

Contents lists available at [SciVerse ScienceDirect](#)

Journal of Development Economics

journal homepage: www.elsevier.com/locate/devec

Microfinance and gender empowerment

Thi Minh-Phuong Ngo^a, Zaki Wahhaj^{b,*}^a UNICEF West and Central Africa Regional Office, Dakar, Senegal^b Department of International Development, University of Oxford, 3 Mansfield Rd, OX1 3TB, United Kingdom

ARTICLE INFO

Article history:

Received 3 December 2008

Received in revised form 27 August 2011

Accepted 5 September 2011

Available online xxx

JEL classification:

C7

D1

O1

Keywords:

Microfinance

Gender

Intra-household bargaining

ABSTRACT

In this paper, we develop a theoretical model of household production, bargaining and credit to analyse how access to microcredit affects intra-household decision-making and welfare, and identify conditions under which female household members are most likely to benefit. We show that, consistent with ethnographic accounts of the impact of microcredit programmes on poor households, access to loans can lead to a variety of outcomes for intra-household decision-making and welfare depending on initial conditions and that, in some instances, women borrowers may experience a decline in welfare. We identify two instances in which a woman is most likely to benefit: when there is scope for investing the loan profitably in a joint activity, and when a large share of the household budget is devoted to household public goods.

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1. Introduction

Over the past 30 years, microfinance practitioners and policy-makers have gravitated towards the view that targeting women in microcredit programmes is the most effective means to deliver wider social benefits. Providing women access to credit, it is argued, would strengthen their bargaining position within the household, and women are more likely than men to spend resources in ways that benefit the entire household (Armendariz de Aghion and Morduch, 2005; Khandker, 2003; Pitt et al., 2006).

Indeed, there exists a large body of evidence which shows that, controlling for total household resources, increasing resources in the hands of female household members has a greater impact on family welfare (Thomas, 1990, 1994; Lundberg et al., 1997; Thomas et al., 2002; Duflo, 2003). And bargaining models of the household with non-cooperation or divorce as the threat-point would lead to the same prediction if women are assumed to have a stronger preference than men for family-related goods (Bergstrom, 1996; Lundberg and Pollak, 1993). However, making predictions about the potential impact of microfinance on the basis of this theory and evidence is far from straightforward: while women may readily keep control over cash transfers, access to credit necessarily triggers a complex decision-making process – including decisions about whether to participate in a credit programme, how to invest the loan, and how to

divide the proceeds of the investment – in which household members have the incentive to make strategic choices to protect their individual welfare. This complexity is also highlighted by congruent evidence that many women borrowers relinquish the use of their loans, in part or in whole, to their spouses (Goetz and Gupta, 1996; Kabeer, 2001; Ngo, 2008; Rahman, 1999).

In this paper, we develop a theoretical model of household production, bargaining and credit to analyse how access to microcredit would affect intra-household decision-making and welfare and, in particular, identify conditions under which female household members are most likely to benefit. Our main interest is in patriarchal societies where social norms may impose strong restrictions on the type of productive activities a married woman may undertake. Therefore, we distinguish between three types of productive activities for men and women: (i) activities which a household member may carry out autonomously, (ii) activities which, given traditional gender roles, would require the active cooperation of both spouses, and (iii) activities which conflict with socially defined gender roles such that one would be willing to engage in them only after he or she has exited the marriage and gained pariah status within the community.

We show that access to microfinance can lead to a variety of outcomes for intra-household decision-making and welfare depending on initial conditions, consistent with ethnographic accounts of the impact of microcredit programmes on poor households (Kabeer, 2001; Rahman, 1999). A woman with few skills to carry out an productive activity that is sanctioned by socially defined gender norms is unlikely to experience an increase in bargaining power within the household from access to a credit programme. On the other hand, a

* Corresponding author. Tel.: +44 1865271913; fax: +44 1865281801.

E-mail addresses: tmpngo@unicef.org (T.M.-P. Ngo), zaki.wahhaj@qeh.ox.ac.uk (Z. Wahhaj).

woman who has sufficient skills to invest the loan profitably in an autonomous activity may have her husband veto the loan, or appropriate it for his own use, to retain his own bargaining power. We identify two instances in which a woman is most likely to experience an improvement in welfare; namely, when there is scope for investing the loan profitably in a joint activity, and when a large share of the household budget is devoted to household public goods. The reason is that under either of these conditions, an investment in a household activity causes a comparatively small shift in intra-household bargaining power, and therefore household members are less likely to exercise a veto or appropriate a loan to preserve their future bargaining position. We also identify a situation – namely, when a household member's welfare under non-cooperation is low compared to that from exiting the household – when access to the credit programme may actually weaken his or her bargaining position.

A number of recent papers in the literature have used theoretical models of intra-household bargaining to analyse household choices regarding the control and use of microcredit loans. Ligon (2002) showed, using a framework of dynamic household bargaining, that even if a woman is able to invest a loan profitably in an autonomous activity, her bargaining position in the household may be undermined if the initiative causes her income stream to become more uncertain. In this case, she would be better off handing over the loan money to her husband rather than investing it herself. Van Tassel (2004) showed that relinquishing control of a loan can be a way for a woman to ensure that her husband helps to repay the debt and thereby secure access to future credit in the event that the current loan project fails.

The key innovations in our theoretical framework compared to these contributions is the introduction of a sphere of joint production, and the incorporation of household public goods into the model. Allowing households to vary in terms of the scope of joint production, and the share of expenditures on household public goods, leads to the afore-mentioned predictions of heterogeneity in impact; and enable us to formally identify the conditions under which women are most likely to benefit from access to such programmes in patriarchal societies. Our characterisation of the role of joint production in household bargaining is anticipated by Kanbur and Haddad (1994). However, to our knowledge, the implications of these results for microfinance programmes have not previously been considered; furthermore, we provide a generalisation of the results in Kanbur and Haddad (1994).

Our assumptions relating to the different spheres of production within the household are motivated by ethnographic studies which indicate that the scope for women to invest capital in purely autonomous activities is often circumscribed by gender norms that delineate the division of labour and responsibilities between men and women in the household and the wider community (Johnson, 2004; Kabeer, 1998, 2001; Mayoux, 1999; Rahman, 1999). In particular, social conventions and gender norms regarding the division of labour may oblige women to remain near the home to take care of children, or restrain their ability to travel to markets.

Limitations on women's self-employment opportunities within socially prescribed gender norms have been widely documented. For example, in Bangladesh, where the practice of purdah puts considerable limits on women's mobility in the public space, women who invest their loans in their own activities remain bound to home-based activities (e.g. poultry or milk cow rearing) in line with traditions stipulating that these activities are managed by women. Loans used by men and women in joint enterprises also retain the same gender structure, for example with women making puffed rice or sweet, which are then sold by their husbands (Anderson and Eswaran, 2007; Hashemi et al., 1996; Kabeer, 1998).

Our focus on cooperation in the household also echoes recent concerns about the consequences of excluding men in microfinance (Armendariz de Aghion and Roome, 2008) or health (Mullany et al., 2005) programmes, when their participation is important for

programme success; and evidence that household enterprises that are managed with the cooperation of both spouses are more likely to make efficient use of capital injections (de Mel et al., 2009).

The model on household production, bargaining and credit is developed and analysed in Section 2 of the paper. In Section 3, we illustrate the model's predictions using numerical simulations and by drawing on ethnographic studies of the outcomes of microcredit programmes. Section 4 concludes with further discussions of our theoretical results.

2. A model of household bargaining, joint production and credit

Imagine a household consisting of a husband, h and a wife w . They can engage in production in a number of different activities, represented by the set S . Each productive activity requires assets that are specific to that activity – for example, a husking machine for husking paddy – and so we represent household assets by a vector $\mathbf{k} = (k_1, \dots, k_S)$, where k_s is the value of assets specific to activity s . Each activity also involves performing various tasks that, because of the prevailing gender-related norms, can only be performed by a man, while others can only be performed by a woman. Therefore, a unit of effective labour by the husband in an activity is not equivalent to a unit of effective labour by the wife, and output depends on the specific levels of each. Each spouse is endowed with one unit of labour per period. Formally, output in activity s is given by

$$y_s = g_s(k_s, l_s^h, l_s^w) \\ l_s^h = \gamma_s \left(\frac{l_s^h}{l_s^w} \right)^{\theta_s} (l_s^w)^{1-\theta_s}$$

where l_s^h, l_s^w measure the labour input by the husband and the wife, respectively, in activity s . The parameter θ_s captures the relative importance of male and female labour, and γ_s the combined skill level of the couple, in the activity concerned. We assume $g_s(\cdot)$ is weakly increasing and concave in both inputs.

Since we wish to examine the effects of credit on bargaining and cooperation within the household, we consider the case where the household has three productive activities: $S = \{m, f, c\}$, $\theta_m = 1, \theta_f = 0, \theta_c \in (0, 1)$ (the letters stand for 'male', 'female' and 'cooperative'). Thus, the husband and wife can undertake production independently in activities m and f respectively, but some labour input from both is required for positive output in activity c .

The husband and the wife have control rights over the output from activities m and f respectively. Either spouse may have full control rights over output in activity c , without affecting our analysis: under non-cooperation, the spouse without control rights would refuse to provide labour for this activity, and thus output would equal zero. Therefore, in the absence of an agreement about the allocation of labour and expenditures, each spouse devotes all her labour to her own activity. The resulting autarkic incomes are given by $y_a^h = g_m(k_m, \gamma_m), y_a^w = g_f(k_f, \gamma_f)$.

