Journal of Development Economics 90 (2009) 179–191

Contents lists available at ScienceDirect

Journal of Development Economics

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

What determines female autonomy? Evidence from Bangladesh☆

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ARTICLE INFO

Article history:
Received 17 November 2007
Received in revised form 27 October 2008
Accepted 28 October 2008

JEL classification:
D13
J16

Keywords:
Female autonomy
Intrahousehold bargaining

ABSTRACT

This paper examines the determinants of female autonomy within households in a developing country. In particular, we investigate the relative contributions of earned versus unearned income in enhancing women's autonomy and the role of employment outside of their husband's farm. In a simple theoretical model, it is demonstrated that earned income could be more important than unearned income in empowering women. Using data from rural Bangladesh, empirical estimations confirm this prediction and also reveal the surprising fact that it is not employment per se but employment outside their husbands' farms that contributes to women's autonomy. The data also point to the importance of choosing the correct threat point in theoretical analyses of female autonomy.

1. Introduction

In recent decades, particularly since the Beijing Women's conference in 1995, empowering women in the developing world has become a primary policy goal. Quite apart from being an important goal in its own right, increased female autonomy has been shown to confer other benefits like long-term reduction in fertility, higher child survival rates, and allocation of resources in favour of children in the household.[1] There has been much debate in the women and development literature on how to empower women, with the debate often centering on their participation in economic activities and access to financial resources. That greater labour market access for women increases their autonomy has almost come to be taken as a stylized fact in development economics (World Bank, 1995). Much earlier, Engels (1884) had argued that participation in the labour market is essential if women are to be emancipated from the servitude in which the patriarchal family held them. Apart from the substantial anecdotal evidence on this issue, numerous case studies suggest that a woman's access to employment outside the home increases her domestic decision-making power and control over resources.[2] Blumberg and Coleman (1989) have been strong proponents of this in the sociology literature; Rahman and Rao (2004) have recently provided evidence of this using data from two states of India. Others have emphasized the role of access to resources such as land and credit. Agarwal (1994), in particular, has argued that ownership of assets would be a very efficacious avenue in developing countries. In economies that are largely agrarian, land is the most productive asset and access to it enhances women's autonomy for many reasons.[3] In a similar vein, others have demonstrated a link between pre-marital assets and women's decision-making power.[4] Also, there is some evidence that access to credit programs has a positive effect on female empowerment (see, for example, Hashemi et al., 1996).[5]

Female autonomy is typically defined as the ability of women to make choices/decisions within the household relative to their husbands'. The whole question of autonomy does not, of course, arise if the household is viewed as a monolithic unit, with a single decision maker. However, there is now ample evidence contradicting this unitary model of the household.[6] Accordingly, Folbre (1986), Sen (1990) and several others have

☆ We thank two anonymous referees, Helene Couprie, Patrick Francois, Kevin Milligan, and participants of the Empirical Economics Workshop at UBC, the Economic Development Workshop at the Delhi School of Economics, and the University of Washington for useful comments. We are grateful to the UBC Hampton Research Grant for financial support.

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[1] For the link to fertility and child mortality, among many others, see, Dyson and Moore (1983), Caldwell and Caldwell (1987), Mason (1984), Hogan et al. (1999), and Eswaran (2002). Many studies find that children's well-being is strongly correlated with women's income relative to men's, where women consistently devote a higher proportion of their income to family needs than do men. Refer to a survey by Strauss et al. (2000) for studies that find evidence from Cameroon, India, Kenya, Malawi, and the Dominican Republic. In the same vein, Thomas (1990) finds that unearned income in the hands of a mother has a bigger effect on a family's health than when under the control of the father; for child survival probabilities, the marginal effect is roughly twenty times larger. There is some recent work suggesting that this relationship is non-monotonic (Lancaster et al. 2006, Gitter and Barham, 2008).

[2] See, for example, Acharya and Bennett (1982) for Nepal, Finalay (1989) for the Dominican Republic, Safa (1992) for the Carribean, and Ecevit (1991) for Turkey.

[3] See also Boserup (1970) and Dyson and Moore (1983), among several others.

[4] See, for example Kabeer (1999) and Folbre (1984).

[5] An additional contributing factor is, of course, the role of social norms and cultural practices and how these interact with these more economic factors.

[6] Refer to the work of Thomas (1990), Browning et al. (1994), Hoddinott and Haddad (1995), Gray (1998), Lundberg et al. (1997) and Thomas (1994), among others.

