Rural Women's Access to Credit: Market Imperfections and Intrahousehold Dynamics

DIANA FLETSCHNER [*]
University of Washington, USA

Summary. — Credit rationing studies carried out at the household level and based on responses from male heads of households present an incomplete and biased assessment of who is likely to be constrained, why they are constrained, and what is the extent of the constraints. They ignore possibly conflictive intrahousehold dynamics and assume that imperfections in rural financial markets are gender-neutral.

This paper addresses both issues theoretically and empirically. The Semi-Cooperative Household model developed for this analysis formalizes the conditions under which spouses', and particularly women's, individual access to credit can be affected by their own position in the financial market as well as by intrahousehold dynamics. These notions are then explored empirically using husbands' and wives' individual perceptions of their access to credit in rural Paraguay. The most significant empirical findings of the paper are that (i) compared to men, women are more likely to be credit constrained; (ii) women's rationing status responds to a different set of factors than men's; and (iii) husbands may choose not to intermediate capital to their wives even when they are able to do so. Results from this exercise provide empirically sound support for the assumptions underlying women-targeted credit programs.
Published by Elsevier Ltd.

Key words — credit, intrahousehold, decision-making, women, Latin America, Paraguay

1. INTRODUCTION

In settings where obtaining information about a potential borrower's creditworthiness is very costly and enforcing contracts difficult, resource poor households may be constrained in their access to credit even when the projects for which they seek funding are profitable (Besley, 1995; Ghosh, Mookherjee, & Ray, 2001). Improving their access to credit would enable these households to undertake profitable projects, increase their income, and insure against negative shocks (Sadoulet & de Janvry, 1995; Singh, Squire, & Strauss, 1986).

The recognition that credit market imperfections can have severe consequences for poverty alleviation and growth has motivated empirical researchers to try to identify which households are more likely to be constrained, why they are constrained, and the extent of the constraints [see Petrick (2005) for a recent review of the approaches employed]. It has also led to the extraordinary growth of the microcredit industry, fueled by governments, NGOs, and donors who embraced microcredit as an innovative approach for reaching out to poor rural households and addressing the obstacles poor families face in the credit markets.

Most of the rigorous assessments of rationing in credit markets and the policy recommendations emanating from those assessments are based on empirical studies that use data gathered at the household level and rely on the perceptions of survey respondents who are typically the male heads of household. However, many of the microcredit programs targeting the poor have deliberately reached out to women, and these efforts have been largely driven by two premises. First, unless specifically targeted, women face legal, social, cultural, and economic restrictions that further limit their access to credit compared to men (Almeyda, 1996; Lycette & White, 1989; Ospina, 1998; Sisto, 1996). Second, it does matter who in the household receives the loan. Access to capital may influence who controls income within the household, and a number of studies have found that women's relative control over resources has a positive impact on their families' nutrition, education, and health (Pitt, Khandker, Chowdhury, & Millimet, 2003; Pitt & Khandker, 1998; Thomas, 1997). Moreover, recent empirical work demonstrates that women's credit constraints have a negative impact on their households' economies (Fletschner, 2008).

Underlying these two premises is the implicit notion that family members may not intermediate resources effectively. Specifically, a male household member may obtain a loan, but not use it in a way that is best for the family. Supporting this view, and consistent with a separate spheres perspective of the intrahousehold economy (e.g., Carter & Katz, 1997 and Lundberg & Pollak, 1993), empirical evidence suggests that spouses leave unexploited opportunities for the exchange of factors of production (Udry, 1996) and for the intermediation of risk (Duflo & Udry, 2004).

After reviewing credit market conditions that can have a special impact on women, I propose a household decision-making model that explicitly incorporates spouses' access to credit and their possible intermediation of capital. I then use data from a survey applied to 210 couples in rural Paraguay to identify spouses' individual credit rationing status and propose a replicable method to explore intrahousehold financial intermediation. Survey findings indicate that rural women in this region experience different and more severe credit constraints than

men: 23% of the women were credit constrained compared to 17% of their husbands, and more importantly, 15% of the women surveyed reported being credit constrained even though their husbands claimed to have adequate access to credit.

These findings provide initial support for the notion that when spouses have conflicting preferences, women may not be able to count on their husbands' intermediation to help them overcome their insufficient access to credit. Furthermore, they suggest that the standard classification of households into two regimes, constrained or unconstrained, assuming perfect financial intermediation within the family is, indeed, inadequate and may lead to flawed policy recommendations.

2. RURAL FINANCIAL MARKETS AND POOR WOMEN'S DIRECT ACCESS TO CAPITAL

In rural settings, obtaining information about a potential borrower's creditworthiness can be very costly and enforcing contracts difficult. Consequently, some lenders might find lending to be too risky and choose not to offer loans at all. Others, who do lend, might design contracts that rely on indirect mechanisms to screen borrowers and to induce them to undertake actions that reduce their likelihood of default. When lenders use instruments other than the interest rate to address these problems of adverse selection and moral hazard in the credit market, some households are unable to meet their needs for capital to finance profitable projects. These households are credit constrained and as a result they are unable to put their resources to the most efficient use: they underinvest and they produce and earn less. It is therefore generally agreed that improving these households' access to credit should be a critical element of rural development strategies.

However, the extensive body of empirical research on credit rationing, valuable and informative as it is, has been carried out at the household level and researchers have relied almost exclusively on the perceptions of the survey respondents, typically the male heads of the household.[1] Whether or not their findings adequately address the women of the households' need for credit depends on the answer to the following two questions. First, is there a gender bias in women's direct access to credit or can it be assumed that the constraints encountered by resource poor rural women are similar in type and severity to those that affect the men? Second, if women are indeed more severely restricted in their direct access to credit, can we assume that husbands with adequate access to credit will act as financial intermediaries and help their wives overcome these constraints? This second question, in other words, deals with the way resources (including credit) are allocated within households. I propose an analytical framework to explore this second question in Section 3 and devote the remainder of this section to examine in more detail the first question, namely, how women's direct access to credit may differ from men's.

While poverty alone seriously handicaps creditworthy borrowers' access to capital, women may be even more constrained because of their gender. Biases in legal regulations or social norms may limit women's ability to obtain funds directly from formal financial institutions. This is the case in societies in which women are limited in their access to or control over property because inheritance laws give preference to male relatives, because the agrarian reforms in the past have generally allocated land to "household heads," or because in poor households any property that could be offered as collateral is likely to have already been pawned by the men of the household since they are often perceived to be engaged in more profitable activities (Deere & Leo, 2001, 1997; Lycette & White, 1989; Ospina, 1998). It is also the case in societies in which women cannot apply for loans unless they are represented, explicitly authorized, or supported by their husbands or a male relative (Almeyda, 1996; Alvear Valenzuela, 1987; Berger, 1989);[2] or societies in which women do not have access to the same sources of information as men and are less aware of funds available to them and of the conditions for obtaining a loan (Almeyda, 1996; Baydas et al., 1994; Lycette & White, 1989; Weidemann, 1992).[3]

Biases in lending practices can also affect how much capital women can access directly from formal financial institutions. Women are at a disadvantage when financial institutions do not fund the type of production activities typically run by women (Fletschner & Ramos, 1999); when financial institutions require collateral but do not accept the type of assets that women are likely to own; when financial institutions do not accept female guarantors (Baydas et al., 1994; Ospina, 1998);[4] or when their requirements are not clear or widely known and bank employees responsible for loan approvals frame them as special favors which women are unable to repay. The most common forms of repaying such favors—such as inviting loan officials for a drink or for dinner, or the giving of bribes—are not considered acceptable behavior for women (Lycette & White, 1989; Ospina, 1998).

This suggests that in a given household i, husband and wife may differ in the amount of capital directly available to them $(S_i^m \neq S_i^f)$, where S_i represents the supply of credit available to them at a given interest rate and the superscripts m and f denote male and female partners. S_i^f should thus be interpreted as the formal borrowing ceiling for the wife in household i. If the amount of capital she demands, D_i^f, is lower than her formal borrowing ceiling, $D_i^f \leqslant S_i^f$, she can meet her needs for capital directly with loans from financial institutions. However, if $D_i^f > S_i^f$, she is credit constrained. The goal of this paper is to shed light on factors that may have a systematic impact on women's ability to meet their needs for credit and on how these factors may differ from the obstacles that restrict men's access to credit.

Before we proceed, however, it is important to highlight that women's access to credit may not be limited from the supply side alone. In fact, women may face demand-side constraints that make them less likely than their husbands to apply for loans, even when they have profitable projects and funds are available to them. For instance, demand-side constraints can arise when long travel distances and inconvenient schedules become greater obstacles for women due to their reproductive roles in the household, thereby increasing their transaction costs of applying for and repaying loans (Baydas et al., 1994; Lycette & White, 1989; Moser, 1993; Restrepo Chebair & Reichmann, 1995); when women are unable to prepare adequate feasibility studies;[5] when women are more averse to risk (Almeyda, 1996; Morris & Meyer, 1993);[6] or when applying for a loan contravenes what is considered socially acceptable behavior for women (Fletschner & Carter, 2008). If these demand-side constraints are sufficiently strong, they can hamper women's effective demand for capital, leading to the almost perverse result where they are classified as having adequate access to capital when in fact they do not have access to funds.