Although h and w would also engage in autonomous production in the event of divorce, their incomes in this case need not correspond to their autarkic income levels. This is because social norms may impose (or relax) constraints on the types of assets that they can control and the types of activities they can undertake within a marriage. Therefore, we represent income levels following divorce by a different set of variables, $\mathbf{y}_e = (y_e^h, y_e^w)$.

At the end of production, total household income is given by $y = \sum_{s \in S} y_s$ (we assume, for ease of notation, that each output has a price of 1). The income can be spent on a private consumption good for either spouse or on one of two household public goods. We denote by $\mathbf{x} = (x_h, x_w, q_1, q_2)$ a consumption bundle for the household, where x_i is the level of spending on person i 's private good and q_1 and q_2 are the levels of spending on the household public goods.

Adopting the notion of ‘separate spheres’ in consumption expenditures introduced by [Lundberg and Pollak \(1993\)](#), we assume that decisions related to expenditures on the public good q_1 falls within the husband's traditional sphere of responsibility so that “in the absence of a cooperative agreement, the husband decides unilaterally on the level of q_1 consumed by the household” ([Lundberg and Pollak, 1993; page 997](#)). In a similar fashion, the public good q_2 falls within the wife's traditional sphere of responsibility. Thus, under non-cooperation, the husband decides how to allocate his autarkic income y_a^h on the goods x_h and q_1 and the wife decides how to allocate her autarkic income y_a^w on the goods x_w and q_2 .

The preferences of the household members are represented by the utility functions $U^k(x_k, q_1, q_2)$, $k = h, w$, where $U^k(\cdot)$ is increasing and strictly concave in each of its arguments. For certain results, we shall impose additional structure on the utility functions as follows:

Assumption 1. $U^k(x_k, q_1, q_2) = \alpha_k(x_k)^{\rho} + \beta_{1k}(q_1)^{\rho} + \beta_{2k}(q_2)^{\rho}$ for $k = h, w$, where $\alpha_k, \beta_{1k}, \beta_{2k} > 0$ and $\alpha_k + \beta_{1k} + \beta_{2k} = 1$; $0 < \rho < 1$.

Under [Assumption 1](#), the utility functions represent the same underlying preferences as a constant-elasticity-of-substitution (CES) utility function.

2.1. Bargaining

To model the process whereby the couple reach an agreement, we make use of the household bargaining game proposed by [Bergstrom \(1996\)](#) and [Kanbur and Haddad \(1994\)](#). The husband and wife can propose an allocation of labour and consumption expenditures in alternate periods, which the spouse can then accept or refuse. If an offer is accepted, it becomes the standing agreement according to which resources are allocated within the household thereafter, unless it is rejected by the spouse in a subsequent period. When there is no standing agreement, the spouses allocate labour and spend their incomes independently. In addition, either spouse i may choose to walk away from the marriage in any period (before production takes place), in which case he or she would receive the income y_i^e in each period thereafter (once the marriage has broken down, there is no scope of renegotiation possible). Formally, within each period, the bargaining process involves three stages as follows:

Stage 1: If there was no agreement in place in the previous period, then the current offerer can propose an allocation of labour $(l_s^h, l_s^w)_{s \in S}$ and a consumption bundle \mathbf{x} . This then becomes the ‘standing offer’. Alternatively, the current offerer can choose to exit the marriage at this stage.

Stage 2: If there was an agreement in place in the previous period or a standing offer, then the spouse of the offerer must choose whether to (continue to) accept or reject it. If the offer or agreement is rejected, there is no agreement for the remainder of the period. If it is accepted, then there is an agreement in place corresponding to the ‘standing offer’ or previous agreement. Alternatively, the spouse can choose to exit the marriage at this stage.

Stage 3: If there is an agreement in place, then resources are allocated according to the agreement. If not, then the spouses individually choose to allocate labour across productive activities, and spend their autarkic incomes within their separate spheres.

2.2. Access to credit

We now introduce a microcredit programme into this environment, in order to examine its effects on household production and decision-making. A loan product is described by a 4-tuple $\mathcal{L} = (L, z, n, \sigma)$ where L is the size of the loan, which must be repaid, including interest, in equal installments of z over n periods; and $\sigma \in [0, 1]$ is the fraction of each loan installment that the husband is

obliged to pay in the event that cooperation between the spouses breaks down. This last parameter may be determined by the terms of the loan, informal understanding with the bank officer, or by the relevant social norms.

If the size of the loan is small, and investments are lumpy, say the purchase of a cow or a plot of land, then it may well be that the loan will be invested exclusively in one sphere of production within the household. In the subsequent analysis, this is our working assumption. The presence of a microcredit programme implies that the household has to decide not only on the allocation of labour across productive activities and household expenditures, but also, when a new loan is available, on whether or not to take out a loan and, if they do, on how to invest the loan. Therefore, we introduce two additional stages to those described earlier to model decision-making within each period:

Stage P: If the household has access to a credit programme, each spouse states a preference, $P^i \in \{Y, N\}$ about whether or not to participate. The household's decision is determined by the function $P(P^h, P^w): \{Y, N\} \times \{Y, N\} \rightarrow \{Y, N\}$.

Stage I: If $P = Y$, then the household receives a loan of size L ; and each spouse states a preference, $I^i \in \{m, f, c\}$ about the activity in which the loan money should be invested. The household's decision is determined by the function $I(I^h, I^w): \{m, f, c\} \times \{m, f, c\} \rightarrow \{m, f, c\}$. The new level of capital in the activity, s , chosen for investment, becomes $k_s + L$.

The functions $P(\cdot)$ and $I(\cdot)$ define how the household members' preferences for borrowing and investment translate into a collective household decision. The decision-making authority of each spouse regarding financial matters may depend on the cultural context, the precise mechanism through which credit is delivered (e.g. whether or not it is given exclusively to women) and the initial levels of bargaining power within the household.

We assume that there is full enforcement in loan repayment. Therefore, the presence of an outstanding loan lowers the disposable income of household member i under non-cooperation to $y_i^a - \sigma z$ in each period (where $\sigma^h = \sigma$, and $\sigma^w = 1 - \sigma$). Also, while there is an outstanding debt, a cooperative agreement specifies how to allocate the total disposable income $y - z$. Stages P and I are followed by stages 1–3 as defined above, except for the adjustments to disposable income indicated here.

During the time interval that the household is obliged to repay the loan, non-cooperation involves having to pay some part of the installment out of one's own autonomous income. The cost of non-cooperation during the time interval that the loan is being repaid depends on the installment shares σ and $1 - \sigma$, and differs from that after the loan has been fully repaid. Therefore, full repayment of the loan will potentially lead to a shift in bargaining powers within the household and cause any previous agreement in the allocation of resources to be renegotiated.¹

We assume, for simplicity, that the household has access to only one loan. We briefly consider how the availability of repeated loans impact upon the strategic choices of household members in [Section 2.7](#).

2.3. Solution to the bargaining problem

In describing steps 1–3 in the bargaining process, we have assumed, implicitly, that when a couple reach an agreement, they are able to commit to make use of the income generated from the joint

¹ Indeed, since we have assumed that the time interval between offers is close to zero, any previous agreement will always be renegotiated after the last installment is paid.

activity at the end of the production process in accordance with the consumption bundle agreed upon. Under this assumption, any rational proposal will involve an efficient allocation of labour resources within the household; because an offer that involves an efficient allocation of labour can always be made more attractive to both spouses than another which does not. Thus, the total household income in any cooperative agreement will be given by the following maximisation problem:

$$y(\mathbf{k}, \gamma) = \max_{\left(\frac{l_s^h}{l_s^w}\right)_{s \in S}} \sum_{s \in S} g_s(k_s, \gamma_s (l_s^h)^{\theta_s} (l_s^w)^{1-\theta_s}) \quad (1)$$

subject to $\sum_{s \in S} l_s^i \leq 1$ for $i = h, w$

where $\mathbf{k} = (k_m, k_f, k_c)$, $\gamma = (\gamma_m, \gamma_f, \gamma_c)$. In the same manner, any rational proposal should specify expenditures that are Pareto-efficient; because, for any consumption bundle that is inefficient, it is always possible to find, by definition, another bundle which is more attractive to both spouses. Therefore, given total household income y , any consumption bundle agreed upon will belong to the set $\{\mathbf{x}(y, \lambda) : \lambda \in (0, 1)\}$ where

$$\mathbf{x}(y, \lambda) = \arg \max_{\mathbf{p} \mathbf{x} \leq y} (1-\lambda)U^h(\mathbf{x}) + \lambda U^w(\mathbf{x}) \quad (2)$$

and $\mathbf{p} = (p_h, p_w, p_1, p_2)$ describes the prices of the four consumption goods. Thus, any bargaining solution can be fully summarised by the parameter $\lambda \in [0, 1]$. Here, λ is the wife's relative Pareto weight, while $1 - \lambda$ is the husband's Pareto weight. Note that $\mathbf{x}(y, 0)$ represents the household expenditures that would result if they were decided upon entirely by the husband, while $\mathbf{x}(y, 1)$ represents the expenditures that the wife would choose on her own. In this sense, λ can be said to capture decision-making authority or 'say' within the household.