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doi:10.1016/j.jdeveco.2008.10.004

suggested that, instead of being atomistic, the household in developing countries is better modelled as conflictual. The main theoretical contribution of economists to the literature on female empowerment has been through bargaining theory (McElroy and Horney (1981), Manser and Brown (1980) pioneered the approach; Chiappori (1988, 1992) presents a different approach to collective decision-making).[7] Bargaining models have demonstrated that women can be empowered by improving their threat options—which captures the level of wellbeing they could assure themselves of in the event bargaining breaks down with their spouses. An improvement in women's threat option delivers to them, in standard bargaining models, an improvement in their wellbeing within the cooperative equilibrium.

The aim of this paper is to investigate the relative importance of various factors contributing to female empowerment. We are particularly concerned with the relative roles of ownership of assets and access to labour markets in facilitating female autonomy, something that Bangladeshi data allow us to investigate. This distinction is not often made in the literature and we first theoretically model this in order to structure the empirical analysis. This paper brings to bear a theoretical argument to shed light on this issue and marshals some empirical evidence.

Any resolution of this question clearly requires the identification of the threat scenario relevant to developing countries. As Lundberg and Pollak (1993) have argued, divorce is not necessarily the most appropriate characterization of the break down of bargaining between spouses; often, a more relevant scenario is that of non-cooperative behavior within marriage. This is certainly the most appropriate characterization in the developing countries of South Asia (where divorce is very rare), and this is the threat scenario we adopt here.[8] Our empirical results suggest that this threat option is consistent with the data, while divorce as the threat option is not.

Our point of departure in this paper is the observation that the avenues for generating unearned and earned income for women have different impacts on their labour-leisure trade-off. Consequently, they differently affect women's household public good production. It is well-known that, in developing countries, housework—which may be deemed a household public good—is done largely by women. By providing a credible means of committing her labour in the non-cooperative threat scenario, the introduction of outside work opportunity for a woman impinges adversely on her spouse's threat utility. Despite reducing her consumption of leisure, the earning of labour income could facilitate a greater increase in her relative bargaining power—her autonomy—than an equivalent increase in her non-labour income. We formalize this claim with a simple model and then investigate its empirical validity. Our model follows the separate spheres bargaining set up pioneered by Lundberg and Pollak (1993), where the spouses retreat into their traditional gender roles in the threat scenario and provide the household public input that is the norm for their gender.[9]

We also examine the empowerment effects of different forms of labour participation. In particular, we compare the effect of labour that generates an independent income for women to that of working on the household farm. Although it is widely acknowledged that women are more empowered if they maintain direct control of their earnings, it has been hypothesised that any contribution to an income generating activity potentially increases female autonomy. Based on the premise that female autonomy is higher when contributing to traditional subsistence farming, it has been commonly argued that women's status falls in the initial periods of industrialization as the economy sheds its reliance on household subsistence agriculture.[10] If women are confined to the domestic sphere, it is argued, they suffer a decline in status and decision-making power relative to their spouse. However, in a bargaining framework, working on their husbands' farms can only increase women's autonomy if the threat option is improved by this activity. This may not be the case if there does not exist a labour market (as is true in our data from Bangladesh) in which women could work in the event household cooperation breakdown. Therefore, bargaining theory would caution us against concluding that engaging in any income me-generating activity (whether it be household or individual production) should increase female autonomy. We examine this issue empirically and find compelling evidence in support of bargaining theory.

There has been little empirical work directly examining the determinants of female autonomy.[11] Moreover, most research identifies female autonomy with relative measures such as earnings, education, and age, between husbands and wives. These are indirect measures, for they presume unspecified (though reasonable) links to female autonomy. We are, instead, able to exploit a dataset collected from the rural area of Matlab in Bangladesh with direct measures of female decision making power within the household. We use information that directly speaks to the extent to which women can make independent decisions on various matters.