But why should we be concerned about women's direct access to credit? After all, even if women are not able to meet their own needs for credit directly $(D_i^f > S_i^f)$, their constraints need not have economic relevance if, as is often assumed, spouses pool their resources to achieve shared goals. I examine this proposition next by relying on household decision-making models that help explain how couples may respond to imperfections in rural financial markets.

3. INTRAHOUSEHOLD DYNAMICS AND WOMEN'S INDIRECT ACCESS TO CAPITAL

Consider the following standard Unitary Household model. While each spouse has L units of labor time, the man dedicates all his labor to the production of marketable goods that can be exchanged or consumed, and the woman divides her time between the production of those goods and the provision of household services Z_i.[7] Since the provision of household services does not require capital, Z_i can be thought of as the number of hours the woman dedicates to the provision of household services.

Spouses borrow $(K_i^m + K_i^f)$, under the condition that $K_i^m + K_i^f \leqslant S_i$, where S_i represents the family's formal borrowing ceiling and is determined by what the spouse with most ample access to funds can obtain given the family's pooled resources: $S_i = \max[S_i^m, S_i^f]$. They produce $Q^m(K_i^m)$ and $Q^f(K_i^f, L - Z_i)$. They pool their resources, they pay back all loans plus the accrued interest, $(1 + r)(K_i^m + K_i^f)$, and they consume goods G_i. Family i's decision-making process can thus be portrayed as

$$\left.\begin{array}{l} \underset{K_i^m, K_i^f, Z_i}{\text{Max}} \quad U_i(G_i, Z_i) \\[6pt] \text{subject to} \quad G_i \leqslant Q^m(K_i^m) + Q^f(K_i^f, L - Z_i) - (1 + r)(K_i^m + K_i^f), \\[6pt] \qquad\qquad K_i^m + K_i^f \leqslant S_i. \end{array}\right\}$$
(1)

Under this scenario, the family chooses a level of household services Z_i at which a marginal increase in these services equals the additional benefit the family would have obtained if the woman had instead used her additional unit of labor to produce consumption goods:

$$\frac{\partial U(G_i, Z_i)}{\partial Z} = -\frac{\partial U(G_i, Z_i)}{\partial G} \frac{\partial Q^f(K_i^f, L - Z_i)}{\partial Z}.$$
(2)

Spouses share the capital they borrow and allocate it so that, for a given level of household services, they equalize their marginal productivities:

$$\frac{\partial Q^m(K_i^m)}{\partial K^m} = \frac{\partial Q^f(K_i^f, L - Z_i)}{\partial K^f}.$$
(3)

If the family has adequate access to credit, each spouse will demand and be able to obtain the amount of capital at which their marginal productivities are exactly offset by the cost of borrowing $(1 + r)$. If this amount exceeds the supply of funds available to the family, then both spouses are credit constrained.

Note that this Unitary Household model predicts that any obstacles women might face in their direct access to credit can be overcome by obtaining those funds indirectly, with their husbands' assistance. According to this model, creditworthy female borrowers with insufficient direct access to credit could, presumably, persuade their husbands to act as their intermediaries in the financial markets and, as long as the spouses' combined supply of capital exceeds their combined demand, they would be able to meet their needs for capital.

Weakening the above argument is the growing economic literature on intrahousehold decision-making which indicates that families do not always pool their resources that, in fact, spouses often differ in their preferences, and that household decisions are better portrayed as the outcome of a bargaining process (Carter & Katz, 1997; Duflo & Udry, 2004; Haddad, Hoddinott, & Alderman, 1997; Hoddinott & Haddad, 1994; Lundberg & Pollak, 1993; Udry, 1996).

This suggests that the Semi-Cooperative Household model I propose below may be a more suitable framework for analyzing the way in which imperfections in the capital market permeate intrahousehold decision-making. This model builds on Carter and Katz's (1997) Conjugal Contract model of a peasant household economy by incorporating imperfections in the capital market in the form of individual borrowing ceilings.

The Semi-Cooperative Household model differs from the Unitary Household model in three ways. First, spouses make individual rather than joint decisions on how to allocate their own resources and what goods to provide. They have individual control over their budget, but the goods and services they choose to provide are available to the entire family. Second, spouses' borrowing ceilings are individualized and determined by the sum of the funds they can obtain directly from financial institutions and those they are able to borrow indirectly with their partners' assistance: $S_i^f + \theta_i$ for the wife in household i and $S_i^m - \theta_i$ for her husband, where θ_i are net intrafamily loans. I assume no voluntary default to lenders or spouse:[8] by lending capital to their partners spouses are only acting as intermediaries, compensating for their partners' lack of direct access to capital without assuming additional risk.[9] Third, spouses bargain over how much they loan to each other.

Thus, 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 of goods and household services the family shares. The behavior of family i is thus characterized as the equilibrium of a non-cooperative game where the husband solves:

$$\left.\begin{array}{l} \underset{K_i^m}{\text{Max}} \qquad U_i^m(G_i, \overline{Z}_i) \\[6pt] \text{subject to} \quad G_i \leqslant Q^m(K_i^m) - (1 + r)K_i^m + \overline{G}_i^f, \\[6pt] \qquad\qquad K_i^m \leqslant S_i^m - \overline{\theta}_i \end{array}\right\}$$
(4)

and the wife solves:

$$\left.\begin{array}{l} \underset{K_i^f, Z_i}{\text{Max}} \qquad U_i^f(G_i, Z_i) \\[6pt] \text{subject to} \quad G_i \leqslant Q^f(K_i^f, L - Z_i) - (1 + r)K_i^f + \overline{G}_i^m, \\[6pt] \qquad\qquad K_i^f \leqslant S_i^f + \overline{\theta}_i. \end{array}\right\}$$
(5)

This implies that (i) the husband will use the amount of capital K_i^{m*} that exactly balances his marginal returns with the cost of borrowing additional capital, $\partial Q^m(K_i^{m*})/\partial K^m = (1 + r)$, unless he is credit constrained, in which case he can only obtain $K_i^{m*} = S_i^m - \theta_i$; (ii) similarly, the wife will demand K_i^{f*} such that $\partial Q^f(K_i^{f*}, L - Z_i^*)/\partial K^f = (1 + r)$ and will obtain it unless she is credit constrained, in which case she only gets $K_i^{f*} = S_i^f + \theta_i$; and (iii) she will allocate her labor time so that the marginal benefits *she* gets from providing more household services are equal to those *she* gets from the additional goods she would contribute:

$$\frac{\partial U^f(\overline{G}_i^{m*} + G_i^{f*}, Z_i^*)}{\partial Z} = -\frac{\partial U^f(\overline{G}_i^{m*} + G_i^{f*}, Z_i)}{\partial G^f} \times \frac{\partial Q^f(K_i^{f*}, L - Z_i^*)}{\partial Z}.$$
(6)

Note that the husband can influence the wife's behavior in two ways. First, the more the basket of goods G_i^{m*} he provides resembles the one the wife would have chosen, the more she would be willing to dedicate her time to providing household services. Second, if the wife does not have adequate direct

access to credit, he can influence her choices by adjusting the loans he intermediates to her, θ_i. The more capital she can borrow from him, the more time she will choose to allocate to producing and contributing consumption goods G_i^f, substituting away from her provision of household services.

Embedded in spouses' individual decision-making processes is their choice of how much capital they transfer to each other. The process by which they make that choice can be modeled as a Nash bargaining game as follows: each spouse's relative bargaining power depends on how much he or she benefits from this partnership. The gains from cooperation for husband and wife in household i are given by $(U_i^{m*} - V_i^m)$ and $(U_i^{f*} - V_i^f)$, respectively, where U^{m*} and U^{f*} are the utility levels they achieve as a result of their cooperation, when they both enjoy $G_i^{m*} + G_i^{f*}$ and Z_i^* and V_i^m and V_i^f are the utility levels they achieve when they do not cooperate and each partner's contribution to the family is limited to the minimum dictated by social norms, G_{min}^m, G_{min}^f, and Z_{min}. [10] Their negotiation of intrafamily transfers of capital can be represented as

$$\begin{aligned} \underset{\theta_i}{\text{Max}} \quad & N_i = [U^{m*}(\theta_i) - V_i^m]^*[U^{f*}(\theta_i) - V_i^f] \\ \text{subject to} \quad & -S_i^f \leqslant \theta_i \leqslant S_i^m. \end{aligned} \tag{7}$$

The solution to Eqn. (7) shows that if family i has adequate access to capital, the spouses' choice of intrafamily loan θ_i is a function of their individual preferences, productivities, and direct access to capital, and that it balances spouses' marginal benefits from the transfer, weighed by their bargaining power:

$$\frac{\partial U_i^{m*}}{\partial \theta_i}(U_i^{f*} - V^f) = -\frac{\partial U_i^{f*}}{\partial \theta_i}(U_i^{m*} - V^m). \tag{8}$$

This indicates that intrafamily loans, and possibly household production decisions, will favor the preferences of the spouse with the stronger bargaining power, that is, the one for whom cooperation matters the least.