We introduce the indirect utility functions $V^i(y, \lambda) = U^i(\mathbf{x}(y, \lambda))$ for $i = h, w$ to describe the utility levels obtained from a cooperative agreement when total household income equals y and the wife's Pareto weight equals λ . Furthermore, we introduce the functions $\hat{V}^i(y_a^h, y_a^w)$, for $i = h, w$ to describe the utility levels attained by the two spouses under non-cooperation; more precisely, the payoffs from the Cournot–Nash equilibrium when each spouse independently allocates her own autarkic income y_a^i between her private consumption good and the household public good which lies within her sphere.^{2,3}

In the absence of any outstanding loan, the bargaining problem defined by steps 1–3 above is akin to the bargaining game analysed by Rubinstein (1982) with the modification introduced by Binmore (1985).⁴ Following Binmore's reasoning, we can show that the two parties reach an agreement immediately and, if the time lapse

² Formally,

$$\bar{V}^h(y_a^h, y_a^w) = U^h(\tilde{x}_h, \tilde{q}_1, \tilde{q}_2) \text{ and } \bar{V}^w(y_a^h, y_a^w) = U^w(\tilde{x}_w, \tilde{q}_1, \tilde{q}_2)$$

where $\tilde{x}_h, \tilde{x}_w, \tilde{q}_1, \tilde{q}_2$ provides the unique solution to the following joint-maximisation problem:

$$\max_{p_h x_h + p_1 q_1 \leq y_a^h} U^h(x_h, q_1, \tilde{q}_2) \quad \max_{p_w x_w + p_2 q_2 \leq y_a^w} U^w(x_w, \tilde{q}_1, q_2)$$

³ Note that, for the sake of brevity, we do not allow for intra-household transfers. However, the model can be extended in a straightforward manner to allow for this and its implications are well-understood from the work by Lundberg and Pollak (1993). See footnote 8 for a further discussion.

⁴ Note that, unlike Rubinstein's bargaining game, spouses may choose to reject an offer that was accepted in a preceding period. However, as noted by Bergstrom (1996), it is never optimal for either spouse to do so. Given the stationary environment, if it is optimal for a spouse to accept an offer in some period t , it is also optimal to accept the standing agreement corresponding to this offer in subsequent periods.

between proposals is infinitesimally small, then the consumption bundle agreed upon is given by the solution to the following problem:

$$\lambda(\mathbf{k}, \gamma, \mathbf{y}_e) = \arg \max_{\lambda \in (0, \infty)} \left[V^h(y, \lambda) - \tilde{V}^h(y_a^h, y_a^w) \right] \left[V^w(y, \lambda) - \tilde{V}^w(y_a^h, y_a^w) \right]$$

subject to $V^i(y, \lambda) \geq \hat{V}^i(y_e^i)$ for $i = h, w$ (3)

where $\hat{V}^i(\cdot)$ is the indirect utility function for welfare from exiting the marriage.⁵

The allocation of resources during loan repayment is a more difficult problem because, in this case, bargaining is taking place in a non-stationary environment. Each period brings closer the date when the last installment will be repaid and therefore, in theory, the strategic incentives of the spouses will change over time such that an offer that is acceptable in some period t may no longer be acceptable in period $t + 1$. In our modelling, we abstract away from the problem of non-stationarity by arguing that when the date of the final installment is weeks or months distant, the spouses should bargain as if they are negotiating in a stationary environment. In reality, a counter-offer may require no more than a few hours (if not minutes) while experiments with bargaining games, and more generally repeated games, have shown that subjects do not engage in backward induction reasoning for more than a few periods (Johnson et al., 2002; Selten and Stoecker, 1986). Therefore it seems reasonable to assume that when bargaining over an allocation of resources, spouses do not take into account that each new round of a offer and counter-offer brings closer the event of full repayment of the loan. On the other hand, they should consider the implications of full repayment on the decision whether or not to exit the marriage because no backward induction reasoning is necessary here. Hence, we write the solution to the bargaining problem while a loan \mathcal{L} is being repaid, as follows:

$$\hat{\lambda}(\mathbf{k}_s, \gamma, \mathbf{y}_e, \mathcal{L}) = \arg \max_{\lambda \in [0, 1]} \prod_{i=h,w} \left[V^i(y-z, \lambda) - \tilde{V}^i(y_a^h - \sigma^h z, y_a^w - \sigma^w z) \right] \quad (4)$$

subject to

$$\sum_{t=1}^n (\delta_i)^{t-1} V^i(y-z, \lambda) + \sum_{t=n+1}^{\infty} (\delta_i)^{t-1} V^i(y, \lambda(\mathbf{k}_s, \gamma, \mathbf{y}_e)) \geq \sum_{t=1}^{\infty} (\delta_i)^{t-1} \hat{V}^i(y_e^i) \text{ for } i = h, w$$

where $\hat{\lambda}(\mathbf{k}_s, \gamma, \mathbf{y}_e, \mathcal{L})$ is the wife's Pareto weight, $\mathcal{L} = (L, z, n, \sigma)$, $\mathbf{k}_s = \mathbf{k} + e_s L$, s denotes the activity in which the loan is invested, δ_i is the discount factor for household member i , and y, y_a^h , and y_a^w are as defined earlier for household assets \mathbf{k}_s .

2.4. How a credit programme affects decision-making authority and welfare within the household

In this section, we investigate how the introduction of a credit programme affects decision-making authority and welfare with a household. We assume throughout that the exit options do not bind for either spouse. (The alternative case will be discussed in the next section). Then $\lambda(\mathbf{k}, \gamma, \mathbf{y}_e)$ is given implicitly by the following equation:

$$\frac{1-\lambda}{\lambda} = \frac{V^w(y, \lambda) - \tilde{V}^w(y_a^h, y_a^w)}{V^h(y, \lambda) - \tilde{V}^h(y_a^h, y_a^w)} \quad (5)$$

⁵ Formally, $\hat{V}^i(y_e^i) = \max_{\mathbf{p} \mathbf{x} \leq y_e^i} U^i(\mathbf{x})$.

Differentiating throughout Eq. (5) with respect to some parameter v , we obtain

$$\frac{d\lambda}{dv} \equiv \frac{y_v [\lambda_h V_y^h - \lambda_w V_y^w] + y_v^w [\lambda_h \tilde{V}_w^w - \lambda_w \tilde{V}_w^h] - y_v^h [\lambda_h \tilde{V}_h^h - \lambda_w \tilde{V}_h^w]}{[V^w - \tilde{V}^w + V^h - \tilde{V}^h + \lambda_w V_\lambda^w - \lambda_h V_\lambda^h]} \quad (6)$$

where $\lambda_w = \lambda$, $\lambda_h = 1 - \lambda$ and $v = k_m, k_c$, or k_f .⁶ From Eq. (6), it is possible to distinguish between two distinct effects of any investment on decision-making authority within the household, as measured by λ . The first is an ‘income effect’, caused by a shift in total household income, which (ignoring the denominator which, it can be shown, is always positive) is equal to $y_v(\lambda_h V_y^h - \lambda_w V_y^w)$. Under Assumption 1, we obtain $\lambda_h V_y^h - \lambda_w V_y^w \geq 0$ for $\lambda \geq \lambda_e$ where λ_e solves $\lambda_h V_y^h(y, \lambda) - \lambda_w V_y^w(y, \lambda) = 0$ (see proof of Proposition 2.1).⁷ In the case of a symmetric utility possibility set, $\lambda_e = \frac{1}{2}$. Then, the income effect shifts the relative Pareto weights of the spouses towards one-half each and, in this sense, it can be said to lead to more egalitarian decision-making within the household.

The second is a ‘threat-point effect’, caused by a shift in the non-cooperative threat points. The ‘threat-point effect’ is absent in case of an investment in joint production. For an investment in the male or female sphere of production, it corresponds to the terms $-y_v^h [\lambda_h \tilde{V}_h^h - \lambda_w \tilde{V}_h^w]$ and $y_v^w [\lambda_w \tilde{V}_w^w - \lambda_h \tilde{V}_w^h]$ respectively in Eq. (6).⁸ The magnitude and direction of the ‘threat-point effect’ depends on the initial levels of bargaining power and the preferences of household members for private versus household public goods. This is more apparent when we consider the corresponding terms under Assumption 1; in this case, an investment in the female (male) sphere favours the wife (husband) if and only if $\lambda_w \alpha_w \left(\frac{\alpha_w}{\beta_w}\right)^{\frac{p}{1-p}} + (\lambda_w \beta_{1w} - \lambda_h \beta_{1h}) \left(\frac{\beta_{1w}}{\beta_{1h}}\right)^{\frac{p}{1-p}} > 0$ ($\lambda_h \alpha_h \left(\frac{\alpha_h}{\beta_h}\right)^{\frac{p}{1-p}} + (\lambda_h \beta_{2h} - \lambda_w \beta_{2w}) \left(\frac{\beta_{2h}}{\beta_{2w}}\right)^{\frac{p}{1-p}} > 0$). It is evident that these effects favour the spouse who is initially in a stronger bargaining position. In this sense, the ‘threat-point effect’ can be said to lead to more inegalitarian decision-making within the household. Moreover, if the spouses have strong preferences for private goods, then α_w and α_h are large relative to $\beta_{1w}, \beta_{1h}, \beta_{2h}$ and β_{2w} , and this will tend to increase the size of the ‘threat-point effect’.

We are now in a position to state the key difference between an investment in joint production and one that enables capital buildup within the autonomous sphere of either spouse. The former has only an ‘income effect’ on the Pareto weights, and causes decision-making within the household to grow more egalitarian. Furthermore, we can show that such an investment would lead to improved welfare for both spouses. The latter involves both an ‘income effect’ as well as a ‘threat-point effect’ and therefore its impact on decision-making authority and intra-household welfare are ambiguous.