Empirically implementing such models of household decision making proves difficult for two reasons. First, causality is an issue when identifying the extent to which the work activities of women contribute to their autonomy. As Basu (2006) has persuasively argued, the say a woman has in household matters is determined by her earnings but her work activity itself is an outcome of her existing bargaining power. To take care of this possible reverse causality that Basu points to, in our empirical work we are careful to address the endogeneity of women's work activities by using suitable instruments. Secondly, our theoretical model has predictions for how threat points impinge on female autonomy, however, what we observe in the data is the cooperative outcome. We do not see the threat scenarios. The context of rural Bangladesh allows us, however, to make assumptions regarding how the observed work activities in the cooperative outcome would map to activities in the event of cooperation breaking down. Many parts of rural Bangladesh, such as the Matlab area, remain very traditional societies in which social and cultural norms curtail the autonomy of women. The subordination of women in traditional rural Bangladeshi society is powerfully supported by the institution of purdah: a set of norms and regulations that promote the seclusion of women and enforce their exclusion from public spaces.[12] Amin (1997) documents how purdah determines the work patterns of women and continues to limit women's opportunities for employment outside of their homestead in rural Bangladesh. Women are confined to a small number of 'female' occupations which, consistent with our data, primarily include homestead poultry rearing and paddy husking (Kabeer, 2001). In the former, women earn an independent income, with the latter they only contribute labour to household paddy cultivation. Since women are denied access to the labour market in this area, we can assume that in the event of cooperation breaking down, women would continue in their homestead wage earning activity but would cease to provide labour to paddy cultivation, as there is no market for these skills outside of the family environment.

Based on the Matlab dataset from Bangladesh, our paper makes three contributions to our understanding of female autonomy in developing countries. Firstly, it is shown that the effect of earned income on women's

[7] See also Udry (1996) and Bergstrom (1996) for an overview of models of allocation within the family.

[8] The proportion of individuals divorced in our sample from rural Bangladesh is less than 1%. Under Islamic Marriage Law, women are not legally permitted to initiate divorce proceedings.

[9] They invoke the separate spheres model to provide a theoretical explanation for why it matters whether child allowances are received by the mother or the father.

[10] Refer to the pioneering work by Boserup (1970). See later work by, among others, Ibraz (1993), Beneria and Sen (1986), Geisler (1993), and Vlassoff (1994).

[11] Kantor (2003) and Rahman and Rao (2004) are exceptions.

[12] In the data used here, 93% of women have never been to the local bazaar, 92% have never been to the local mosque, and 68% leave their residential compound at most once a week.

bargaining power is far greater (by an order of magnitude) than that of unearned income. Secondly, it is demonstrated that women who work on the household farm have no more autonomy than those who are housewives, while those do earn independent incomes have considerably greater autonomy. This brings out the importance of controlling income, as opposed to merely contributing to the generation of income, as a crucial determinant of autonomy. Thirdly, our paper provides compelling evidence that noncooperative behavior within marriage is the threat point that is relevant to developing countries. It is this scenario that generates predictions consistent with our empirical results; predictions with divorce as the threat option are refuted by the data. That is to say, divorce as the threat scenario, in contrast, points to unearned income as the more important determinant of female autonomy.

The next section of this paper spells out a simple theoretical model and the subsequent section derives some empirical implications. Section 4 describes the data. The estimation strategy is then explained in Section 5, and the main empirical results summarized in Section 6. Section 7 presents some concluding thoughts.

2. The Model

In this section, we write down a simple model that identifies how, in a household setting consistent with our context, earned and unearned income might determine the bargaining power of a woman relative to that of her husband. The purpose of our separate spheres model is to suggest possibilities and to motivate our empirical work. We then investigate the reality of the situation in Bangladesh's Matlab area by examining the data drawn from there. We must emphasize right away that we do not solve for the cooperative solution of a bargaining game here. As is well-acknowledged in bargaining scenarios, players' bargaining powers are determined by their (threat) utilities that obtain in the non-cooperative scenario that obtains when negotiations break down. To ascertain the factors that impinge on women's autonomy, therefore, it is only necessary for us to identify the properties of this non-cooperative outcome—which is what we focus on.

We assume the wife has three possible uses for her time: producing a household public good (by doing housework), working in an activity that earns her income, and leisure. In the data, as is commonly found in rural Bangladesh, women are relegated to the homestead for their work activities. As mentioned, they either engage in post-harvest cultivation tasks on the household farm or they rear poultry which gains them independent earnings. For now, we ignore the possibility of individuals working on the household farm; we discuss this possibility in Section 3. Since working in the labour market is not an option for these women, we assume this to be the case in the model. Purdah and religious sanctions circumscribe women's mobility.

The husband has two uses for his time: working in the labour market, and leisure. The husband is assumed not to participate in the production of the household public good. This is consistent with the cultural norms in South Asia and many other developing countries: housework is relegated to women.

