men's returns to capital exceed what their wives would have contributed, given spouses preferences and bargaining power. The additional contribution of their wives is given by the increase in the amount of goods their wives would contribute, weighed by the *family rate of substitution* between the type of goods each spouse would provide, FRS_{C^f, C^m} ,¹³ (first term), and the decrease in the household services, weighed by the differences in preferences and bargaining power (second term).

It is important to note that if this condition is met men will restrict loans to their wives even when their action translates in a smaller basket of goods available to the family—that is, if their power and their preferences for C^m or Z over C^f are strong enough, men will restrict loans to their wives even when $\frac{\partial Q^f}{\partial K^f} > \frac{\partial Q^m}{\partial K^m}$. In this case, family dynamics give rise to intrahousehold-based inefficiency, with $\tilde{r}_i^m < \tilde{r}_i^f$.

¹³ The *iso-gain product curves* presented by McElroy and Horney (1981)—this model's equivalent to the neoclassical indifference curves—are the combination of goods C^m and C^f for which the family utility, N , is constant (McElroy and Horney, 1981). The family rate of substitution between C^f and C^m is given by:

$$FRS_{C^f, C^m} = \frac{\partial N / \partial C^f}{\partial N / \partial C^m}$$

The opposite scenario grants women the ability to restrict their loans to their husbands. If men's returns to capital are higher than their wives, $\frac{\partial Q^m}{\partial K^m} > \frac{\partial Q^f}{\partial K^f}$, then under this scenario women's preferences and power will create intrahousehold-based inefficiency, this time with $\tilde{r}_i^f < \tilde{r}_i^m$.

To summarize, if families decision-making is adequately captured by the Semi-Cooperative Household Model, financial intermediation among spouses need not be perfect, and conflicting family dynamics coupled with non-price rationing in the financial markets can lead to intrahousehold inefficiencies. We explore this next using detailed data gathered from 215 families in rural Paraguay. We divide the empirical analysis in three parts. First we identify families' credit rationing regime. Then we measure families' technical efficiency. Finally, we use multivariate analysis to test our hypothesis that families in Regime II are less efficient than families in Regime I.

4. Identifying Families' Credit Rationing Regime

The empirical literature on capital markets has generally adopted two approaches for distinguishing individuals who have adequate access to credit from those who have an excess demand. One approach has been to use information on actual loans and derive individuals' position in the credit market by making assumptions about capital supply and demand. Another approach has been to determine individuals' credit rationing status by conducting surveys with qualitative questions from both borrowers and potential borrowers.¹⁴

We follow the second approach and use qualitative information obtained directly from both spouses to unambiguously and uniquely determine whether each respondent has an adequate supply of capital or an excess demand. Each spouse was asked in detail about all the loans that family members had obtained from financial institutions during the previous year. If they themselves reported having received at least one loan, we asked whether they had been able to

¹⁴ Researchers in the first group have resorted to a variety of assumptions to derive additional information on households' credit rationing status from the observed loans. A prevalent approach within this line of research is to assume that a loan obtained from the formal sector is cheaper than one from the informal sector. Under this assumption, anyone with a loan in the informal sector can be classified as having an excess demand in the formal sector (Hauge, 1998; Conning, 1996; Carter and Olinto, 1996; Bell, 1988). The additional information increases observable sample separation and improves the efficiency of the estimates.

Researchers in the second group have inferred households' credit rationing status based on qualitative information from questionnaires especially designed to allow complete sample separation (Barham et al, 1996; Zeller, 1994; Jappelli, 1990; Feder et al, 1990). Households who were unable to obtain the loans they had applied for or who had wanted a loan but decided not to apply are considered to have an excess demand. All others have an adequate supply. This methodology improves sample separation, increases the efficiency of the estimates, and may offer additional information on the specific rationing mechanism affecting each household. Gathering such direct information on credit rationing status, however, is not easy. This method requires carefully designed questionnaires and well trained enumerators.

obtain as much capital (and inputs) as they would have liked, and if not, why. If, on the other hand, they reported that they had not received a loan during the previous agricultural year, we asked whether they had requested one. If they had applied for a loan, we asked why they had not received it. For those who had not applied for one, we asked whether they had wanted a loan at the current rates or not, and why.