Finally, after some manipulation, Eqn. (8) can be shown to be equivalent to

$$\left[\frac{\partial Q_i^f}{\partial K^f} - (1+r)\right]\left[\frac{\partial^2 Q_i^f/\partial Z^2}{\partial^2 Q_i^f/\partial K^f \partial Z}\right]$$
$$= [MRS_{i,Z,G^f}^m - MRS_{i,Z,G^f}^f]\left[\frac{(\partial U_i^{m*}/\partial G^f)}{(\partial N_i^*/\partial G^f)}\right][U_i^{f*} - V_i^f]. \tag{9}$$

The left hand side of the equation represents the change in the wife's contribution of goods G_i^f brought about by her returns to capital (first bracket) weighed by the associated change in the productivity of her labor (second bracket). The right hand side of the equation captures spouses' relative preferences and bargaining power: the difference in spouses' marginal rates of substitution between the household services and the additional goods provided by the wife (first bracket) and the strength of her husband's preference for those goods in relation to her family's preferences (second bracket), weighed by his bargaining power as captured by her gains to cooperation (third bracket).

Eqn. (9) indicates that the spouses' choice of intrafamily loans depends not only on the wife's productivity but also on the husband's preferences and his bargaining power. By contrast to the Unitary Household model, in the Semi-Cooperative Household model, some women may be unable to overcome their insufficient direct access to credit by relying on their husbands: their husbands may choose not to intermediate funds to them even when they have adequate access to credit. This would be the case in households in which, relative to their wives, men have a strong preference for household ser-

vices over the additional goods their wives would provide if their access to capital improved, and in which men have sufficient bargaining power to enforce their preferences.

Thus, the Semi-Cooperative Household model now predicts three types of households: (i) those in which both spouses have an adequate supply of capital; (ii) those in which both spouses are constrained; and (iii) those in which the wife is credit constrained even though her husband could have intermediated funds to her. This last category does not exist in the Unitary Household Framework.

To summarize, by individualizing spouses' preferences and decision-making spheres, the Semi-Cooperative Household model allows us to better understand the way in which market imperfections can permeate into families' behavior. More specifically, the framework presented here shows that spouses' direct access to credit matters by formalizing conditions under which it would be incorrect to assume that women can always rely on their husbands to overcome their limitations in financial markets. The remainder of the paper investigates these questions empirically.

4. DATA AND CONTEXT

To explore intrahousehold dynamics and women's access to credit, I surveyed 210 couples in Eastern Paraguay in 1999. In the rural setting covered by this study, production spheres are distinctly gender-specific. Men are in charge of tilling, plowing, fumigating, and selling crops to wholesale traders. They typically manage the income generated by the sale of cotton, tobacco, and all market-oriented crops except for those from vegetable gardens, and from the sale of large animals and extractive products such as timber, bricks, and, petitgrain essence. Women are responsible for the vegetable gardens, most of the animal husbandry, and the processing of agricultural or animal products. They tend to manage the income obtained from vegetable gardens and sales of small animals (Fletschner & Ramos, 1999).

Field observations and survey results indicate that of the three main sources of loans in the area—State bank, credit cooperatives, and wholesalers—women only received loans from the cooperatives. State banks and wholesalers do not openly discriminate against women, but they tend to fund production activities that are run entirely by men, such as cotton and large livestock enterprises. During their interviews, male respondents repeatedly volunteered the information that they had never seen a female client in the State bank offices. In fact, the survey findings clearly show that most women in the region do not know where the State bank agencies are located, what the bank's lending requirements are, or whether they would qualify for a bank loan.

Women's participation in the credit cooperatives is relatively recent and was the result of a credit program sponsored by the International Fund for Agricultural Development (IFAD) that explicitly included women. The program was launched in 1994 by three Paraguayan State organizations: the Peasant Development Fund, the Department of Agriculture, and the Office of Charity. It had as its main goal the strengthening of the financial and institutional infrastructures of the credit cooperatives. The program also aimed to improve women's socio-economic conditions by promoting their participation in income-generating activities and enhancing their direct access to credit. A team of female agronomists was formed to provide technical support to the women, to help them organize into production-oriented committees, and to advise those who wanted to join a credit cooperative and apply for loans.

To identify the population of interest, I used information obtained from combining a rapid oral census of the region, the comprehensive membership lists of the three credit cooperatives in the area, and data from the committees supported by the rural women component of the IFAD project. [11] Because of the study's focus on the effects of intrahousehold dynamics, the sample was limited to households headed by couples. The sample frame was stratified into three groups: (i) Non-Participants: couples in which the woman was not involved in the IFAD program; (ii) Partial-Participants: couples in which the woman participated in a committee and received technical assistance, but was not a member of a cooperative; and (iii) Full-Participants: couples in which the woman participated in a committee, received technical assistance, and was a member of a cooperative. Given the program's emphasis on market-oriented production, women in the second and third groups are likely to have a demand for capital. Women in the third group should have had direct access to credit. I selected couples randomly from each of the three groups. [12] Households in groups two and three were oversampled because of the small number of women who were active participants. The descriptive statistics and econometric analysis that follow use weights to correct for this.

5. IDENTIFYING SPOUSES' CREDIT RATIONING REGIMES

Any strategy designed to address imperfections in the credit market requires identifying those who are likely to be credit constrained, and the main obstacles that they face. In his survey of the methods most commonly employed to assess credit rationing, Petrick (2005) distinguishes between approaches that identify households' credit rationing status by relying directly on observed financial information (households' reliance on loans from sources other than formal lending institutions, loan-specific transaction costs, households' assessments of their own credit limit, or qualitative information describing their positions in the credit market), and other methods that rely more heavily on econometric estimations, indirectly inferring households' credit rationing status from their production, consumption, and investment decisions. [13]

In this study, I build on one of the "direct" approaches to identify households' credit rationing status. This method of eliciting households' credit constraints directly enables researchers to classify households into credit rationing regimes without resorting to assumptions about the financial market and often provides additional information on the specific rationing mechanism affecting the households. Examples of studies that rely on this methodology include Barham, Boucher, and Carter (1996), Baydas et al. (1994), Boucher, Guirkinger, and and Trivelli (2006), Feder, Lau, Lin, and Luo (1990), Jappelli (1990), Mushinski (1999) and Zeller (1994). To identify households' credit rationing status, these studies typically start with observed market transactions, recording all loans taken during a specific period (e.g., the previous agricultural year), and then ask qualitative questions to determine whether households had been denied credit or had received less credit than they had requested in that period. Those households that had are classified as credit constrained. In addition, the studies recognize that there may be households which, despite having a positive demand for credit at the going interest rate, chose not to apply for loans because of the imperfect nature of rural financial markets. If applying for credit is costly and households believe that there is a high probability that their request will be denied, they may decide not to apply.

These are Jappelli's (1990) "discouraged borrowers" or Mushinski's (1999) "preemptively rationed borrowers." To properly distinguish which among the non-borrowing households are credit constrained, these studies have relied on additional qualitative questions to elicit whether these households would have liked to borrow at the going interest rate and why they had not requested a loan.

The attractiveness of the direct approach for eliciting credit rationing status lies in its ease of implementation. However, most of the existing empirical studies using this approach have identified credit rationing status at the household level and have done so based on information reported by the household head. As a result, families in which women are credit constrained have been typically classified as unconstrained as long as their husbands reported having adequate access to credit. By contrast, for the purposes of this study, information was collected about each spouse's ability to meet his/her individual demand for capital. Since spouses may not have complete information about one another, the survey posed the questions directly to each of them, rather than rely on one of the spouses to be the informant. Furthermore, given the potentially private nature of this information, both spouses were interviewed simultaneously, though far enough from one another that they could not hear or influence each other's responses. Finally, female enumerators were used to interview women and male enumerators to interview their husbands, in an attempt to make both spouses comfortable with the interview process and more willing to share information that could be gender-sensitive.

Spouses' individual credit rationing status was determined as follows: Each spouse was asked about loans anyone in the household had obtained from financial institutions during the 1998–99 agricultural year. If they reported having received at least one loan (in cash or kind) under their own name, they were asked whether they had been able to obtain as much capital (and inputs) as they would have liked to, and if not, why not. If, on the other hand, they reported that they had not received any loan personally, they were asked whether they had requested one. Those who replied that they had applied for a loan were then asked why they had not received one. Those who had not applied for one were asked whether they had wanted a loan at the current rates, and depending on their response, why they had not applied for one or why they did not want a loan.