Husbands and wives each have one unit of time endowment. Apart from labour income, they may each have unearned income. We denote by R_f and R_m, respectively, the exogenous unearned income accruing to the wife and the husband.

The utility function of the wife is assumed to be[13]:

$$U_f\left(x_f, z, l_f\right) = \beta_f \ln x_f + \gamma_f \ln z + \delta_f \ln l_f, \tag{2.1}$$

where x_f and z, respectively, denote the amount of private and household public good she consumes, and l_f is her leisure. If the time allocations e_f^1 and e_f^2 denote, respectively, the time she spends doing housework and working to earn an independent income, her leisure is given by $l_f = 1 - e_f^1 - e_f^2$. We normalize the parameters of the wife's utility function so that $0 \le \beta_f, \gamma_f, \delta_f \le 1$ and $\beta_f + \gamma_f + \delta_f = 1$. Implicit in this restriction is the assumption that all three entities (x_f, z, and l_f) are goods (e.g. leisure is not a bad).

An analogous utility function is posited for the husband:

$$U_m(x_m, z, l_m) = \beta_m \ln x_m + \gamma_m \ln z + \delta_m \ln l_m, \tag{2.2}$$

where x_m denotes the amount of private good he consumes and l_m is his leisure. Clearly $l_m = 1 - e_m$, where e_m denotes the time he spends working in the labour market. We also normalize the parameters of the husband's utility function so that $0 \le \beta_m, \gamma_m, \delta_m \le 1$ and $\beta_m + \gamma_m + \delta_m = 1$. The same caveat on parameter restrictions for wives applies here as well.

We assume that the production function for the household public good uses the wife's labour and the income, y_m, contributed by the husband towards household expenses. Following the separate spheres model of Lundberg and Pollak (1993), we assume that in the non-cooperative scenario the spouses specialize in the public input they provide along traditional gender lines: the wife contributes only labour in the production of the household public good but not income, while the husband provides income but not labour. This commits us to the view that, in the noncooperative mode, men and women operate in separate spheres—with the provision of financial resources for the household public good falling in the husband's. Lundberg and Pollak (1993) provide compelling arguments for the general applicability of the separate spheres assumption, but it is especially relevant to tradition-bound South Asia. Particularly in Bangladesh, because women are confined to the homestead, men and women have completely separate responsibilities (Amin, 1997). Traditionally women provide labour and time to the household and men are responsible for its livelihood and all purchasing decisions.

Furthermore, we assume that the production function, $f(y_m, e_f^1)$, for the household public good is linear in the inputs:

$$z = f\left(y_m, e_f^1\right) = y_m + b e_f^1, \quad b > 0. \tag{2.3}$$

This simplifying assumption is made to facilitate analytical tractability, and further discussion on it is provided towards the end of this section.

As is standard in bargaining models, the allocation of resources in the cooperative endeavour here would be determined by the threat utilities of each person. We follow Woolley (1988), Lundberg-Pollak (1993), Chen-Woolley (2001) in positing that the threat scenario is defined by the noncooperative outcome within marriage. This, and not divorce, is the relevant fallback option in the developing countries of South Asia. Utility under this option will determine the degree of autonomy that women can exercise within their households.

We assume that, in the noncooperative scenario, the wife and the husband entertain Nash conjectures regarding the choices of their partner.

The wife's optimization problem in this scenario may be written

$$\max_{x_f, e_f^1, e_f^2} \beta_f \ln x_f + \gamma_f \ln\left(y_m + b e_f^1\right) + \delta_f \ln\left(1 - e_f^1 - e_f^2\right) \tag{2.4}$$

$$\text{s.t.} \quad 0 \le e_f^1, e_f^2 \le 1, \; e_f^1 + e_f^2 \le 1, \; p_f x_f \le w_f e_f^2 + R_f,$$

where p_f is the price of the wife's private good and w_f is the implicit wage rate she earns in her independent income earning activity.

The husband solves

$$\max_{x_m, e_m} \beta_m \ln x_m + \gamma_m \ln\left(y_m + b e_f^1\right) + \delta_m \ln(1 - e_m) \tag{2.5}$$

$$\text{s.t.} \quad 0 \le e_m \le 1, \; p_m x_m + y_m \le w_m e_m + R_m,$$

where p_m is the price of the husband's private good and w_m is the husband's wage rate in the labour market.[14]

[13] The results generalize to the Stone–Geary utility function (instead of the Cobb–Douglas function) we posit below. But since this adds nothing by way of additional insight, we stick to the simpler Cobb-Douglas framework.