On the basis of their individual responses, men and women were classified as having an adequate supply of capital or an excess demand using the following criteria:

- Respondents who exhibited a positive demand for capital by borrowing during the previous year were classified as having an:
 - *Adequate Supply* of capital if they had obtained all the capital they would have liked to borrow at the going rates; or,
 - *Excess Demand* for capital if:
 - i) they were offered a smaller amount than what they had solicited; or,
 - ii) they had decided to request less than what they would have liked to borrow.
- Respondents who had *not* borrowed during the previous year were classified as having an:
 - *Adequate Supply* of capital (with no effective demand for capital) if they had not wanted a loan; or,
 - *Excess Demand* for capital if:
 - i) they had asked for a loan and were turned down; or,
 - ii) they had wanted a loan at the going rates but decided not apply for one (because they thought they would not get it, could not do the paperwork, etc.).

With this information, we can assign families to regimes as follows:

- **Regime I:** Families where both spouses had an adequate supply of capital (61% of families);
- **Regime II:** Families where she had an excess demand for capital and he could have mediated funds to her because he had a positive and adequate supply of capital (16% of families);
- **Regime III:** Families where both spouses had an excess demand for capital (21% of families);
- **Other:** Families where he had an excess demand for capital and she could have mediated funds to him because she had a positive and adequate supply of capital (2% of the families).¹⁵

5. Measuring Households' Efficiency

A given combination of inputs allows producers to obtain a particular set of outputs, and it is either insufficient or unsuitable for producing other output combinations. The set of procedures that establishes a relationship between inputs and the outputs they can produce is

¹⁵ Although this fourth regime is not predicted under the Semi-Cooperative Household Model, a few families in our sample fit this description. There are at least two possible explanations. It is possible for a few households to have preferences and constraints that are not correctly captured by the asymmetric setup of our decision-making model. Alternatively, it may also be the case that while these women have an adequate access to capital, their supply of funds is insufficient to meet their husbands' needs for capital if they are interested in relatively large and indivisible projects.

called technology. Intuitively, a family is considered to be making efficient decisions when it is maximizing its output given its inputs and the available technology.

There are numerous approaches to measuring efficiency but they typically involve estimating a production function or production frontier representing the underlying technology and calculating each household's distance from that frontier. No one method clearly dominates the others. Parametric approaches require assuming a functional form that may be unduly restrictive while non-parametric approaches are extremely flexible and less inclined to create specification errors. However, non-parametric approaches are deterministic—the entire deviation of an observation from the production frontier is considered inefficiency, while parametric methods are stochastic and account for noise, exogenous shocks, and measurement errors (Lovell, 1993; Fare, Grosskopf, and Lovell, 1985).

We use the Data Envelope Analysis, a non-parametric approach that relies on linear programming tools to construct a production frontier or hyperplane. Each family is compared to all other families in the sample and is considered efficient if no other family (or combination of families) is able to produce at least as much output using fewer inputs (Paris, 1991). The combination of efficient units defines the production frontier or hyperplane. Families that are not on the hyperplane are inefficient because others are able to produce the same level of output using fewer resources. The technical efficiency index, TE^h , captures the minimum proportion of the inputs household h is using that would still allow it to produce its current level of output.

To measure households' efficiency we characterize each of the 215 households in terms of 9 inputs and 7 outputs, as follows.^{16,17} Descriptive statistics for all inputs and outputs are presented in Table 1.

INPUTS:

- *Land*: number of hectares under the household's control
- *Physical Capital*: flow value of the buildings, equipment, and tools they own plus the cost of equipment they had rented.
- *Male Household Labor* and *Female Household Labor*: number of male and female household members, measured in adult equivalents. The survey defines household members as those individuals who were permanently living with the family during the 1998-99 agricultural year.¹⁸ Their contribution to the household was calculated according to their age and adapted from Deere and de Janvry's (1981) criteria for Peruvian peasants (see Table 2).

¹⁶ Whenever possible, inputs and outputs are expressed in the relevant physical units. When different types of goods need to be aggregated they are converted to monetary values. For inputs that are not consumed in the production process, we use flow values calculated as the value of the asset times the interest rate for the 1998-1999 agricultural year. The interest rate is the deposit interest rate offered by commercial banks in Paraguay for six-month certificates of deposit, for the period July 1998 to June 1999, minus the rate of inflation. Figures were obtained from the Central Bank of Paraguay.