On the basis of their responses, respondents were classified as credit constrained if, during the previous year, they had been unable to obtain the amount they had wished to borrow. That is, if (i) they had asked for a loan and were turned down; or (ii) they were offered an amount smaller than what they had solicited; or (iii) they had wanted a loan at the going rates but

Table 1. *Men's and women's credit rationing status*

	% of Men	% of Women
Borrower		
Adequate access to credit	55.1	8.8
Credit constrained	2.3	0.8
Non-borrower		
Adequate access to credit	28.2	67.7
Credit constrained	14.5	22.7
Total		
Adequate access to credit	83.3	76.5
Credit constrained	16.7	23.5
Number of observations	210	210

had decided not to apply for one at all or had requested less than the amount they had wished to borrow because they believed they would not get it.

Table 1 gives the frequency of credit rationing at the individual level. Seventeen percent of the men and 23% of the women were found to be credit constrained. These figures support the notion that women are more likely to be restricted in their access to credit than men. What remains is to carefully explore two important questions: (i) are the factors affecting men's and women's individual access to credit different? and (ii) do intrahousehold dynamics affect whether spouses, particularly wives, are able to meet their needs for capital?

6. FACTORS THAT MAY INFLUENCE MEN'S AND WOMEN'S CREDIT RATIONING STATUS

Spouses' individual credit rationing status can be influenced by individual and household characteristics that affect their needs, resources, and access to opportunities; by intrahousehold dynamics that shape how these resources and opportunities are distributed among family members; and by village-specific characteristics that may determine the resources and opportunities available to their families because of where they are located. The variables described below, and defined in Table 2, are expected to capture these characteristics and help elucidate the main factors affecting men's and women's ability to meet their needs for capital.

(a) Household characteristics

(i) The household's wealth and liquidity, summarized by three variables: household wealth (defined as the value of the land they operate, their livestock assets, and their physical capital); the share of the household's wealth held in land; and the share of the household's wealth held in physical capital;
(ii) the household's human capital, represented by three variables: spouses' age, spouses' education, and the gender-specific availability of family labor;[14]

(iii) the household's collateral and tenure security, captured by a dummy indicating whether either spouse has land titled under their name; and
(iv) the household's credit history, summarized by a dummy indicating whether the husband had defaulted on a formal loan prior to the 1998–99 agricultural year, thus creating a public record that could influence the supply of capital directly available to him or to his wife.

Households that have more wealth, higher levels of education, and more family labor available are expected to have higher returns and to exhibit a higher demand for capital. They are also likely to have better access to capital: they may appear to lenders to present less of a credit risk; they are more likely to be aware of financial opportunities; and it may be easier for them to visit financial institutions, do the required paperwork for loan applications, and attend meetings.

The composition of the household assets may also affect the spouses' credit rationing status. Other things equal, households with larger shares of assets in land or physical capital (as opposed to livestock) may have higher returns to capital and lower liquidity, suggesting a higher demand for credit. On the other hand, these households may also have access to more funds.

Lack of titled land—the most traditional form of collateral—is often viewed as the bottleneck to improving access to credit. In Eastern Paraguay, titled land is required as collateral for loans over $1,600 from the State bank, and loans over $5,000 from the cooperatives. Households without titled land will likely be able to access some funds, but they face lower borrowing ceilings.

Women in Eastern Paraguay have only recently begun to receive loans and therefore do not have an established credit history of their own. There is, however, a high rate of default among the men. Their negative credit history can restrict the supply of funds directly available to them or to their wives; it can limit husbands' ability to intermediate funds to their wives; it can lead women to increase their demand for capital, borrowing more only to transfer funds to their husbands; and depending on the consequences they faced as a result of defaulting, it can affect whether spouses are willing to bear additional risk by borrowing.

Table 2. *Description of variables*

Variables	Definition
Household wealth and liquidity	
Household's wealth	Value of the land the family operates, their physical capital, and their livestock assets at the beginning of the agricultural year (in 000s of US$)
Share of household's wealth held as land	Value of the land the family operates/household's wealth
Share of household's wealth in physical capital	Value of their physical capital/household's wealth
Human capital	
Husband's (Wife's) age	Age of husband (wife) in # of years
Husband's (Wife's) education	# of years of education of husband (wife)
Additional male (female) adults	Number of additional male (female) adults
Credit history, collateral, and tenure security	
Has the husband defaulted?	(1 = yes, 0 = no)
Do they own titled land?	(1 = yes, 0 = no)
Intrahousehold dynamics	
Wife's share of household budget	Value of small animals/value of household's wealth
Is wife more educated than husband?	(1 = yes, 0 = no)
Did her parents have more land than his?	# of Has her parents had minus # of Has his parents had, when they got together
Does husband oppose to his wife taking loans?	(1 = yes, 0 = no) The dummy equals 1 if either spouse indicated that he does not want his wife to take loans for entrepreneurial activities

(b) *Intrahousehold dynamics*

(v) The wife's control over the household budget, represented by the share of small animals in the household's overall wealth;

(vi) the husband's opposition to his wife taking a loan, captured by a dummy that takes the value of one if either spouse indicated that the husband does not want his wife to get involved in market-oriented activities or take loans;

(vii) the wife's relative bargaining power, captured by two dummies: one which indicates whether the wife is more educated than the husband, and one which indicates whether her parents had more land than his parents at the time their relationship began;

(viii) interaction terms that combine the wife's relative bargaining power with her husband's objection to her taking a loan.

Results from three focus groups with men and three focus groups with women in the region uniformly suggest that in this rural setting, women participate in, and in most cases are solely responsible for, decisions regarding the purchasing, killing, and sale of the family's smaller animals and the income these animals generate. They also indicate that, in general, women are much less likely to be involved in financial decisions regarding the family's land, larger animals, market-oriented crops (except for vegetables grown in their small gardens grown and sold in local markets), and extractive products such as timber and bricks. [15] Spouses' responses to survey questions regarding who manages the income generated by each of their economic activities are consistent with these gendered spheres of financial decision making. Since wives tend to be in charge of the smaller animals and of the income these animals generate, I use the ratio of the value of small animals to the household's overall wealth as a proxy for the degree to which wives' have control over family assets.

As described in Section 3, spouses' preferences and bargaining power can influence who has access to and control over resources. If husbands' object to their wives taking loans, they can limit the supply of funds available to them. They can do so by refusing to loan funds to them, restricting their wives' indirect access to capital; or they can limit their wives' direct access to capital by not allowing them to go to the financial institutions and participate in committee meetings, by not helping them pay their membership shares, or by not granting them control over goods that can be offered as collateral. If their opposition is strong enough, they can also affect their wives' demand for capital. This would be the case if the emotional, psychological, or physical burden of contravening their husbands' preferences becomes so onerous that they actually drive the wives' demand for capital to zero. Note that in these cases the wives might indicate having an adequate supply of capital even when, effectively, they have no access to funds.

To capture husbands' preferences, the survey asked both spouses about the husband's attitude toward his wife taking loans. Based on their responses, I created a dummy that signals the husband's opposition to his wife taking loans if either the husband or the wife indicated that he would not approve of it, that he would be opposed to it, that he would interfere, or that he would get angry if she did take a loan.

Finally, a spouse is assumed to be in a stronger bargaining position when his or her gains from cooperation are smaller. This, in turn, depends on the wellbeing spouses can achieve on their own, when their partners' contributions are limited to the minimum established by social norms. Thus, I rely on two variables, both based on conditions prior to their marriage, that can serve as proxies for spouses' relative bargaining strength: which spouse is more educated and which spouse comes from a wealthier family (as measured by the land held by their parents). The rationale for these proxies is that, other things equal, a spouse will be in a better bargaining position if he or she is more educated or has a family that is better able to provide economic support.

(c) *Village characteristics*

(ix) Five regional dummies control for unobserved village characteristics.

The village dummies capture the combined effects of omitted factors common to all households in each region. These characteristics may affect spouses' demand for capital (e.g., regional variation in weather conditions, soil quality, prices, and access to markets) or the supply of funds available to them (e.g., number and size of the financial institutions in the area, and how time consuming or costly it is for borrowers to go to those institutions and for credit officers to visit clients).

The descriptive statistics shown in Table 3 allow some basic comparisons of families in which men or women are able to meet their needs for capital *versus* those in which they are credit constrained. These results suggest that the main factors affecting individuals' credit rationing status may differ by gender. Relative to the men who are able to meet their needs for capital, the men who are constrained are more likely to have a bad credit history and to belong to households with more male family labor. Women who are constrained, on the other hand, are more likely to belong to a wealthier household and to have less control over the family budget than the women who are not constrained. The results in Table 3 also suggest that spouses' ability to obtain adequate access to credit are correlated. Both men and women are more likely to be constrained if their spouses are also constrained. A more in-depth analysis of how these factors influence men's and women's position in the credit market follows.