[14] In reality, the husband may own a farm on which he works (possibly with hired labour). If hired labour requires supervision, the implicit wage rate of the husband working his farm would be greater than the market wage he could earn. Furthermore, the larger the amount of land owned the higher would this implicit wage be. Refer to Section 3 for further discussion.

For the assumed utility function, each person's marginal utilities of consumption for all the goods are unbounded at zero. To sidestep the distracting possibility of zero consumption, we shall assume in what follows that R_f and w_f are both positive, even though they may be much smaller than R_m and w_m, respectively.

The wife's best response functions for the amounts of time allocated to household production and to earning an independent income will depend on the amount of financial contribution made by the husband for household expenditures. Likewise, the husband's best response functions for the amount of time spent working and his financial contribution to the public good will depend on the amount of time the wife devotes to producing the public good. Given our assumptions regarding preferences and the production technology of the public good, the husband's income contribution (y_m) and the time devoted by the wife to producing the public good (e_f^1) can be readily shown to be strategic substitutes.

Increases in the wife's unearned income and increases in the implicit wage rate in her independent income earning activity would both be expected to increase her utility in the noncooperative equilibrium. However, there is a basic asymmetry in the manner in which they impinge on her husband's threat utility. We now turn our attention to address this.

The following proposition records the effects on the Nash equilibrium of an increase in the wife's unearned income. (This and the results to follow are proved in Appendix A.)

Proposition 1. *Suppose the Nash equilibrium is fully interior. Then, in equilibrium, an increase in the wife's unearned income: (a) increases the time she devotes to the production of the public good, (b) reduces the amount of time she devotes to earning income, (c) increases her consumption of leisure, (d) decreases her husband's contribution to the public good, and (e) reduces the amount of time the husband works.*

An increase in the wife's rental income, ceteris paribus, would increase her consumption of the private good, lowering its marginal utility. Since she would allocate her time so that its marginal worth is the same in all uses, she would want to increase her consumption of the public good and so increase the time she allocates to its production. The income effect, however, would induce her to consume more leisure. So, on balance, not all the reduction in the time she devotes to earned labour would be diverted to public good production; some of it goes to leisure. Since her time is a substitute for the financial resources her husband provides for the public good, he will curtail some of the income he allocates for the household and divert it to his private consumption—thereby lowering the marginal utility he derives from his private good. This, in turn, would warrant an increase in his consumption of leisure.

The following proposition records the effects on the Nash equilibrium of an increase in the wife's wage rate.

Proposition 2. *Suppose the Nash equilibrium is fully interior. Then, in equilibrium, an increase in the wife's implicit wage rate: (a) decreases the amount of time she devotes to the public good, (b) increases her husband's contribution to the public good, (c) increases the amount of time the husband works in the labour market, and (d) decreases the husband's private good consumption.*

An increase in the wife's wage rate would induce her to allocate more of her time to earning, raising her marginal utility from leisure. She will offset this partly by reducing the time allocated to public good production, thereby lowering the output of the public good. Her husband will partly compensate for this by contributing more income to the household, curtailing his private consumption. The accompanying increase in the marginal utility of private consumption will induce him to spend more time earning, thereby reducing his leisure. Thus in the noncooperative equilibrium, an increase the wife's wage rate will not only increase the time she devotes to earning but also induce an increase in the husband's market work.

From the above propositions, we immediately obtain the following corollary:

Corollary 1. *(a) An increase in the wife's unearned income increases the threat utility of both spouses, while (b) an increase in the wife's wage rate increases her threat utility but decreases the husband's.*

An increase in the wife's unearned income increases the husband's consumption of the public good, his private good and leisure. So both spouses are better off in the ensuing Nash equilibrium. When her wage rate increases, however, their utilities move in opposite directions. Because she diverts some time away from public good production, her husband's consumption of the public good, the private good, and leisure all decrease. Consequently, while the wife is better off, her husband is worse off.