If the credit programme improves income-earning opportunities only in activities which lie outside the realm of socially defined gender norms then, in terms of the model, it would only affect the vector y_e . It is evident from Eq. (4) that if the increase in y_e is relatively small, then this would have no impact on decision-making authority and welfare within the household. The following proposition summarises the results discussed above.

⁶ We use the following abbreviated notation: $y_v = \frac{\partial y}{\partial v}$, $y_v^w = \frac{\partial y^w}{\partial v}$, $y_v^h = \frac{\partial y^h}{\partial v}$, and $V_\lambda^i = \frac{\partial V^i}{\partial \lambda}$.

⁷ Note that λ_e depends on the preference parameters and prices but is independent of household income.

⁸ If the spouses are able to make intra-household transfers under non-cooperation, and make positive transfers in equilibrium, then, from the results in Lundberg and Pollak (1993), we obtain $\tilde{V}_i^i = \tilde{V}_j^i$ for $j \neq i$. Therefore, an investment in either autonomous activity leads to the same effect on bargaining power (per unit of additional income).

Proposition 1. If the divorce option is not a binding constraint for either spouse in the initial equilibrium, then, under Assumption 1.

- (i) An investment in any household productive activity has two distinct effects on decision-making authority within the household as measured by λ :
 - (a) an ‘income effect’ which is smaller than, equal to, or greater than zero depending on whether the initial value of λ is greater than, equal to, or smaller than λ_e ; the ‘income effect’ leads to an improvement in welfare of both spouses;
 - (b) a ‘threat-point effect’ which, in the case of an intervention in the female (male) sphere of activity, is greater than zero if and only if $\lambda_w \alpha_w \left(\frac{\alpha_w}{\beta_w}\right)^{\frac{p}{1-p}} + (\lambda_w \beta_{1w} - \lambda_h \beta_{1h}) \left(\frac{\beta_{1w}}{\beta_{1h}}\right)^{\frac{p}{1-p}} > 0$ ($\lambda_h \alpha_h \left(\frac{\alpha_h}{\beta_h}\right)^{\frac{p}{1-p}} + (\lambda_h \beta_{2h} - \lambda_w \beta_{2w}) \left(\frac{\beta_{2h}}{\beta_{2w}}\right)^{\frac{p}{1-p}} < 0$); the effect is absent in the case of a cooperative activity.
- (ii) a small increase in y_e^h or y_e^w , such that the constraints imposed by the divorce options continue to be slack, will have no impact on λ or on welfare levels; for a sufficiently large increase in y_e^i , $i \in \{h, w\}$, the constraint for spouse i will begin to bind, and λ will shift in favour of this spouse. Correspondingly, the welfare level of this spouse will improve at the expense of the other.

To provide additional structure to the model, we focus henceforth on the case where the ‘threat-point effect’ favours the spouse in whose autonomous activity an investment occurs. This is consistent with the approach taken in recent theoretical literature on household bargaining,⁹ and also consistent with a large number of results from the empirical literature.¹⁰

2.4.1. Preferences of household members regarding participation in a credit programme and investment of a loan

Using Proposition 1, we can analyse the spouses’ preferences regarding participation in a credit programme and investment of a loan. For this purpose, we define the *efficient investment choice*, $s^*(\mathbf{k}, \gamma, L)$, as one that, given a household with initial assets \mathbf{k} and skill level γ , and a loan of size L , would maximise total household income. Given that any investment can potentially affect bargaining power within the household, household members would not necessarily prefer the efficient choice. We say that an investment is *potentially Pareto-improving* if there exists Pareto weights for which both spouses are at least as well-off, and one spouse strictly better-off, from the investment compared to the situation before the loan was taken.

It is evident from the previous discussion that if the initial levels of bargaining power are not very asymmetric, and there are some consumption expenditures on private goods, then the ‘threat-point effect’ of an investment in an autonomous sphere will favour the spouse in whose activity this investment occurs. Then, it follows from Proposition 1 that both would prefer the efficient investment if this happens to be in their own autonomous activity.

They may prefer investing the loan in a different activity if this yields a higher return than does their own. But they would require a significantly higher ‘premium’ (in terms of profitability) if the activity lies entirely within their partner’s autonomous sphere than for a joint activity. In this sense, one would be more willing to have the loan invested in a productive activity to which both spouses contribute compared to one which is carried out autonomously by one’s spouse. The following proposition formalises these results.

⁹ See, for example, Anderson and Eswaran (2007), Chen and Woolley (2001), and Lundberg and Pollak (1993).

¹⁰ In particular, the theoretical framework is able to provide consistent explanations for results obtained by Duflo (2003), Lundberg et al. (1997) and Thomas et al. (2002).

Proposition 2. Suppose the exit options do not bind in the solution to the bargaining problem, and that the 'threat-point effect' always favours the spouse whose autonomous activity is targeted in an intervention. Then

- (i) If the efficient investment lies in spouse *i*'s sphere of activity, she/he would always prefer investing the borrowed sum in this activity;
- (ii) if there are two investment opportunities that would yield the same total household income, then a spouse would prefer an investment in his or her own activity to an investment in the joint activity, and an investment in the joint activity to one in the autonomous activity of the other spouse.

Since taking out and investing a loan can lead to a shift in decision-making authority within the household, the presence of *potentially Pareto-improving* investments is neither a necessary nor a sufficient condition for participation to occur (in Section 2.5, we highlight a case where it is both). A household member would be most 'willing' to participate in the loan programme if he or she anticipates that the loan would ultimately be invested in his or her own autonomous activity, and least 'willing', if the investment takes place in the activity of the other spouse. And this can potentially lead to a conflict between the spouses.

To formalise this notion, we introduce the following variables: let $y_s^i(y_0, \lambda_0)$ be the smallest value of household income, following an investment, for which spouse *i* would be willing to participate in a credit programme, if it is anticipated that the loan will be invested in activity *s* (i.e. $I(I^h, I^w) = s$; y_0 is the household income, and λ_0 is the wife's Pareto weight prior to the investment); let $\underline{y}_c^i(y_0, \lambda_0)$ be the corresponding threshold value if the initial balance of bargaining power were maintained in all periods.¹¹ Then, we have the following result:

Proposition 3. If the divorce option is not a binding constraint for either spouse following the use of a loan and the 'threat-point effect' always favours the spouse whose autonomous activity is targeted in an intervention, then $y_f^h > y_c^h > y_m^h$ and $y_f^w < y_c^w < y_m^w$. Furthermore, if the wife (husband) is initially in a weaker bargaining position, then $y_c^w < y_0^w$ and $y_c^h > y_0^h$ ($y_c^w < y_0^w$ and $y_c^h > y_0^h$).

According to Proposition 3, if the exit option constraints do not bind, then the minimum increase in total household income for which one would be willing to participate in the credit programme is smallest in the case that the loan will be invested in his or her own autonomous activity, followed by an investment in the joint activity, and largest in the case of an investment in the autonomous activity of the other spouse.

To abstract away from differences in the participation choice that arise from different intertemporal preferences, we can assume that $y_0^h \approx y_0^w$ (i.e. if taking up the loan had no impact on bargaining power within the household, the gain in income above which one would be willing to take the loan is the same for both spouses). Then, it follows from Proposition 3 that if, say, the wife is initially in a weaker bargaining position, then

$$y_f^w < y_c^w < y_0^w \approx y_0^h < y_c^h < y_f^h$$

Thus, we obtain $[y_c^w, y_c^h] \subset [y_f^w, y_f^h]$; which means that the range of income values over which the spouses disagree on the participation decision is smaller in the case of an investment in a joint activity compared to that of an investment in the female activity. Of course the

¹¹ Formally, $y_0^i(y_0, \lambda_0)$ is given, implicitly, by the equation

$$\sum_{t=1}^n (\delta_t)^{t-1} V^i(y_0^i - z, \lambda_0) + \sum_{t=n+1}^{\infty} (\delta_t)^{t-1} V^i(y_0^i, \lambda_0) = \sum_{t=1}^{\infty} (\delta_t)^{t-1} V^i(y_0, \lambda_0)$$

same sort of reasoning would apply if the husband is initially in a weaker bargaining position.

2.5. Impact of a credit programme when either exit option is a binding constraint

We now consider the situation where one of the exit options is a binding constraint in the initial solution to the bargaining problem. If the constraint continues to bind following an investment then, by construction, one spouse continues to receive the same level of utility as from her or his exit option. And all the gains from the investment will accrue to the other spouse.

It follows that the first spouse will be indifferent between all the possible investment choices, and even between taking and not taking out a loan, because each option yields the same level of utility to her. Her partner, who reaps all the surplus, will prefer the *efficient investment choice*; and he will take out a loan if and only if this improves his welfare, which in turn means that the investment is *potentially Pareto-improving*.

But, paradoxically, the bargaining power of the first spouse, as measured by λ , will *decline*. The reason is that when exit from the marriage is a credible threat for one spouse, there is, in effect, no more bargaining taking place within the household. The other spouse need only ensure that his partner is receiving just enough utility within the marriage so as not to opt for exit. As the household becomes richer, it becomes cheaper for him to do so: his partner will be content with staying in the marriage for an even smaller share of the gains from cooperation.

The first spouse would benefit from the credit programme if it improves her expected income from exiting the marriage. In this case, the availability of the programme strengthens her exit option and thus bargaining position even if no loan is actually taken out by the household. The following proposition formally states these results.

Proposition 3. Suppose the bargaining problem initially has a corner solution with spouse *i* receiving the same utility in the agreement as she would from her exit option.