¹⁷ It should be noted that we are calculating inputs and output at the household level, without differentiating which spouse has access or control over them. This approach, common in the efficiency literature, implicitly assumes that spouses can pool their resources.

¹⁸ Family labor is differentiated from hired labor because household members are believed to be more strongly motivated and they can perform supervisory roles (Feder, 1985).

- *Hired Labor*: total expenditure in labor hired to work for the household;
- *Inputs*: monetary value of inputs used by the household;
- *Animals*: flow value of the livestock they owned at the beginning of the agricultural year.

OUTPUTS:

- *Farm Income*: monetary value of farm production. It includes crops harvested, animals sold or consumed, sale of firewood, charcoal, bricks, etc., and the sale of processed products derived from any of the above;
- *Off-Farm Income*: total income earned by household members working, permanently or temporarily, outside the farm (it includes wage labor as well as income earned from independent activities).

To measure household h 's efficiency we adapt the linear program put forward by Chavas and Aliber (1993) and solve:

$$\begin{aligned} \min_{TE^h, I^h} \quad & TE^h \\ \text{s.t.} \quad & \sum_{t=1}^z I_t^h y_s^t \geq y_s^h \quad \text{for } s=1, \dots, 7 \\ & \sum_{t=1}^z I_t^h x_g^t \leq TE^h x_g^h \quad \text{for } g=1, \dots, 9 \\ & \sum_{t=1}^z I_t^h = 1 \\ & I_t^h \geq 0 \quad \text{for } t=1, \dots, 215 \end{aligned}$$

where y^i and x^i are household i 's vectors of outputs and inputs. Household h is compared to all z households in the sample and it is efficient, $TE^h = 1$, unless there is a convex combination of other households (third constraint)¹⁹ that produces at least as much output as household h (first constraint) while using fewer inputs (second constraint).

We present a summary of the efficiency measures in Table 3. As expected, on aggregate, households in Regime I have the highest level of technical efficiency, with a mean of 0.973. In line with our argument, families in Regime II have a lower median: 0.945. However, the difference between the two means is not statistically significant. A more rigorous inspection of our hypothesis, requires that we rely on multivariate analysis to control for the effect of other factors.

6. Do Women's Financial Constraints Affect Household Efficiency?

¹⁹ This constraint guarantees a concave production frontier.

The literature on credit markets argues that non-price rationing mechanisms may have distributional and efficiency impacts. We argue here that women's inability to meet their own need for capital can lead to efficiency losses even when their husbands have adequate access to credit.

To examine this assertion, consider an equation:

$$TE_i = \mathbf{a} + \mathbf{b}_q q_i + \mathbf{b}_{R2} R2_i + \mathbf{b}_{OR} OR_i + \mathbf{e}_i$$

where the non-random component of the technical efficiency is explained by a vector of household characteristics q_i and the household's credit rationing regime. The vector of household characteristics that could impact the family's efficiency includes: the amount of land they operate, whether or not the family owns titled land, the value of their equipment and infrastructure, the value of their livestock, age and education of both spouses, the number of other adults in the household (additional family labor), and regional dummies that capture village-specific unobserved characteristics such as soil quality, access to markets, and agroclimatic conditions.

The household's credit rationing regime is captured by two dummies: $R2_i$ that takes the value of 1 if family i is in Regime II and OR_i which equals 1 when the family is in Regime 3 or Other.²⁰ The effect of being in Regime I is embedded in the constant. Thus, under this specification \mathbf{b}_{R2} captures the decrease(increase) in technical efficiency associated with being in Regime II, relative to a family with similar endowments and characteristics who is in Regime I.