It might appear that the result in the above corollary is dependent on the assumption that the wife's time input into the public good and the husband's income contribution are substitutes. This is not so. Even if these inputs were complementary, we would expect these outcomes to obtain. The only difference is that, when the wife diverts time from public good production, the husband, too, would divert resources away from household expenditures instead of augmenting them. While this response would partly compensate for the decline in his public good consumption, it would not entirely offset it. When the wife's implicit wage rate increases, the husband would still be worse off.

It must be noted that the results stated in Proposition 2 and Corollary 1 depend on our assumption of separate spheres, where the wife contributes only labour and the husband only financial resources towards the public good in the noncooperative scenario. That spouses retreat into traditional gender roles—specializing in the input they provide—when cooperation breaks down has a ring of truth to it. Lundberg and Pollak (1993), in pioneering the separate spheres approach, invoked the assumption to explain empirical findings that could not be understood with standard bargaining models, namely, why the effects of child allowances depend on the identity of the parent who receives the allowance. Warr (1983) and Bergstrom et al. (1986) had previously demonstrated that the aggregate amount of public good provided by agents in the Nash equilibrium would be invariant with respect to marginal income redistributions as long as the solution is interior (that is, all agents involved in the redistribution were providing positive amounts of the public good).[15] This 'neutrality' result breaks down when corner solutions obtain and, as Lundberg and Pollak (1993) emphasize, this is precisely what occurs in the separate spheres model.

Let $\bar{U}_f$ and $\bar{U}_m$ denote the (threat) utilities of the wife and husband in the noncooperative Nash equilibrium considered above. Naturally, these will impinge on the cooperative outcome. Assuming that these utilities are cardinal we posit, as in Basu (2006), that in their cooperative endeavour, the couple jointly makes its choices to maximize the objective function $\alpha U_f + (1-\alpha)U_m$, with $0 \leq \alpha \leq 1$. It is reasonable to suppose that the weight, α, that is put on the wife's utility in the cooperative scenario is a measure of her autonomy within the household. It would be increasing in her threat utility and decreasing in her husband's. We may write:

$$\alpha = g(\bar{U}_f, \bar{U}_m), \tag{2.6}$$

where the function g is increasing in the first argument, decreasing in the second, and bounded between 0 and 1. A reasonable functional form might be $g(\bar{U}_f, \bar{U}_m) = \bar{U}_f / (\bar{U}_f + \bar{U}_m)$.

The cooperative outcome is the solution to

$$\max_{x_f, e_f^1, e_f^2, x_m, e_m, L} \alpha U_f(x_f, z, l_f) + (1-\alpha)U_m(x_m, z, l_m) \tag{2.7}$$

$$\text{s.t.} \quad l_f = 1 - e_f^1 - e_f^2,\ l_m = 1 - e_m,\ 0 \leq e_f^1, e_f^2,\ e_m \leq 1,$$

$$p_f x_f + p_m x_m + y_m \leq w_f e_f^2 + R_f + w_m e_m + R_m,\ z = f\left(y_m, e_f^1\right).$$

[15] See Naito and Yamada (2004) for evidence from Japan contradicting this invariance prediction in the Nash equilibrium.

We do not explicitly solve for the cooperative outcome here because our primary interest is in the wife's bargaining power, as captured by α, which is determined by the *noncooperative* outcome. Our empirical estimation in subsequent sections seeks to identify the determinants of α.

Propositions 1 and 2 may appear to suggest that a woman's earned income in the noncooperative outcome may have greater potential to contribute to the wife's wellbeing in the cooperative outcome than does unearned income. This might appear so because, in the case of unearned income, the higher threat utility of the woman does not come at the expense of leisure; in fact, her leisure increases. In contrast, when the wage rate increases, her higher income comes partly from her decreased leisure. So the increase in threat utility associated with the unearned income would be larger. To see that the outcome on the bargaining solution is not clear-cut, suppose we consider two alternative scenarios. In one, the wife's unearned income increases by a given amount but the wage rate stays the same. In the second, her unearned income stays the same but her wage rate increases. Suppose we adjust her unearned income in the latter case—possibly taking away some of it—so that, in the Nash equilibrium, her total income increases by the same amount in both cases. Which scenario would lead to a better cooperative outcome for her? The answer is not clear *a priori*. For equal changes in her income, her utility will naturally be higher when it is due to an increase in unearned income since that comes at no cost to her leisure (as we have seen). In the second scenario, she diverts time from household public good production (from which her husband benefits) to market work (from which her husband does not), and so he gets worse off. It is conceivable, therefore, that she is actually better off in the cooperative outcome associated with the latter case if the decline in her husband's threat utility more than compensates for the reduction in her leisure in terms of the effect on bargaining power. For equal increases in earned and unearned incomes in the noncooperative Nash equilibrium, the increase in earned income may well confer greater bargaining power on the woman.