- (i) If spouse *i*'s exit option continues to bind following any use of the loan, both during and following repayment, then
 - (a) spouse *i* will be indifferent among all investment choices and spouse *j* will prefer the efficient investment choice;
 - (b) spouse *i* will be indifferent between participating and not participating in the credit programme, and spouse *j* will prefer taking out the loan if and only if the efficient investment choice is potentially Pareto-improving;
 - (c) spouse *i*'s bargaining power in the household will decline after a loan has been invested and repaid;
- (ii) An increase in spouse *i*'s potential income from exiting the marriage will improve her welfare, and cause bargaining power to shift in her favour; a small increase in spouse *j*'s potential income from exiting the marriage will have no impact, but a sufficiently large increase will lead to the dissolution of marriage.

2.6. Discussion of theoretical results

The first lesson we learn from the analysis in Section 2.4 is that an increase in household income as a result of a new investment can, by itself, lead to more egalitarian decision-making within the household and improved welfare for both spouses. This is the only effect of an investment in a joint productive activity to which both spouses contribute.

If this investment occurs in a household activity carried out independently by one of the spouses, then there will be an additional effect on bargaining powers within the household as the investment

affects the non-cooperative threat-points of the household members. From Proposition 1 and the preceding discussion, we observe that this effect is unfavourable to the spouse who is initially in a weaker bargaining position; e.g. if the wife initially has low bargaining power, as measured by λ , then the threat-point effect of an investment in the husband's autonomous sphere will have a strong negative effect, and that of an investment in her own autonomous sphere will have, at best, a weak positive effect, on her subsequent bargaining power.

In strongly patriarchal societies, it is likely that in at least a subset of households, it is the husband who decides whether to take a loan, and how to invest the money, even if the credit programme targets women; i.e. $P(P^h, P^w) = P^h$, $I(I^h, I^w) = I^h$. If so, he will have strong incentives to veto participation or appropriate the loan for his own activity if it happens that an investment in the wife's sphere autonomous will substantially weaken his bargaining position.

This suggests that the availability of the credit programme is more likely to be beneficial to women in households where (i) there is a strong preference for household public goods, or (ii) capital can be invested in a joint activity to which both spouses provide essential inputs. A strong preference for household public goods dampens the 'threat-point effect' of any investment; such that the husband would not oppose an investment in the wife's autonomous sphere and the woman's bargaining power within the household will not suffer excessively even if the loan is eventually invested in the husband's autonomous sphere. The existence of a joint productive activity means that there is a potential use of the loan that would improve the wife's welfare without substantially weakening the husband's bargaining power; such that the husband is likely to favour taking out a loan and investing it in such an activity.

In Section 2.5, we considered the situation where either exit option is initially binding in the solution to the bargaining process. Such an equilibrium may be pertinent in patriarchal societies where a certain level of violence against women by their husbands may be deemed socially permissible and, therefore, the threat of violence or actual violence may be used in the bargaining process. The possibility of violence under non-cooperation can imply that, in certain instances, leaving the marriage is a realistic option (even if it is not actually undertaken); then exit is a credible threat in the bargaining process. We observed that in this situation, the household will participate in the credit programme if and only if this is Pareto-improving, and that it will make the efficient investment choice. However, the welfare of the spouse with the binding exit option will remain unchanged and her decision-making authority will decline.

2.7. Repeated loans

If a household has access to repeated loans, then any decision made regarding a loan today can potentially affect the fall-back options of household members, and therefore have consequences for loan take-up and loan use decisions in the future. In other words, when making choices regarding a loan today, household members may also take into account the impact of these choices for their decision-making authority regarding future loans. We do not provide a formal analysis of this issue in this paper because, in the model, there is no formal relation between the variable λ , which measures decision-making authority with regard to household expenditures, and the functions $P(\cdot)$ and $I(\cdot)$ which represent various possibilities for how participation and investment decisions are made.¹²

However, we provide an insight based on intuition about how the possibility of future loans would impact upon the strategic choices of the husband and the wife today: the availability of future loans

provides an additional reason for a household member to be concerned about his or her future bargaining power; this is irrespective of whether or not one would wish to take up a loan in the future, but depends on the condition that the spouses are potentially in conflict about these future loan-related choices. Consequently, a household member would be more willing to waste resources today – e.g. by making an inefficient investment – to be able to protect his decision-making authority for the future. In this sense, the possibility of future loans – to the extent that spouses may be in conflict regarding the take-up and use of these loans – would make them more protective of their existing bargaining power when making any strategic choices.

3. Heterogenous impact of credit programmes across households

The stylised framework of the household economy we have developed can account for a variety of outcomes described in ethnographic studies regarding household responses to credit programmes. In particular, the theoretical results developed in the preceding sections allow us to distinguish between different types of intra-household relations and predict, in each case, what would be the impact of a microcredit programme that targets women. We shall use the wide array of intra-household relations documented in Naila Kabear's (1998, 2001) study of women participating in the SEDP credit programme in Bangladesh to illustrate the model's predictions.

The parameters of the model provide a large set of possible initial conditions for the household. Before considering the ethnographic study, we compute numerical solutions for a range of values of the productivity parameters γ_m , γ_f and γ_c to illustrate the scope of heterogeneous impacts within the model.

3.1. Numerical solutions

Specifically, we fix $\gamma_m = 4$ and allow γ_f to vary between 1 and 8, and γ_c between 2 and 16. We assume that, initially, the household owns 4 units of capital specific to the male activity, and 2 units of capital in each of the other two (female and joint) activities. We consider a loan size equivalent to 2 units of capital, which requires repayment in 12 equal installments, each worth 0.2 units of capital. The loan must be invested in a single activity. The time discount rate for the period between each installment is assumed to be 0.9 for both spouses.

If the marriage breaks down, it is assumed that the male spouse would have access to 6 units of capital, and the female spouse access to 4 units of capital (including any assets they may obtain using credit). Both will be able to carry on their autonomous activities, with their level of skill given by $\gamma = 4$. Utility is assumed to take the logarithmic form $U^k(x_k, q_1, q_2) = \alpha_k \log x_k + \beta_{1k} \log q_1 + \beta_{2k} \log q_2$ with the parameter values shown in Fig. 1.

Fig. 1 shows the preferred investment choice of each spouse for two different sets of preference parameters and a range of γ values. The first simulation represents a household where 70% of household resources are spent on household public goods. A significant feature of the simulation is that, if household productivity in the joint activity is low, the spouses are rarely in agreement about how to invest the loan. Unless one spouse is much more skilled than the other, each prefers to make use of the loan himself or herself. In particular, it is evident that if the husband has final say over the choice of investment, then the loan would rarely be employed in the female activity. By contrast, if their productivity in the joint activity is relatively high, then both spouses would prefer to invest the loan in this activity and, as previously mentioned, this would lead to more egalitarian decision-making within the household and improved welfare for both spouses.

It is also evident from the first simulation that the loan may be invested in the female activity if the wife has final say regarding the

¹² Basu (2006) proposes an innovative approach to determine the equilibrium decision in such a situation. We do not adopt the same approach here as Basu abstracts away from modelling the bargaining process, which is a key element in the analytical framework presented above.

Parameter Values

	Cooperative		
	Activity	Male Activity	Female Activity
Initial Capital	2	4	2
Gamma	2-16	4	1-8
In case of exit			
Initial Capital	-	6	4
Gamma	-	4	4

Legend

	Investment in ... preferred
c	cooperative activity
m	male activity
f	female activity
n	no participation

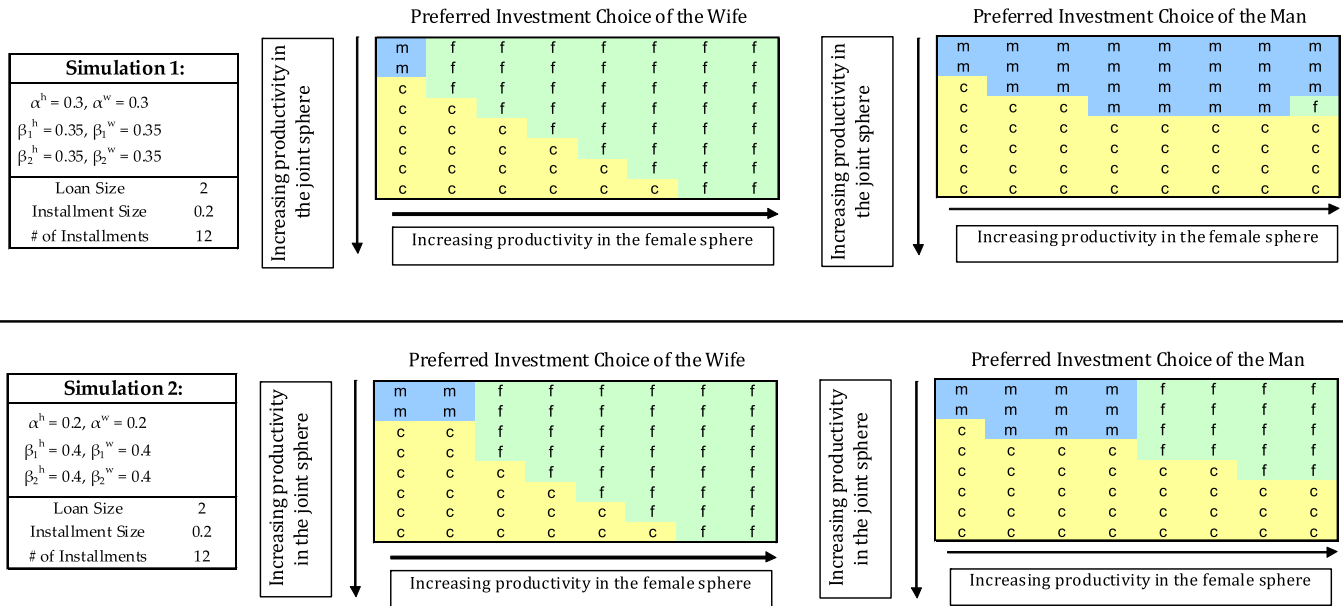


Fig. 1. Household decisions regarding credit use, based on logarithmic utility functions.

participation and investment choices. But we would argue that, in terms of the empowering potential of microfinance, this case is less interesting: if the wife can opt to invest the loan in her own activity even though the husband would prefer otherwise, it must be that she is, in some sense, already empowered in terms of decision-making authority within the household.