7. ECONOMETRIC ASSESSMENT OF THE FACTORS AFFECTING INDIVIDUALS' ACCESS TO CREDIT

Denote as $S_i + \theta_i$, the maximum amount of capital that agent i can borrow, at the market interest rate, from the market S_i or from his/her spouse θ_i. Agent i's supply of credit is a function of household, H_i^S, intrahousehold, W_i^S, and village characteristics, V_i^S, as

$$S_i + \theta_i = \gamma^S + \alpha^S H_i^S + \beta^S W_i^S + \delta^S V_i^S + \varepsilon_i^S. \tag{10}$$

Denote as D_i, agent i's demand for capital, which is a function of socio-economic household characteristics, H_i^D, intrahousehold dynamics, W_i^D, and village characteristics, V_i^D, as

$$D_i = \gamma^D + \alpha^D H_i^D + \beta^D W_i^D + \delta^D V_i^D + \varepsilon_i^D. \tag{11}$$

Data limitations prevent the estimation of these two structural equations. However, the probability that agent i will be credit constrained can be estimated as the reduced-form

$$\Pr[D_i > S_i + \theta_i] = \gamma + \alpha H_i + \beta W_i + \delta V_i + \varepsilon_i, \tag{12}$$

where $H_i = H_i^D \cup H_i^S$, and W_i and V_i can be similarly defined (see Barham *et al.*, 1996; Kochar, 1998; Conning, 1996; Mushinski, 1999 for other examples of reduced-form estimations of households' credit rationing). Under this specification, the

Table 3. *Descriptive statistics*

	Men		Women		All
	Unconstrained	Constrained	Unconstrained	Constrained	
Spouse's access to credit					
Is husband constrained?			0.105 (0.308)	0.369** (0.488)	0.167 (0.374)
Is wife constrained?	0.178 (0.383)	0.518** (0.507)			0.235 (0.425)
Household wealth and liquidity					
Household's wealth	3.926 (3.016)	5.319 (4.021)	3.738 (2.512)	5.533* (4.693)	4.159 (3.238)
Share of household's wealth held as land	0.417 (0.174)	0.404 (0.151)	0.412 (0.177)	0.424 (0.151)	0.414 (0.170)
Share of household's wealth in physical capital	0.138 (0.104)	0.157 (0.121)	0.133 (0.101)	0.168 (0.151)	0.141 (0.107)
Human capital					
Husband's age	49.136 (11.961)	48.453 (7.713)	49.439 (12.053)	47.662 (8.633)	49.022 (11.349)
Husband's education	4.222 (2.410)	4.406 (2.031)	4.231 (2.443)	4.324 (2.027)	4.253 (2.347)
Additional male adults	0.353 (0.630)	0.695* (0.905)	0.369 (0.669)	0.545 (0.760)	0.410 (0.693)
Wife's age	44.231 (12.181)	43.612 (7.690)	44.152 (11.955)	44.046 (10.183)	44.127 (11.539)
Wife's education	4.463 (2.409)	5.006 (2.361)	4.384 (2.383)	5.107 (2.414)	4.554 (2.404)
Additional female adults	0.332 (0.606)	0.361 (0.548)	0.329 (0.582)	0.362 (0.642)	0.336 (0.595)
Credit history, collateral, and tenure security					
Has the husband defaulted?	0.283 (0.452)	0.835*** (0.376)	0.336 (0.474)	0.504 (0.506)	0.375 (0.485)
Do they own titled land?	0.426 (0.496)	0.533 (0.506)	0.432 (0.497)	0.483 (0.505)	0.444 (0.498)
Intrahousehold dynamics					
Wife's share of household budget	0.318 (0.170)	0.288 (0.164)	0.329 (0.177)	0.261** (0.131)	0.313 (0.169)
Is wife more educated than husband?	0.355 (0.480)	0.489 (0.507)	0.332 (0.472)	0.525 (0.505)	0.377 (0.486)
Did her parents have more land than his?	−6.023 (22.854)	−10.148 (52.603)	−6.302 (22.961)	−8.056 (45.916)	−6.714 (29.827)
Does husband oppose to his wife taking loans?	0.437 (0.497)	0.328 (0.476)	0.447 (0.499)	0.327 (0.474)	0.419 (0.495)
Husband opposes and wife is more educated	0.135 (0.343)	0.114 (0.322)	0.125 (0.332)	0.152 (0.363)	0.132 (0.339)
Husband opposes and wife's parents had more land	−0.957 (8.181)	−1.478 (4.637)	−1.228 (6.937)	−0.443 (9.841)	−1.044 (7.695)
No. of observations	173	37	165	45	210
Proportion	83%	17%	76%	24%	100%

t-Test rejects null hypothesis of equality of means between that mean and that of unconstrained individuals. In testing whether the means are different I allowed the variances to differ across samples. The null hypothesis is that the means are equal, against the two-sided alternative.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

parameters capture the combined supply and demand effects of each of these variables.

However, to evaluate spouses' individual position in the credit market and to allow the factors affecting men's and women's access to capital to be different, I estimate two separate models:

$$\Pr[D_i^m > S_i^m - \theta_i] = \gamma^m + \alpha^m H_i^m + \beta^m W_i^m + \delta^m V_i^m + \varepsilon_i^m \quad (13)$$

and

$$\Pr[D_i^f > S_i^f + \theta_i] = \gamma^f + \alpha^f H_i^f + \beta^f W_i^f + \delta^f V_i^f + \varepsilon_i^f, \quad (14)$$

where the superscripts m and f indicate male and female, respectively. Given the dichotomous nature of the dependent variables, namely, spouses' ability to meet their need for capital, Eqns. (13) and (14) are estimated using probit models.

While estimating the two models separately yields consistent results, unobserved factors such as spouses' preferences, intra-family transfers of capital, family members' health, and the family's status in the community may affect both spouses' access to credit. The efficiency of the results can therefore be improved by using a bivariate probit model to estimate both equations jointly:

$$\begin{cases} \Pr[D_i^m > S_i^m - \theta_i] = \gamma^m + \alpha^m H_i^m + \beta^m W_i^m \\ \qquad\qquad + \delta^m V_i^m + \varepsilon_i^m, \\ \Pr[D_i^f > S_i^f + \theta_i] = \gamma^f + \alpha^f H_i^f \\ \qquad\qquad + \beta^f W_i^f + \delta^f V_i^f + \varepsilon_i^f, \end{cases} \quad (15)$$

where the disturbances ε_i^m and ε_i^f have a standard bivariate normal distribution with an unknown correlation ρ:

$$[\varepsilon_i^m, \varepsilon_i^f] \approx BVN\left[\underline{0}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}\right]. \quad (16)$$

In this model, the disturbances, ε_i^m and ε_i^f, capture the excess demand shocks of the husband and the wife in couple i, and ρ embodies the extent to which the spouses' shocks are correlated. If spouses have perfect information and fully share their resources, financial intermediation within the family is perfect and ρ would be very close to one. If, instead, spouses have asymmetric information or conflicting preferences, one spouse's excess demand shock may not be completely passed on to the other spouse. The more segregated the economic spheres of the husband and wife are, the closer ρ would be to zero.

Finally, to learn more about financial intermediation between spouses, the results from the bivariate probit model will be used to look at the probability that a woman (man) has an adequate supply of capital *conditional* on her (his) spouse's credit rationing status. For instance, the probability that a woman would be credit constrained when her husband has adequate access to credit is given by [16]

$$\Pr[D_i^f > S_i^f + \theta_i | D_i^m \leqslant S_i^m - \theta_i, H_i, W_i, V_i]$$
$$= \frac{\Pr[D_i^f > S_i^f + \theta_i, D_i^m \leqslant S_i^m - \theta_i | H_i, W_i, V_i]}{\Pr[D_i^m \leqslant S_i^m - \theta_i | H_i, W_i, V_i]}. \quad (17)$$

8. DETERMINANTS OF MEN'S AND WOMEN'S CREDIT RATIONING STATUS IN RURAL PARAGUAY

Table 4 reports the results of the probit models used to predict men's and women's credit rationed status separately, ignoring the likely correlation between their error terms (Eqns. (13) and (14)). The results from these models shed light on the two issues of interest: they provide evidence that intrahousehold dynamics have an effect on women's position in the credit market and that credit rationing patterns do indeed differ by gender.

The set of variables affecting women's credit rationing status is quite different from those that impact men's position in the credit market. The results for men suggest that, at least for the strata of producers included in this study, the likelihood that they will meet their demand for capital is affected by the composition of the household assets, the family's endowment of male labor, and the family's credit history. Men are more likely to be constrained in households where there are more adult males and in households that have a larger share of their assets in livestock, as opposed to land or physical infrastructure. Men are also considerably more likely to be constrained if they have defaulted on a loan. Despite the fact that men have access to several financial institutions, and that those institutions do not share financial records, a bad credit history appears to have a strong impact on whether or not men are able to meet their need for capital. This is important considering the high rates of default among men in the region.