Because the efficiency measures have an upper bound equal to 1, we use a TOBIT model and estimate:

$$TE_i = \begin{cases} 0 & \text{if } \mathbf{a} + \mathbf{b}_q q_i + \mathbf{b}_{R2} R2_i + \mathbf{b}_{OR} OR_i + \mathbf{e}_i \leq 0 \\ \mathbf{a} + \mathbf{b}_q q_i + \mathbf{b}_{R2} R2_i + \mathbf{b}_{OR} OR_i + \mathbf{e}_i & \text{if } 0 \leq \mathbf{a} + \mathbf{b}_q q_i + \mathbf{b}_{R2} R2_i + \mathbf{b}_{OR} OR_i + \mathbf{e}_i \leq 1 \\ 1 & \text{if } \mathbf{a} + \mathbf{b}_q q_i + \mathbf{b}_{R2} R2_i + \mathbf{b}_{OR} OR_i + \mathbf{e}_i \geq 1 \end{cases}$$

to test the hypothesis that: $H_0 : \mathbf{b}_{R2} = 0$ against the one-sided alternative: $H_a : \mathbf{b}_{R2} < 0$.

Using observed credit rationing regimes as explanatory variables can present a problem, however, since a household's credit rationing status may not be exogenous. We test for exogeneity using the approach suggested by Blundell and Smith (1986) as follows: 1) We estimate OLS regressions with $R2$ and OR as dependent variables and q as the independent variables, saving the residuals; 2) We estimate the Tobit model as specified above, but including the three residuals as additional independent variables; 3) We test the joint hypothesis that the coefficients on the two residuals equal zero. Results from this estimation are presented in the first column of Table 4. Our results reject the assumption of exogeneity and we have to resort to instrumental variables for $R2$ and OR .

To instrument for family i 's credit rationing regimes, we estimate the propensity that a family with their characteristics will be in Regime I, in Regime II, or in Other Regime. Let Y be a categorical variable that represents the families' observed credit rationing status. Define the unobservable propensity that a family i will be in Regime I, Regime II, and Other Regime as:

²⁰ We aggregate these two groups into one because of the limited number of observations in the Other Regime.

$$Y_{ij}^* = \mathbf{g}_j \mathbf{x}_i + \mathbf{m}_j \quad j = R1, R2, OR$$

where \mathbf{x}_i is a vector that captures household characteristics and intrahousehold dynamics that may affect credit supply and/or demand and as a result may influence family i 's credit rationing status. In particular, the household characteristics included are: the family's wealth in land, physical capital, and livestock; spouses' age and education as a proxy for their human capital; additional labor available to the family; two variables capturing the family's availability of collateral and the husband's credit history because they may affect their access to capital;²¹ a measure of the extent to which women in the wife's reference group are members of a cooperative as a proxy for social norms that may influence whether or not she demands capital (see Fletschner and Carter, 2005); and village dummies that summarize unobserved household characteristics such as financial institutions in the area, and access to markets and to extension agents.

To capture intrahousehold dynamics we include: the proportion of the family wealth that is held in small animals as a proxy for the woman's control over the family budget; and two dummies that combine her husband's opposition to her involvement in entrepreneurial activities with their bargaining power. We consider that the husband has bargaining power if he is at least as old as his wife and has inherited at least as much land as she had. Similarly, the wife has bargaining power if she is as old as he is and has inherited as much land as he had.²²

The probability that family i falls in Regime j is given by:

$$\Pr(Y_i = j) = \Pr(Y_{ij}^* \geq Y_{ik}^*) \quad \forall k = R1, R2, OR$$

which, assuming the error terms are independent and identically distributed with Weibull distribution, is equivalent to:

$$\Pr(Y_i = j) = \frac{e^{\mathbf{g}_j \mathbf{x}_i}}{\sum_{s=R1, R2, OR} e^{\mathbf{g}_s \mathbf{x}_i}}$$

We estimate these probabilities using a single equation multinomial choice model and present marginal effects and model predictions in Tables 5 and 6. These results allow us to construct the instrumental variables:

$$\bar{R1} = \Pr(Y_i = R1); \quad \bar{R2} = \Pr(Y_i = R2); \quad \text{and} \quad \bar{OR} = \Pr(Y_i = OR)$$

²¹ At the time of the survey, women were relatively new borrowers and did not have a credit history. The rate of default among men, however, was very high. The government responded to political pressure by pardoning all previous debts to the State bank but for a majority of the peasants their financial history remained tainted and affected their access to loans from the State bank and from the cooperatives.