The second simulation represents a household where both spouses would choose to spend 80% of the household budget on household public goods. As previously discussed, the stronger preference for household public goods means that any investment in the autonomous sphere of either spouse leads to a smaller shift in decision-making authority than in the case depicted in the first simulation. As a result, both spouses are more willing to have the loan invested in the autonomous activity of their partner when the latter is highly skilled in this activity. In particular, the husband is more likely to accept an investment in the female autonomous sphere.

3.2. Illustration with an ethnographic study

In Kabeer's (1998, 2001) study of the SEDP credit programme in Bangladesh, women borrowers described the impact of their loan-taking activities on their welfare and decision-making authority within the household in a variety of ways. A subset of women borrowers reported that they had no control over – and sometimes little knowledge of – the income generated using their loans, although the household relied on them for access to credit and, in some instances, they made substantial labour contributions to the loan-related activity. A second group of women reported that they were able to use their loans “to create a parallel economy for themselves which gave them considerable financial independence from their husbands” (Kabeer, 2001, p.74), a situation that Kabeer refers to as one of “divorce within

marriage”. A third group of women indicated that they had an important role in deciding how to use the profits generated using their loans, although, in some instances, bringing in the loan was their only contribution to the productive activity. How can we account for such a variety of outcomes on women's decision-making authority within the household from the same credit programme?

We argue that each of these outcomes can be represented using the theoretical model by choosing different parameter values. Consider, first, a household where γ_f and γ_c are small relative to γ_m . In this case, there is little scope for the woman to engage in a productive activity within the household, either on her own or with the assistance of her husband. The husband has strong incentives to appropriate the loan for his own use. And, according to the discussion in Section 2.6, investing the loan in the husband's autonomous activity will likely lead to a shift in bargaining power in his favour. Thus, the woman would have less say within the household after she has brought in the loan, and her level of welfare can potentially decline.

Next, consider a household where γ_c is small relative to γ_f and γ_m . Then, in equilibrium, each spouse allocates all of one's labour to the autonomous sphere, and consumes the income generated in this sphere. No bargaining takes place within the household as there is no surplus to bargain over. This equilibrium can represent extremely conflictual relationships with no scope for the spouses to cooperate in a joint activity, that Kabeer described as exhibiting “divorce within marriage”. If the availability of credit enables the woman to obtain a loan and invest it in her own autonomous activity, then the gains will necessarily accrue to her. The husband's welfare will be unaffected while her welfare would improve.

Finally, consider a household where γ_c is high relative to both γ_m and γ_f . This means that both spouses provide valuable inputs in a joint activity. This may be a female enterprise in which the man provides

essential inputs like marketing or a male enterprise where the woman's contribution is highly valued (if only because she is a conduit for an essential input, namely credit). If the household has a high level of skill in the joint activity compared to the autonomous activities, then the numerical simulations presented above suggest that both spouses would prefer to invest the loan in the former. As previously discussed, an investment in the joint activity would shift decision-making authority within the household in favour of the more disempowered spouse and lead to improved welfare for both spouses.

4. Conclusion

In this paper, we developed a simple model to investigate how access to credit affects decision-making and the allocation of resources within the household in an environment where labour activities of household members are strongly circumscribed by socially defined gender norms.

The model demonstrates that a microcredit programme is likely to have heterogeneous impacts across households. Access to credit may not improve a woman's decision-making authority within the household if she has limited skills to engage in an autonomous productive activity; or if she has substantial skills to do so but the husband finds it in his strategic interest to appropriate the loan to maintain his own bargaining power. By contrast, in households where capital can be invested in a joint productive activity, such an investment will shift decision-making authority power in favour of the spouse who is initially in a weaker bargaining position.

Thus, the theory suggests that the impact of microfinance programmes on household welfare can vary according to initial conditions and underscores the importance of taking into account, in both practice and empirical research, the ability of female household members to undertake autonomous activities, and engage in joint production. We also show the theory can satisfactorily account for the heterogeneity of outcomes across households revealed in careful ethnographic studies of microcredit programmes.

In the impoverished settings in which microfinance projects operate, kinship ties and marriage play an important role in providing individuals with legitimate claims over household and community resources, together with vital access to insurance networks in times of crisis. Hence, as argued by Kabeer (1998), cooperation and jointness of decision-making may be more desirable for women than autonomous control over resources. This perspective has important implications regarding our understanding of the empowering potential of microfinance programmes. If new economic opportunities lie outside the traditional realm of the female spouse and exit options for women are severely limited, then she may be better off ignoring them to preserve her social ties within the community.

For these reasons, an intervention that requires the cooperation of both spouses and ensures that the male spouses do not lose out, may be more successful at achieving wider social impacts than interventions that focus on women's autonomous spheres only. In the context of microfinance, this reasoning suggests that women who receive complementary business training in an activity which requires their husbands' cooperation are more likely to benefit from access to credit than those who receive training in an autonomous productive activity that they can undertake independently within the household.

Appendix A

First, we assign a name to the following, endogenous, condition that is assumed to hold true in the statement of Propositions 2.2 and 2.3.

Condition A.1. The 'threat point effect' favours the spouse whose autonomous activity is targeted in an intervention.

Proof of Proposition 2.1.

(i)(a) By definition, the 'income effect' equals

$$\frac{y_v [\lambda_h V_y^h - \lambda_w V_y^w]}{V^w - \tilde{V}^w + V^h - \tilde{V}^h + \lambda_w V_\lambda^w - \lambda_h V_\lambda^h} \tag{7}$$

By construction, if there are potential gains from cooperation, each spouse receives more than the level of utility from non-cooperation in the solution to the bargaining problem. Therefore, $V^w > \tilde{V}^w$ and $V^h > \tilde{V}^h$. Furthermore, by construction, $V^w(y, \lambda)$ is increasing in λ , and $V^h(y, \lambda)$ is decreasing in λ . Therefore, $\lambda_w V_\lambda^w - \lambda_h V_\lambda^h > 0$. Therefore, the denominator in Eq. (7) is positive. Moreover, $y_v > 0$ for $v = k_m, k_c$, or k_f (where $y_v = \frac{\partial y}{\partial v}$). Therefore, it remains for us to sign the term $\lambda_h V_y^h - \lambda_w V_y^w$. Under Assumption 1, the first-order conditions to Eq. (2) can be written as

$$\rho \lambda_k \alpha_k (x_k)^{\rho-1} = p_k \tau \text{ for } k = h, w \tag{8}$$

$$\rho (\lambda_h \beta_{sh} + \lambda_w \beta_{sw}) (q_s)^{\rho-1} = p_s \tau \text{ for } s = 1, 2 \tag{9}$$

Then, using Eqs. (8) and (9) and the budget condition in Eq. (2), we obtain

$$x_k = \frac{A_k y}{\mathbf{p} \cdot \mathbf{A}} \text{ for } k = h, w \text{ and } q_s = \frac{A_s y}{\mathbf{p} \cdot \mathbf{A}} \text{ for } s = 1, 2 \tag{10}$$

where $A_k = \left(\frac{\lambda_k \alpha_k}{p_k}\right)^{\frac{1}{1-\rho}}$, $A_s = \left(\frac{\lambda_h \beta_{sh} + \lambda_w \beta_{sw}}{p_s}\right)^{\frac{1}{1-\rho}}$ and $\mathbf{A} = [A_h, A_w, A_1, A_2]'$ (and recall that $\mathbf{p} = (p_h, p_w, p_1, p_2)$). Therefore, $\frac{\partial x_k}{\partial y} = \frac{A_k}{\mathbf{p} \cdot \mathbf{A}} = \frac{x_k}{y}$. Similarly, $\frac{\partial q_s}{\partial y} = \frac{q_s}{y}$. From Assumption 1, we have $\frac{\partial U^k}{\partial x_k} = \rho \alpha_k (x_k)^{\rho-1}$ and $\frac{\partial U^k}{\partial q_s} = \rho \beta_{sk} (q_s)^{\rho-1}$. From the defini-

tions of the indirect utility functions, we have $\frac{\partial V^k}{\partial y} = \frac{\partial U^k}{\partial x_k} \frac{\partial x_k}{\partial y} + \frac{\partial U^k}{\partial q_1} \frac{\partial q_1}{\partial y} + \frac{\partial U^k}{\partial q_2} \frac{\partial q_2}{\partial y}$ for $k = h, w$. Thus we obtain

$$\frac{\partial V^k}{\partial y} = \frac{\rho}{y} [\alpha_k (x_k)^\rho + \beta_{1k} (q_1)^\rho + \beta_{2k} (q_2)^\rho] = \frac{\rho}{y} U^k(\mathbf{x}) \tag{11}$$

$$\Rightarrow \lambda_h V_y^h - \lambda_w V_y^w = \frac{\rho}{y} [(1-\lambda)U^h(\mathbf{x}(y, \lambda)) - \lambda U^w(\mathbf{x}(y, \lambda))] \tag{12}$$