The factors that affect women's ability to meet their capital needs are different. Women are more likely to be credit constrained if they belong to wealthier households. Women from wealthy households may have access to assets, resources, or information that allow them to undertake high-return entrepreneurial activities. In fact, analysis of women's demand for capital based on these data and available from the author indicates that, other things equal, women in wealthier households are more likely to have a demand for capital. Thus, the results presented here suggest that, in this region, household wealth boosts women's demand for capital more than it expands the supply of funds available to them.

More importantly given the focus of this paper, the results are consistent with the notion that spouses may not pool all their resources: women's credit rationing status is affected by their control over household resources, their bargaining power, and their husbands' preferences. Interestingly, intrahousehold dynamics do not seem to affect men's ability to meet their needs for capital.

Women are less likely to be constrained if they have control over a larger share of the family assets, as proxied by the share of the household's wealth held in small animals, the income from which women are more likely to control. While one could argue that this result merely reflects the fact that families who invest in small animals have easier access to liquidity, it is important to note that this variable has no significant impact on whether or not men are able to meet their need for capital.

Women are also less likely to be constrained when their husbands are opposed to them taking loans. This finding may seem counterintuitive at first, but it is largely explained by the impact that husbands' preferences can have on their wives' demand for capital. Among families that reported husbands' opposition to their wives taking loans, only 25% of the women

Table 4. *Men's and women's credit rationing status—probit marginal effects (calculated at mean of the regressors)*

	Probability men are constrained	Probability women are constrained
Household wealth and liquidity		
Household's wealth	0.006 (0.006)	0.017* (0.010)
Share of household's wealth held as land	−0.451** (0.203)	−0.057 (0.297)
Share of household's wealth in physical capital	−0.627** (0.280)	−0.265 (0.399)
Human capital		
Husband's age	0.001 (0.003)	
Husband's education	0.011 (0.012)	
Additional male adults	0.064** (0.029)	
Wife's age		0.004 (0.003)
Wife's education		0.000 (0.018)
Additional female adults		−0.034 (0.046)
Credit history, collateral, and tenure security		
Has the husband defaulted?	0.300*** (0.072)	0.046 (0.066)
Do they own titled land?	−0.008 (0.044)	−0.078 (0.063)
Intrahousehold dynamics		
Wife's share of household budget	−0.198 (0.187)	−0.877*** (0.306)
Is wife more educated than husband?	0.110 (0.078)	0.036 (0.084)
Did her parents have more land than his?	0.000 (0.001)	0.000 (0.001)
Does husband oppose to his wife taking loans?	−0.010 (0.058)	−0.148* (0.078)
Husband opposes and wife is more educated	−0.006 (0.082)	0.362* (0.212)
Husband opposes and wife's parents had more land	−0.002 (0.002)	0.003 (0.003)
Village dummies		
Constant	−0.104 (0.254)	−0.452 (0.330)
Log *L*	−59.840	−77.758
No. of Observations: 210		

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

expressed a demand for capital. By contrast, almost twice as many (42%) of the women whose husbands were not opposed to them taking a loan, expressed a demand for capital.

There are at least two ways in which husbands can deter their wives from borrowing. They can reduce their wives' demand for capital by providing the goods their wives would have contributed to the household, or, alternatively, they can make it so burdensome for their wives to borrow as to effectively drive their demand to zero. With the data available, one cannot rigorously evaluate these two competing explanations. However, the notion that husbands might choose to keep their wives from taking loans by providing the goods desired by their wives is considerably weakened by our finding that women's control over the family budget has a significant impact on whether or not they are able to meet their needs for capital.

Finally, among women whose husbands oppose their taking a loan, those who are in a stronger bargaining position—that is, those who are more educated than their husbands—are more likely to be credit constrained. This result suggests that increases in women's bargaining power may raise women's demand for capital, offsetting some of their husbands' opposition, but that their stronger position is not sufficient to avail them of an adequate supply of funds.

As explained in Section 7, however, unobserved characteristics can also affect both spouses' credit rationing status. Estimates based on the bivariate probit model (Eqn. (15)) yield only slight improvements in efficiency over estimates using independent probit models, but they indicate that the error terms of men's and women's equations are correlated with an estimate of $\rho = 0.59$ that is significant at the 1% level.

These results support the notion that spouses' economies are linked and that they do share resources—one spouse's excess demand shock does extend to the other spouse. More precisely, the figures in the first row of Table 5 indicate that an average woman is approximately 42% more likely to be constrained when her husband is also constrained than when he is able to meet his needs for capital. Yet, while spouses may intermediate funds to each other, the results suggest that the sharing is not perfect: even when her husband has adequate access to credit, a woman from an average family has a 12% probability of being constrained.

In contrast, men's credit rationing status appears to be less influenced by intrahousehold dynamics. The probability that a man from an average family will be constrained is not significantly affected by his wife's bargaining power or control over the family budget. Nor does it fluctuate as much in response to his wife's credit rationing status (based on the figures in the first row of Table 5, the difference for men is 22%, as compared to 42% for women).

The figures presented in Table 5 permit a more in-depth look at the intermediation of funds within the household. The first two columns indicate the marginal contribution of each factor to the probability that an average man will be credit constrained, conditional on his wife credit rationing status. Similarly, columns three and four present the conditional marginal effects for women. [17]

Table 5. *Conditional marginal effects—bivariate probit (calculated at mean of the regressors)*

	Probability men are constrained		Probability women are constrained	
	If wife has adequate access	If wife is constrained	If husband has adequate access	If husband is constrained
Model predictions	3.8%	25.8%	11.5%	53.4%
Household wealth and liquidity				
Household's wealth	0.002 (0.005)	0.006 (0.020)	0.011 (0.013)	0.019 (0.027)
Share of household's wealth held as land	−0.300 (0.230)	−1.221 (0.813)	0.082 (0.371)	0.674 (0.893)
Share of household's wealth in physical capital	−0.403 (0.314)	−1.578 (0.979)	−0.084 (0.447)	0.505 (1.023)
Human capital				
Husband's age	0.001 (0.003)	0.005 (0.011)	−0.001 (0.001)	−0.003 (0.007)
Husband's education	0.006 (0.012)	0.025 (0.049)	−0.003 (0.006)	−0.016 (0.032)
Additional male adults	0.044 (0.034)	0.183 (0.113)	−0.020 (0.017)	−0.117[*] (0.069)
Wife's age	0.000 (0.001)	−0.003 (0.003)	0.003 (0.004)	0.008 (0.008)
Wife's education	0.000 (0.003)	0.002 (0.021)	−0.002 (0.025)	−0.005 (0.056)
Additional female adults	0.006 (0.008)	0.035[***] (0.051)	−0.041 (0.053)	−0.095 (0.117)
Credit history, collateral, and tenure security				
Has the husband defaulted?	0.227[***] (0.083)	0.569 (0.146)	−0.020 (0.070)	−0.235 (0.191)
Do they own titled land?	0.006 (0.039)	0.042 (0.173)	−0.059 (0.083)	−0.133 (0.199)
Intrahousehold dynamics				
Wife's share of household budget	−0.038 (0.152)	0.083 (0.640)	−0.769[**] (0.354)	−1.518[*] (0.849)
Is wife more educated than husband?	0.073 (0.082)	0.251 (0.244)	−0.012 (0.091)	−0.118 (0.232)
Did her parents have more land than his?	0.000 (0.001)	0.001 (0.003)	0.000 (0.001)	−0.001 (0.003)
Does husband oppose to his wife taking loans?	−0.008 (0.076)	0.012 (0.348)	−0.130 (0.124)	−0.266 (0.323)
Husband opposes and wife is more educated	−0.027 (0.064)	−0.142 (0.332)	0.394 (0.330)	0.455[**] (0.237)
Husband opposes and wife's parents had more land	−0.002 (0.003)	−0.008 (0.011)	0.004 (0.003)	0.010 (0.009)
Village dummies				
ρ	−0.593[***] (0.197)			
Log *L*: −132.411	No. of Observations: 210			

[*] Significant at 10%.
[**] Significant at 5%.
[***] Significant at 1%.

Table 6. *Predictions of households' credit rationing status—bivariate probit*

Who is constrained?	Observed (%)	Correct predictions (%)
Men		
Price rationed	83	82
Constrained	17	91
Total	**100**	**83**
Women		
Price Rationed	77	76
Constrained	23	90
Total	**100**	**79**
Households		
Both spouses price rationed	68	67
Only husband constrained	8	70
Only wife constrained	**15**	**66**
Both spouses constrained	9	92
Total	**100**	**69**

Of particular interest are the estimates in column 3 of Table 5 which shed light on the characteristics that may lead women to be credit constrained even when they belong to families that most studies would have categorized as having adequate access to credit. The findings indicate that when a husband has adequate access to capital, the only variable that appears to affect his wife's ability to meet her credit needs is her command over her family's budget. When a husband is unable to meet his own needs for capital (column 4 of Table 5), intrahousehold dynamics become even more important: in this case, the probability that the wife would be constrained is strongly determined by how much control she has over her family budget and, if the husband opposes her involvement in economic activities, by her bargaining power.