²² The assumption here was that her husband's opposition could affect her access to capital, because he could refuse to loan funds to her. However, if he has sufficient bargaining power, he could influence her demand and she would indicate having adequate supply of capital even when she has no access to funds.

With these instruments we can now return to our initial question and evaluate the factors that affect households' efficiency. More concretely, we can test the hypothesis that families in Regime II tend to be less efficient than those in Regime I. Using the measure of technical efficiency as the dependent variable, we present results from an OLS estimation and from a TOBIT regression (middle and right columns of Table 4). An OLS regression has some disadvantages since the efficiency measures are capped at one. However, dealing with measurement errors can be considerably more complicated in a Tobit or other non-linear models.²³ Both regressions lead to results that coincide in sign and significance and are very similar in size.

In particular, the estimates we obtain are consistent with our hypothesis: after controlling for household wealth, human capital, collateral, and other unobserved household characteristics, an average family in Regime II is 10 to 13% less efficient than an equivalent family in Regime I. That is, families in which women are unable to meet their credit needs are less efficient than those where both spouses have adequate access to loans.

7. Conclusions

This theoretical exercise expanded existing economic models of intrahousehold decision-making to incorporate rationing mechanisms found in the capital market. The Semi-Cooperative Household Model developed here contributes to the credit rationing literature by providing a rigorous framework to analyze how imperfections in the financial market permeate within the household.

We depict the household as an arena in which some decisions are made cooperatively (albeit influenced by spouses' relative bargaining powers), while some other decisions are made on a non-cooperative basis. The non-cooperative decisions, as well as the differences in bargaining power, introduce the notion that capital flow among family members should not be taken for granted. In fact, when it comes to allocating capital, the external market-based inefficiencies may be amplified by intrahousehold-based inefficiencies.

In so far as empirical evidence corroborates that the Semi-Cooperative Household Model mirrors family decision-making, our theoretical framework should offer valuable insights to policy makers. In particular, the Semi-Cooperative Household Model sheds light on two fronts. First, even when family members are able to smooth their spouses' individual difficulties in the capital market, they may have incentives not to do so. If women's more restricted direct access to capital is not fully compensated with intrafamily loans from their husbands, as is the case for families in Regime II (and maybe Regime III), there are *equity-based arguments* for programs that enhance women's direct access to credit.

²³ Because all three probabilities for each household must add to one, if the probability that a household belongs to a regime is overestimated then it must be the case that the probability that the same family belongs to at least one other regime is underestimated. However, we have excluded the probability of households belonging to Regime I, $\overline{R1}$, and therefore this should not be a problem unless the probabilities of being in one regime are systematically over or underestimated. If there is consistent over or underestimation of a particular regime then the coefficient for that regime will be biased in the opposite direction to maintain the same conditional mean.

Secondly, improving women's access to credit may also yield gains in intrahousehold-based efficiency. In particular, for households in which men choose not to channel funds to their wives, that is families in Regime II (and maybe Regime III), credit programs that target poor women may be a cost-effective way to induce economic growth. Thus, there may be *efficiency-based arguments* for enhancing women's direct access to credit.

Our empirical analysis suggests that, though present, intrafamily financial intermediation is not perfect. More precisely, there are families in which husbands are able to ameliorate their wives credit constraints but choose not to do so. Those families exhibit lower technical efficiency. In summary, our empirical results support efficiency-based arguments for improving women's direct access to credit.

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Table 1. Descriptive Statistics of Inputs and Outputs^(*)

	N.Obs.	Mean	Median	Std. Dev.	Minimum	Maximum
Farm Income	215	11022198	7628750	9934826	1617500	76911922
Off-Farm Income	144	5546442	1350000	11844523	20000	103230000
Land (in Has.)	214	9.59	7.88	7.95	0.63	60.00
Physical Capital	215	478390	180837	1016882	3429	12742545
Inputs	176	3317934	1046500	7215719	15000	94727000
Male Household Labor	215	1.88	1.70	0.88	0.50	6.00
Female Household Labor	215	1.91	1.80	0.82	0.50	4.90
Hired Labor	141	531926	247700	688362	7000	4447500
Animals	215	678669	528828	560357	60770	4650186