(recalling that $\lambda_h = 1 - \lambda$ and $\lambda_w = \lambda$). As $(1-\lambda)U^h(\mathbf{x}(y, \lambda))$ and $\lambda U^w(\mathbf{x}(y, \lambda))$ are continuous in λ , $\exists \lambda_e \in (0, 1)$ such that $(1-\lambda)U^h(\mathbf{x}(y, \lambda)) - \lambda U^w(\mathbf{x}(y, \lambda)) = 0$ at $\lambda = \lambda_e$.¹³ By construction, $U^h(\mathbf{x}(y, \lambda))$ is decreasing and $U^w(\mathbf{x}(y, \lambda))$ is increasing in λ . Therefore, for $\lambda \geq \lambda_e$, we have $(1-\lambda)U^h(\mathbf{x}(y, \lambda)) - \lambda U^w(\mathbf{x}(y, \lambda)) \leq 0$. Hence, from Eq. (12), $\lambda \leq \lambda_e \Rightarrow (1-\lambda)V_y^h - \lambda V_y^w \geq 0$. Therefore, the 'income effect' is smaller than, equal to, or greater than zero depending on whether the initial value of λ is greater than, equal to, or smaller than λ_e .

i (b) We prove by contradiction that the 'income effect' improves welfare for both spouses: suppose an intervention leads to an increase in household income from y_0 to y_1 , and has no effect on the non-cooperative threat points of either spouse. Suppose that the utility level of the husband declines or remains

¹³ Substituting for $\mathbf{x}(y, \lambda)$ in (12) using (10), we can show that λ_e solves $\lambda_h \alpha_h (A_h)^\rho - \lambda_w \alpha_w (A_w)^\rho + [\lambda_h \beta_{1h} - \lambda_w \beta_{1w}] (A_1)^\rho + [\lambda_h \beta_{2h} - \lambda_w \beta_{2w}] (A_2)^\rho = 0$

unchanged as a result of this intervention. Let λ_0 and λ_1 be the values of the wife's pareto weight in the solution to the bargaining problem before and after the intervention. By assumption, $V^h(y_1, \lambda_1) < V^h(y_0, \lambda_0)$. Therefore, $\lambda_1 > \lambda_0$. Hence, $V^w(y_1, \lambda_1) > V^w(y_0, \lambda_0)$. Then, using Eq. (5), we obtain

$$\frac{1-\lambda_0}{\lambda_0} = \frac{[V^w(y_0, \lambda_0) - \tilde{V}^w(y_a^h, y_a^w)]}{[V^h(y_0, \lambda_0) - \tilde{V}^h(y_a^h, y_a^w)]} < \frac{[V^w(y_1, \lambda_1) - \tilde{V}^w(y_a^h, y_a^w)]}{[V^h(y_1, \lambda_1) - \tilde{V}^h(y_a^h, y_a^w)]} = \frac{1-\lambda_1}{\lambda_1}$$

which contradicts the previous deduction. Therefore, the utility level of the husband must improve following an increase in household income. Using the same reasoning, we can show that the utility level of the wife must improve following an increase in household income.

(i)(b) By definition, the 'threat-point effect' equals

$$\frac{y_v^w [\lambda_h \tilde{V}_w^w - \lambda_w \tilde{V}_w^h] - y_v^h [\lambda_h \tilde{V}_h^h - \lambda_w \tilde{V}_h^w]}{[V^w - \tilde{V}^w + V^h - \tilde{V}^h + \lambda_w V_\lambda^w - \lambda_h V_\lambda^h]}$$

We have shown, in part (i)(a), that the denominator in Eq. (6) is positive. As for the numerator, we can show, under Assumption 1, that

$$x_h = \frac{\tilde{A}_h y_h}{p_h \tilde{A}_h + p_1 \tilde{A}_1}, \quad x_w = \frac{\tilde{A}_w y_w}{p_w \tilde{A}_w + p_2 \tilde{A}_2} \quad (13)$$

$$q_1 = \frac{\tilde{A}_1 y_h}{p_h \tilde{A}_h + p_1 \tilde{A}_1}, \quad q_2 = \frac{\tilde{A}_2 y_w}{p_w \tilde{A}_w + p_2 \tilde{A}_2} \quad (14)$$

where $\tilde{A}_1 = \left(\frac{\beta_{1h}}{p_1}\right)^{\frac{1}{1-\rho}}$, $\tilde{A}_2 = \left(\frac{\beta_{2w}}{p_2}\right)^{\frac{1}{1-\rho}}$ and $\tilde{A}_k = \left(\frac{\alpha_k}{p_k}\right)^{\frac{1}{1-\rho}}$ for $k = h, w$. Using Eqs. (13) and (14) and the definitions of the indirect utility functions provided in footnote 2, we obtain

$$\lambda_h \tilde{V}_h^h - \lambda_w \tilde{V}_h^w = \frac{\rho}{(y_h)^{1-\rho}} \left[\frac{(\lambda_h \alpha_h (\tilde{A}_h)^\rho + (\lambda_h \beta_{1h} - \lambda_w \beta_{1w}) (\tilde{A}_1)^\rho)}{(p_h \tilde{A}_h + p_1 \tilde{A}_1)^\rho} \right] \quad (15)$$

$$\lambda_w \tilde{V}_w^w - \lambda_h \tilde{V}_w^h = \frac{\rho}{(y_w)^{1-\rho}} \left[\frac{(\lambda_w \alpha_w (\tilde{A}_w)^\rho + (\lambda_w \beta_{2w} - \lambda_h \beta_{2h}) (\tilde{A}_2)^\rho)}{(p_w \tilde{A}_w + p_2 \tilde{A}_2)^\rho} \right] \quad (16)$$

In the case of an intervention in the male sphere of activity, $y_v^h > 0$ and $y_v^w = 0$. Therefore, the threat-point effect is positive, i.e. causes λ to increase, if and only if $\lambda_h \alpha_h (\tilde{A}_h)^\rho + (\lambda_h \beta_{1h} - \lambda_w \beta_{1w}) (\tilde{A}_1)^\rho < 0$. In the case of an intervention in the female sphere of activity, $y_v^h = 0$ and $y_v^w > 0$. Therefore, the threat-point effect is positive, i.e. causes λ to increase, if and only if $\lambda_w \alpha_w (\tilde{A}_w)^\rho + (\lambda_w \beta_{2w} - \lambda_h \beta_{2h}) (\tilde{A}_2)^\rho > 0$. In the case of an intervention in the joint activity, $y_v^h = 0$ and $y_v^w = 0$. Therefore, the threat-point effect equals zero.

(ii) If the constraints imposed by the divorce threat points do not bind, the value of λ is determined by Eq. (5). Therefore, a small enough increase in y_e^h or y_e^w would have no impact on λ or on $V^h(y, \lambda)$ and $V^w(y, \lambda)$. If the increase in y_e^i is sufficiently large, we have $V^i(y, \lambda^*) < \hat{V}^i(y_e^i)$ where λ^* is defined implicitly by Eq. (5). Therefore, the constraint for person i will begin

to bind, and the solution will be given, implicitly, by $V^i(y, \lambda^*) = \hat{V}^i(y_e^i)$. Therefore, $\lambda^* > \lambda'$ for $i = w$ and $\lambda^* < \lambda'$ for $i = h$. Therefore, $V^i(y, \lambda^*) > V^i(y, \lambda')$ and $V^j(y, \lambda^*) < V^j(y, \lambda')$ for $j \neq i$. \square

Proof of Proposition 2.2. (i) & (ii) Using Proposition 1 and Condition A.1, the 'threat-point effect' is most favourable to one's bargaining power, as measured by λ , in case of an investment in one's own autonomous sphere, followed by the case of an investment in the cooperative sphere, and least favourable in the case of an investment in the autonomous sphere of the other spouse. Moreover, if two investment opportunities lead to the same total household income then, by definition, the 'income effect' from these investments should also be the same. It follows that

$$\lambda(\mathbf{k}_f, \gamma, \mathbf{y}_e) > \lambda(\mathbf{k}_c, \gamma, \mathbf{y}_e) > \lambda(\mathbf{k}_m, \gamma, \mathbf{y}_e) \quad (17)$$

$$\hat{\lambda}(\mathbf{k}_f, \gamma, \mathbf{y}_e, \mathcal{L}) > \hat{\lambda}(\mathbf{k}_c, \gamma, \mathbf{y}_e, \mathcal{L}) > \hat{\lambda}(\mathbf{k}_m, \gamma, \mathbf{y}_e, \mathcal{L}) \quad (18)$$

where $\mathbf{k}_s = \mathbf{k} + e_s L$. It follows that if the efficient investment choice lies in the male sphere of activity, then

$$\begin{aligned} V^h(y(\mathbf{k}_m, \gamma) - z, \hat{\lambda}(\mathbf{k}_m, \gamma, \mathbf{y}_e, \mathcal{L})) &> V^h(y(\mathbf{k}_s, \gamma) - z, \hat{\lambda}(\mathbf{k}_s, \gamma, \mathbf{y}_e, \mathcal{L})) \\ V^h(y(\mathbf{k}_m, \gamma), \lambda(\mathbf{k}_m, \gamma, \mathbf{y}_e)) &> V^h(y(\mathbf{k}_s, \gamma), \lambda(\mathbf{k}_s, \gamma, \mathbf{y}_e)) \end{aligned}$$

for $s = f, c$. Therefore, the husband obtains the highest utility each period from investing a loan in his own autonomous activity if this is the efficient choice. Therefore, this is his preferred investment choice. Similarly, it also follows from Eqs. (17) and (18) that if $y(\mathbf{k}_m, \gamma) = y(\mathbf{k}_c, \gamma)$, then the husband prefers an investment in his own activity to one in the joint activity; and if $y(\mathbf{k}_c, \gamma) = y(\mathbf{k}_f, \gamma)$, then he prefers an investment in the joint activity to one in the female autonomous activity. The same reasoning applies to the wife. \square