By contrast, the first two columns of Table 5 suggest that these same intrahousehold dynamics—spouses' preferences, bargaining power, and control over resources—do not have a significant impact on whether or not men have adequate access to capital.

Finally, the figures in Table 6 indicate that the model has a strong predictive power: it correctly predicted men's credit rationing status in 83% of the cases, women's credit rationing status 79% of the times, and was correct in predicting both spouses' credit rationing status for 69% of the households. Taken together, these findings shed light into the conditions that may affect spouses' individual access to credit and enhance our understanding of the role that intrahousehold dynamics can play in augmenting or attenuating how rural women are affected by imperfections in the financial market.

9. CONCLUSIONS

Credit rationing studies carried out at the household level and based on responses from male heads of households present an incomplete and biased assessment of who is likely to be constrained, why they are constrained, and what is the extent of the constraints. They ignore possibly conflictive intrahousehold dynamics and assume that imperfections in rural financial markets are gender-neutral. Instead, a more adequate assessment of the type and severity of credit rationing calls for an approach that takes into consideration both women's specific conditions and the possibility that spouses may differ in their preferences. The paper addresses these issues theoretically and empirically.

The Semi-Cooperative Household model developed for this analysis builds upon existing stylized frameworks of rural household decision making to account for imperfections in the financial markets that may differ across gender. It formalizes the conditions under which a woman's individual access to credit is affected by her own position in the financial market as well as by intrahousehold dynamics.

In addition, by relying on a unique and specially designed survey tool to gather information on both husbands' and wives' individual perceptions of their access to credit in rural Paraguay, this paper contributes to the empirical literature on credit rationing in three ways. First, by determining individual-specific credit rationing status, it improves over most studies that carry out the analysis at the household level. Second, it identifies gender-specific factors that constrain individuals' access to credit. Finally, it evaluates the extent to which women's limitations in the financial market are diminished by their husbands.

The paper's most significant empirical findings are that (i) women are more likely to be credit constrained than men under equivalent socio-economic conditions; (ii) women's rationing status responds to a different set of factors than men's; and (iii) contrary to what is implicitly assumed in most of the economic literature on rural financial markets, women may not always be able to rely on their husbands to help them overcome the obstacles they face in those markets. These results provide empirically sound support for the assumptions underlying women-targeted credit programs: the factors determining spouses' credit rationing status vary by gender, and intrafamily financial intermediation does not always compensate for women's insufficient direct access to credit.

Enhancing women's direct access to credit in Eastern Paraguay requires interventions at several levels. Efforts must be made to help relevant government actors understand the need to improve women's access to resources, in this case credit. As mentioned in the introduction, a growing body of rigorous research demonstrates that the constraints women face constitute a heavy social and economic burden to themselves, their families, and their communities. Removing these obstacles, and tapping into this unrealized potential, should therefore be important to national institutions such as the Department of Treasury, the Department of Agriculture, the Peasant Development Fund, the Secretary of Women, the Department of Health, and the Department of Education, as well as regional and local governments. It is important that these institutions send a clear message of their commitment to these efforts by introducing policy changes at the local and national levels that promote the creation and expansion of finance programs and institutions that are friendlier to women.

In parallel, considerable work needs to be done with the institutions that offer financial services in the region. These include State banks, cooperatives, and any other microfinance institutions that may have begun to operate there more recently. In particular, it is important to demonstrate to the directors and staff of the institutions, especially their credit officers, that women clients are just as creditworthy as the men and should be treated accordingly. This can be done by conducting analyses of the institutions' portfolios and assessing the quality of their loans: What percentage of their loans are to women? Are the characteristics of those loans different? What are their repayment rates? Some institutions may be able to carry out such analyses with their computerized information systems; others would need to rely on written or verbal reports from their credit officers. When asked, a number of the (male) officers interviewed for this study regarded women as good clients who are organized,

responsible, and exhibit good repayment behavior. It would be helpful to arrange for these officers to discuss their position and to share their knowledge with colleagues and with other organizations. In particular, they can help inform those officers who expressed concern about working with women because they felt women had no experience in income-generating activities and because they believed that women loan recipients would likely hand over funds to their husbands.

Financial organizations that agree to enhance their efforts to reach out to women will need to conduct thorough reviews of the products they are currently offering and of the processes involved in applying, receiving, and repaying loans. They will need to identify any steps or requirements that directly or indirectly affect women's opportunities to participate. If deemed appropriate, they might need to create financial products especially tailored to women's needs or to build in incentives that encourage staff to reach out to women. Critical to this entire process will be the involvement in all of these discussions of a number of women who are leaders in their communities. Such a measure will enhance the credibility of the organizations' intent to reach out to women, will provide them with a more in-depth understanding of the way current constraints operate, and will offer workable insights into how these constraints can be overcome.

NOTES

1. Exceptions are the study by Diagne and Zeller (2001) in which all adult household members were interviewed, and Baydas, Meyer, and Aguilera-Alfred (1994) in which both male and female microentrepreneurs were interviewed.

2. Even when no such policies exist at the institutional level, married women in smaller and tighter communities may be denied credit if bank employees—who are typically male—believe they would be overstepping a friend's dominion by giving credit to his wife without prior consent from her husband (Ospina, 1998).

3. A study of the financial sources for women microentrepreneurs in Chile found that "...women were less aware than men of financial institutions and instruments such as loans available. Women identified fewer sources of finance and were more misinformed than men regarding collateral requirements and types of enterprises financed by commercial banks." (in Almeyda, 1996, p. 46.).

4. It can be difficult for a woman to obtain a male guarantor, especially when programs limit guarantors to sponsoring one loan at a time (Baydas et al., 1994; Ospina, 1998).

5. Lower literacy levels and lack of experience with financial institutions may prevent women from preparing adequate feasibility studies (Lycette & White, 1989). Women's educational level—particularly for women old enough to engage in income-generating activities—varies widely across countries but still tends to be lower than men's (Almeyda, 1996; Baydas et al., 1994; Morris & Meyer, 1993). Even when literate, women often feel intimidated by and less confident about applying for loans from traditional financial institutions, especially when they lack previous credit experience (Kurwijila & Due, 1991; Weidemann, 1992).

6. Poor women, especially those from households close to the survival margin, give primary importance to satisfying the basic needs of their children and themselves and may be more averse to undertaking risky business activities (Almeyda, 1996; Morris & Meyer, 1993). For the same reasons, women are also more likely to demand ex-post consumption loans. However, the focus of this study is on ex-ante production loans, the only loans offered by formal lenders in the region.

7. This gender-based specification of spouses' distinct use of their time is consistent with empirical findings that household services such as cooking, childcare, laundry, and cleaning in peasant families are performed solely by women (Fletschner & Ramos, 1999; Restrepo Chebair & Reichmann, 1995).

8. The assumption of perfect intrafamily repayment could be justified on the grounds that spouses interact closely and possess precise information about their partners. However, the ability to enforce intrafamily-agreements and the consequences 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 for 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, Witte, & Long, 1991). This suggests that the model, as specified, allows us to focus on the best-case scenario, one in which agents (women) do not assume additional risks by lending to their spouses.

9. In other words, I limit the exercise to cases in which women (or men) own sufficient 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 Ospina, 1998; Deere & Leon, 1997).

10. The characterization of spouses' threat points, V^m and V^f, as a non-cooperative equilibrium is based on the model developed by Lundberg and Pollak's (1993).

11. The communities included in this study are San Juan, Yukyty, La Novia, Leiva'i, Piquete Cue, Ka'atymi 29, Costa Villalba, San Isidro, Calle 10, Ykua Pora, San Enrique, Calle 1 – Esperanza, Calle 1 – San Agustín, Guavira, Moreira, Calle 2, Calle 3, Calle 4, Arroyo Moroti, Santo Domingo, San Roque, and Calle 12. The cooperatives serving this area are Cooperativa Coronel Oviedo, Cooperativa Peteichapa, and Cooperativa Blas Garay.

12. As with any voluntary program, I am faced with a selection problem. Women who chose to participate may be systematically different from those who chose not to. Women who joined the program tend to be slightly younger and have younger spouses than those who did not. However, in comparing the two groups, I find no significant variation when it comes to the amount of land owned, titled land, family size, number of small children, and years of education.