^(*) Statistics for inputs and outputs are based only on nonzero observations for each variable

Table 2. Labor Weights According to Age

Age	Weight
4-5	0.1
6-8	0.2
9-12	0.3
13-17	0.5
18-59	1.0
60-65	0.8
66-75	0.5
76-80	0.3

Table 3. Households' Technical Efficiency Measures

	No. of Observ.	Median	Mean	Std. Dev.	Minimum	Maximum	% Efficient
All	215	0.953	0.859	0.167	0.337	1	43
Regime 1	131	0.973	0.875	0.162	0.337	1	48
Regime 2	34	0.945	0.885	0.139	0.426	1	33
Regime 3	45	0.737	0.803	0.182	0.390	1	34
Other Regime	5	0.879	0.772	0.241	0.395	1	33
Regime 3 + Other	50	0.746	0.799	0.187	0.390	1	34

Table 4. Analysis of Technical Efficiency of Households

	Tobit (Coefficients)	OLS	Tobit (Marg.Effects)
Constant	1.368***	1.059***	0.787***
Household Credit Rationing Regime			
Regime II ($R2$)	-0.287***		
Other Regimes ($R3 + OR$)	-0.055		
Predicted Probability Regime II ($\bar{R}2$)		-0.098**	-0.128***
Predicted Probability Other Regimes (\bar{OR})		-0.147**	-0.153***
Household Wealth			
Land (000s of US\$)	-0.001	-0.001	0
Do They Own Titled Land?	-0.114***	-0.087***	-0.079***
Constructions and Equipments (000s of US\$)	0.015	-0.001	-0.002
Animals (000s of US\$)	0.000	0.007	0.006
Human Capital			
His Age	-0.015***	-0.008***	-0.008***
His Education	-0.005	0.000	-0.001
# of Additional Male Adults	-0.065**	-0.024	-0.024
Her Age	0.014***	0.007***	0.008***
Her Education	-0.013	-0.002	-0.004
# of Additional Female Adults	-0.090***	-0.056***	-0.042**
Village Dummies	(included)	(included)	(included)
Residuals Regime II	0.239*		
Residuals Other Regimes	0.007		
	Log L:-50.687	R2: 0.317	Log L:-48.399
N.Observations		215	

*** = signif. at 1%, ** = signif. at 5%, * = signif. at 10%

Table 5. Multinomial Logit. Dependent Variable: Propensity of being in each Regime (Marginal Effects)

	Regime 1	Regime 2	Other Regimes
Constant	0.644	0.038	-0.682 **
Household Wealth			
Land (000s of US\$)	-0.003	0.002 **	0.001
Constructions and Equipments (000s of US\$)	0.106	0.000	-0.106
Animals (000s of US\$)	-0.061	-0.003	0.064 **
Human Capital			
His Age	0.006	0.000	-0.006
His Education	-0.022	0.002	0.020
Additional Male Adults	-0.089	-0.011	0.101 **
Her Age	-0.005	0.000	0.005
Her Education	-0.019	-0.005 **	0.024
Additional Female Adults	-0.054	-0.015 **	0.069
Collateral and Credit History			
Do They Own Titled Land?	0.024	0.007	-0.031
Has He Defaulted on a Loan?	-0.236	-0.002	0.238 ***
Intrahousehold Dynamics			
Proportion of Capital in Small Animals	0.208	-0.082 ***	-0.126 **
Does He Oppose Her Taking a Loan? * His BP	-0.160	-0.035 ***	0.195
Does He Oppose Her Taking a Loan? * Her BP	0.060	0.066 ***	-0.126
Women's Reference Group Behavior			
Proportion of Coop. Members in Her Group	-0.074	0.012 *	0.062
Village Dummies	(included)	(included)	(included)
Log L: -112.47			
N.Observations: 215			

*** = signif. at 1%, ** = signif. at 5%, * = signif. at 10%

Table 6. Model Predictions

	Observed	Predicted Probabilities			Correct Predictions
		Regime I	Regime II	Other Regimes	
Regime I	61%	56%	1%	3%	92%
Regime II	16%	6%	9%	1%	57%
Other Regimes	23%	10%	1%	12%	50%
Families	100%	72%	12%	16%	77%