Proof of Proposition 2.3. Let λ_s represent the outcome from bargaining following an investment in activity s , after full repayment has been made (defined in Eq. (3)); and let $\hat{\lambda}_s$ represent the corresponding value during periods in which installments are still being paid (defined in Eq. (4)). Let y_s^i be the minimum value of household income, following an investment, at which spouse i would be willing to participate in a credit programme knowing that the loan will be invested in activity s . Therefore, we have

$$\sum_{t=1}^n (\delta_t)^{t-1} V^i(y_s^i - z, \hat{\lambda}_s) + \sum_{t=n+1}^{\infty} (\delta_t)^{t-1} V^i(y_s^i, \lambda_s) = \sum_{t=1}^{\infty} (\delta_t)^{t-1} V^i(y_0, \lambda_0) \quad (19)$$

where y_0 and λ_0 denote the level of household income and the Pareto weight on the wife's utility before the investment. Suppose $y_m = y_c = y_c^w$, where y_s denotes aggregate household income following an investment in activity s . By construction, the wife will be just willing to participate in the credit programme knowing that the loan will be invested in the joint activity. However, by Condition A.1 and Proposition 1, $\lambda_m < \lambda_c$ and $\hat{\lambda}_m < \hat{\lambda}_c$ (using the assumption that $y_m = y_c$). Since $V^w(y, \lambda)$ is increasing in λ , we have

$$\begin{aligned} \sum_{t=1}^n (\delta_w)^{t-1} V^w(y_m - z, \hat{\lambda}_m) + \sum_{t=n+1}^{\infty} (\delta_w)^{t-1} V^w(y_m, \lambda_m) \\ < \sum_{t=1}^{\infty} (\delta_w)^{t-1} V^w(y_0, \lambda_0) \end{aligned}$$

Therefore, $y_m^w > y_m \Rightarrow y_m^w > y_c^w$. Suppose $y_f = y_c = y_c^w$. By Condition A.1 and Proposition 1, $\lambda_f > \lambda_c$ and $\hat{\lambda}_f > \hat{\lambda}_c$. Since $V^w(y, \lambda)$ is increasing in λ , we have

$$\sum_{t=1}^n (\delta_w)^{t-1} V^w(y_m - z, \hat{\lambda}_m) + \sum_{t=n+1}^{\infty} (\delta_w)^{t-1} V^w(y_m, \lambda_m) > \sum_{t=1}^{\infty} (\delta_w)^{t-1} V^w(y_0, \lambda_0)$$

Therefore, $y_f^w < y_f \Rightarrow y_f^w < y_c^w$. Similarly, we can show that $y_f^h > y_c^h > y_m^h$. If $\lambda_0 < \lambda_e(y_0)$ – i.e. the wife is initially in a weaker bargaining position – then, by Proposition 1, $\lambda_c > \lambda_0$ and $\hat{\lambda}_c > \lambda_0$. It follows from (19) that $y_c^w < y_0^w$ and $y_c^h > y_0^h$. In the same manner, we can show that if $\lambda_0 > \lambda_e(y_0)$, then $y_c^w > y_0^w$ and $y_c^h < y_0^h$. □

Proof of Proposition 2.4.

(i)(a) If spouse i's exit option is binding for investment choice s , we have

$$\sum_{t=1}^n (\delta_i)^{t-1} V^i(y(\mathbf{k}_s, \gamma) - z, \hat{\lambda}(\mathbf{k}_s, \gamma, y_e, L)) + \sum_{t=n+1}^{\infty} (\delta_i)^{t-1} V^i(y(\mathbf{k}_s, \gamma), \lambda(\mathbf{k}_s, \gamma, y_e)) = \sum_{t=1}^{\infty} (\delta_i)^{t-1} \hat{V}^i(\hat{y}_e^i)$$

where $\mathbf{k}_s = \mathbf{k} + e_s L \Rightarrow (1 - (\delta_i)^n) V^i(y(\mathbf{k}_s, \gamma) - z, \hat{\lambda}(\mathbf{k}_s, \gamma, y_e, L)) = \hat{V}^i(\hat{y}_e^i) - (\delta_i)^n V^i(y(\mathbf{k}_s, \gamma), \lambda(\mathbf{k}_s, \gamma, y_e))$

Since it is assumed that the exit option is also binding in periods after repayment of the loan is complete, we have $V^i(y(\mathbf{k}_s, \gamma), \lambda(\mathbf{k}_s, \gamma, y_e)) = \hat{V}^i(\hat{y}_e^i)$. Therefore, the condition above can be written as

$$V^i(y(\mathbf{k}_s, \gamma) - z, \hat{\lambda}(\mathbf{k}_s, \gamma, y_e, L)) = \hat{V}^i(\hat{y}_e^i) \tag{20}$$

Therefore, the bargaining outcome in periods prior to full repayment, $\hat{\lambda}(\mathbf{k}_s, \gamma, y_e, L)$ and following full repayment, $\lambda(\mathbf{k}_s, \gamma, y_e)$, are given by

$$V^i(y(\mathbf{k}_s, \gamma) - z, \hat{\lambda}(\mathbf{k}_s, \gamma, y_e, L)) = \hat{V}^i(\hat{y}_e^i) \tag{21}$$

$$V^i(y(\mathbf{k}_s, \gamma), \lambda(\mathbf{k}_s, \gamma, y_e)) = \hat{V}^i(\hat{y}_e^i) \tag{22}$$

Using Eqs. (21) and (22), we can conclude that if the exit option constraint is binding for spouse i for one or more investment choices, then each yields her a per-period utility of $\hat{V}^i(\hat{y}_e^i)$. Therefore, she is indifferent among them. Moreover, given two investment choices s' and s'' for which the exit option constraint binds for spouse i , it follows from Eqs. (21) and (22) that if total household income is greater following an investment in activity s' , then the pareto weights $\hat{\lambda}(\mathbf{k}_1, \gamma, y_e, L)$ and $\lambda(\mathbf{k}_1, \gamma, y_e)$ are more favourable to spouse j in the case of activity s'' . Therefore, spouse j must prefer investment in activity s' which results both in higher household income and greater bargaining power for himself. Therefore, if spouse i 's exit option continues to bind following any use, both during and following repayment, of the loan, then she will be indifferent among them and spouse j will prefer the efficient investment choice.

(i)(b) If spouse i 's exit option is a binding constraint in the initial situation, then she receives a utility of $\sum_{t=1}^{\infty} (\delta_i)^{t-1} \hat{V}^i(\hat{y}_e^i)$ from non-participation. Therefore, if the exit option continues to bind for all three investment choices, then she is indifferent between participation and non-participation in the credit programme. If the efficient investment choice is pareto-improving then, by definition, there exists some Pareto weights λ_0, λ_1 such that

$V^l(y(\mathbf{k}_s, \gamma) - z, \lambda_0) \geq \hat{V}^l(\hat{y}_e^l), V^l(y(\mathbf{k}_s, \gamma), \lambda_1) \geq \hat{V}^l(\hat{y}_e^l)$ for $l \in \{h, w\}$. By construction, spouse i receives the same level of utility as before the investment. Therefore, spouse j must be at least as well-off as in the initial situation. On the other hand, if the efficient investment choice is not pareto-improving then, since spouse i 's utility is unchanged, spouse j must be worse off after the investment has been made.

(i)(c) If the efficient investment choice is potentially pareto-improving, it must lead to an increase in total household income: i.e. $y(\mathbf{k}_s, \gamma) > y(\mathbf{k}, \gamma)$. If spouse i 's exit option is initially a binding constraint, we have $V^i(y(\mathbf{k}, \gamma), \lambda(\mathbf{k}, \gamma, y_e)) = \hat{V}^i(\hat{y}_e^i)$. Then, if Eq. (22) holds for the efficient investment choice, it must be that $\lambda(\mathbf{k}_s, \gamma, y_e)$ is less favourable to spouse i than $\lambda(\mathbf{k}, \gamma, y_e)$.

(ii) An increase in \hat{y}_e^i affects only the right-hand side of Eqs. (21) and (22). Therefore, the constraints will continue to bind in the solution to the bargaining problem. Since y is unchanged, λ and $\hat{\lambda}$ must shift in favour of spouse i to satisfy the constraints. Since the constraints were initially binding for spouse i and her utility from exit has improved, so must her level of utility from the cooperative agreement. Since spouse j 's constraint is initially slack, the initial solution to Eqs. (3) and (4) will continue to satisfy both constraints for a small enough increase in \hat{y}_e^i . For a sufficiently large increase in \hat{y}_e^i , the initial solution will violate spouse j 's constraint. As spouse i 's constraint binds in this solution, and the allocation of resources within the household is, by construction, efficient, there is no other possible allocation that would satisfy the constraints for both spouses. Therefore, both spouses are better off from leaving the marriage. □

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