13. More specifically, Petrick (2005) aggregated these approaches into (i) direct measurement of loan transaction costs; (ii) qualitative information collected in interviews; (iii) the credit limit concept; (iv) spill-over effects; (v) econometric household modeling; and (vi) an econometric analysis of dynamic investment decisions.

14. I separate additional male adults from additional female adults because of the consistent empirical finding that chores and responsibilities are defined along gender lines (Fletschner & Ramos, 1999; Restrepo Chebair & Reichmann, 1995).

15. See Fletschner and Ramos (1999) for more detailed results of the set of focus group exercises designed to help understand how men and women in rural Paraguay differ in their access to resources, in their decision-making spheres, and in their activities for which they tend to be responsible.

16. A woman's probability of being credit constrained when her husband is also constrained, and the corresponding probabilities for men's credit rationing status can be derived similarly.

17. Greene (1997) provides a detailed derivation of the marginal effects on the conditional probabilities.

REFERENCES

Almeyda, G. (1996). Money matters. Reaching women microentrepreneurs with financial services. Inter-American Development Bank: Washington, DC.

Alvear Valenzuela, M. S. (1987). Situación de la Mujer Campesina Frente a la Legislación. In *Mujeres Campesinas en América Latina*. Santiago, Chile: FAO.

Barham, B., Boucher, S., & Carter, M. (1996). Credit constraints, credit unions, and small-scale producers in Guatemala. *World Development, 24*, 793–806.

Baydas, M. M., Meyer, R. L., & Aguilera-Alfred, N. (1994). Discrimination against women in formal credit markets: Reality or rethoric?. *World Development, 22*(7), 1073–1082.

Berger, M. (1989). An introduction. In M. Berger, & M. Buvinic (Eds.), *Women's ventures: Assistance to the informal sector in Latin America*. West Hartford, Connecticut: Kumarian Press.

Besley, T. (1995). Savings, Credit, and Insurance. In J. Behrman, & T. N. Srnivasan (Eds.). *The handbook of development economics* (Vol. 3). Holland: Amsterdam.

Boucher, S., Guirkinger, C., and Trivelli, C. 2006. Direct Elicitation of Credit Constraints: Conceptual and Practical Issues with and Empirical Application to Peruvian Agriculture. Unpublished manuscript, Department of Agricultural and Resource Economics.

Carter, M., & Katz, E. (1997). Separate spheres and the conjugal contract: Understanding the impact of gender-biased development. In L. Haddad, J. Hoddinott, & H. Alderman (Eds.), *Intrahousehold resource allocation in developing countries: Methods, models, and policies* (pp. 95–111). Baltimore, MD: Johns Hopkins University Press.

Conning, J. (1996). Credit Rationing and Spillover in a Rural Loan Market in Chile, IRIS working paper no. 194.

Deere, C., & Leo, M. (2001). Empowering women. Land and property rights in Latin America. University of Pittsburgh Press.

Deere, C., & Leon, M. (1997). Women and Land Rights in the Latin American Neo-Liberal Counter-Reforms. Working Paper #264. Women in International Development. Michigan State University.

Diagne, A., & Zeller, M. (2001). Access to Credit and its Impact on Welfare in Malawi. Research Report 116, IFPRI, Washington.

Duflo, E., & Udry, C. (2004). Intrahousehold Resource Allocation in Côte d'Ivoire: Social Norms, Separate Accounts and Consumption Choices. National Bureau of Economic Research, Inc, NBER Working Papers: 10498.

Feder, G., Lau, L., Lin, J., & Luo, X. (1990). The relationship between credit and productivity in Chinese agriculture: a microeconomic model of disequilibrium. *American Journal of Agricultural Economics, 72*, 1151–1157.

Fletschner, D. (2008). Women's access to credit: Does it matter for household efficiency?. *American Journal of Agricultural Economics, 90*(3), 669–683.

Fletschner, D., & Carter, M. (2008). Constructing and reconstructing gender: Reference group effects and women's demand for entrepreneurial capital. *Journal of Socio-Economics, 37*(2), 672–693.

Fletschner, D., & Ramos, N. (1999). Tienen las Mujeres las Mismas Oportunidades que los Hombres? Resultado de Seis Jornadas de Trabajo Grupal en San Pedro, Concepción y Coronel Oviedo. Fondo de Desarrollo Campesino. Paraguay.

Ghosh, P., Mookherjee, D., & Ray, D. (2001). Credit rationing in developing countries: An overview of the theory. In D. Mookherjee, &

D. Ray (Eds.), *Readings in the theory of economic development* (pp. 283–301). Malden, MA: Blackwell.

Greene, W. (1997). Econometric analysis. *3rd ed.*. New York: Simon and Schuster.

Haddad, L., Hoddinott, J., & Alderman, H. (1997). Introduction: The scope of intrahousehold resource allocation issues. In L. Haddad, J. Hoddinott, & H. Alderman (Eds.), *Intrahousehold resource allocation in developing countries: models, methods, and policy*. Baltimore, Maryland: The Johns Hopkins University Press.

Hoddinott, J., & Haddad, L. (1994). Does female income share influence household expenditure patterns? Evidence from Cote d'Ivoire. *Oxford Bulletin of Economics and Statistics*.

Jappelli, T. (1990). Who is credit constrained in the US economy?. *Quarterly Journal of Economics, 104*, 220–234.

Kochar, A. (1998). An empirical investigation of rationing constraints in rural credit markets in India. *Journal of Development Economics, 53*, 339–371.

Kurwijila, R., & Due, J. M. (1991). Credit for Women's Income Generation: A Tanzanian Case Study. Unpublished manuscript.

Lundberg, S., & Pollak, R. A. (1993). Separate spheres bargaining and the marriage market. *Journal of Political Economy, 101*(6), 988–1010.

Lycette, M., & White, K. (1989). Improving women's access to credit in Latin America and the Caribbean: Policy and project recommendations. In M. Berger, & M. Buvinic (Eds.), *Women's ventures: assistance to the informal sector in Latin America*. West Hartford, Connecticut: Kumarian Press.

Morris, G., & Meyer, R. (1993). Women and financial services in developing countries: a review of the literature. Economics, and Sociology, Occasional Paper No. 2056, Department of Agricultural Economics and Rural Sociology, Ohio State University, Columbus, Ohio.

Moser, C. (1993). *Gender planning and development: Theory, practice, and training*. New York: Routledge.

Mushinski, D. (1999). An analysis of loan offer functions of banks and credit unions in Guatemala. *Journal of Development Studies, 36*(2), 88–112.

Ospina, R. I. 1998. Perspectiva de Genero en la Mision Rural: Para Dotar de Poder a las Mujeres, Mision Rural Proyecto Proequidad GTZ/DNP, Santa Fe de Bogotá, Colombia.

Petrick, M. (2005). Empirical measurement of credit rationing in agriculture: A methodological survey. *Agricultural Economics, 33*, 191–203.

Pitt, M., Khandker, S., Chowdhury, O., & Millimet, D. (2003). Credit programs for the poor and the health status of children in rural Bangladesh. *International Economic Review, 44*(1), 87–118.

Pitt, M., & Khandker, S. (1998). The impact of group-based credit programs on poor households in Bangladesh: Does the gender of participants matter?. *The Journal of Political Economy, 106*(5), 958–997.

Restrepo Chebair, E., & Reichmann, E. (1995). *Balancing the double day: Women as managers of microenterprises*. Monograph Series No. 10, Cambridge, Mass: ACCION International.

Sadoulet, E., & de Janvry, A. (1995). *Quantitative development policy analysis*. Baltimore: Johns Hopkins University Press.

Singh, I., Squire, L., & Strauss, J. (1986). *Agricultural household models: Extensions, applications, and policy*. Baltimore: Johns Hopkins University Press.

Sisto, M. (1996). La Política del Sector Agropecuario Frente a la Mujer Productora de Alimentos en el Cono Sur. Síntesis, Análisis Comparativo, Conclusiones y Recomendaciones. In B. Kleysen (Ed.), *Productoras Agropecuarias en América del Sur*. San José, Costa Rica: IICA-BID.

Tauchen, H., Witte, A., & Long, S. (1991). Domestic violence: A nonrandom affair. *International Economic Review, 32*(May), 491–511.

Thomas, D. (1997). Incomes, expenditures, and health outcomes: Evidence on intrahousehold resource allocation. In L. Haddad, J. Hoddinott, & H. Alderman (Eds.), *Intrahousehold resource allocation in developing countries: Models, methods, and policy*. Baltimore, Maryland: The Johns Hopkins University Press.

Udry, C. (1996). Gender, agricultural productivity and the theory of the household. *Journal of Political Economy, 104*, 1010–1046.

Weidemann, C. J. (1992). Financial Services for Women. *Tools for Microenterprise Programs, GEMINI*.

Zeller, Manfred (1994). Determinants of credit rationing: A study of informal lenders and formal credit groups in Madagascar . *World Development, 22*, 1895–1907.

Available online at www.sciencedirect.com

ScienceDirect