Corollary 1 brings out the importance of assuming that the fallback option is within marriage itself—as proposed by Woolley (1988), Lundberg-Pollak (1993), and Chen-Woolley (2001)—as opposed to divorce. If the threat utility were determined by their utilities when they are divorced, the wife's utility would be higher and the husband's utility constant whether it is the wife's unearned income or unearned income that increases. Qualitatively, there would be nothing to choose between the two routes to empowering women. Indeed, as argued above, for equal increases in the wife's earned and unearned income, her utility would increase by less in the former case since she has to forego some leisure to bring about the increase in income. Therefore, the divorce option for threat utility would unambiguously predict that, for equal increases in her earned and unearned income, it is unearned income that would have greater quantitative effect on her bargaining power. In Corollary 1, in sharp contrast, the comparative statics on the threat utilities are not identical for the two routes. As we have argued above, this leaves open the possibility that, for equal increases in earned and unearned income, it may be earned income that is more efficacious in raising the wife's bargaining power. Whether, in fact, this is the case is an empirical issue.

3. Empirical conjectures

Before we embark on our empirical investigation, we pause to dwell on some of the features present in the data which are not captured in the stark model of the previous section. Many families in the sample engage in cultivation. Farm work can be done with family labour and with hired labour. But family labour has the advantage that it does not require supervision. Put differently, inclusive of supervision costs, family labour is cheaper. This makes the time allocation decision more complicated than we assumed in the previous section. In the cooperative endeavour, the wife has one more use for her time: working on her husband's farm.[16] Similarly, the husband has the option of working on his farm or participating in the labour market.

When the husband's land holdings are very small, the couple would use only family labour to cultivate the farm, and the husband would work in the labour market for some time.[17] An increase in his land holding, for given bargaining power, α, would induce them to use more family labour on his farm. The husband would curtail his time on the labour market and/or his leisure; the wife would cut back her housework and help out at the farm. Thus one would expect to see a positive correlation between the husband's landholdings and farm work of the wife. At even higher levels of farm holdings, in the cooperative solution we would expect the wife to even cut back her independent earning activity. Thus we should observe a negative correlation between husband's landholdings and the wife's independent earning activity.[18] Of course, when the husband's landholdings increase, his threat utility would too (that is, α would decline). This would induce a substitution away from her consumption of the private good and leisure in favour of his. In any event, we would expect the above correlations to still obtain.

When the wife's threat utility increases relative to the husband's, the allocation of their joint resources would tilt in her favour. If the exogenous change that increases her threat utility also brings more resources into the household in the cooperative endeavour—say, through higher unearned income—the husband may become better off, too. The wife's consumption of her private good and leisure would certainly increase. Her consumption of the public good would, too, but may require more of her effort. So we would expect to see a diversion of her labour effort towards housework from farm work or from her independent earning activity when her unearned income increases. To the extent that the income of the family is higher, the couple may substitute financial resources for the wife's time in housework. This could entail the hiring of domestic servants and/or a greater reliance on household gadgets. When her threat utility is very high (possibly because she has considerable wealth or education), we could well expect to see the wife only overseeing the production of the household public good.

When we take the theory to the data, we encounter the difficulty that what we observe in the data is the cooperative outcome. We do not see the threat scenario. How do we know that, in fact, we are not observing the noncooperative outcome? In a world in which there is no asymmetric information (as we presume) between husband and wife, it is reasonable to expect that we would observe the cooperative outcome. (This is the same reason that we would not expect strikes to occur in firms when union and management have access to the same information.) The noncooperative outcome would be the fallback position that supports this cooperative outcome. We assume this to be the case.

There is a further difficulty, which Pollak (2005) alludes to. While it is not hard to identify most of the ingredients of the threat outcome (like education, assets, position in the hierarchy within the household, etc. of the two spouses), we cannot observe the activities each member of the couple would undertake in the noncooperative equilibrium. We need to make some assumptions regarding how the observed activities in the cooperative outcome would map into activities in the event cooperation breaks down.

[16] In reality, even in the noncooperative equilibrium there is the remote possibility that the wife could work on her husband's farm because the increase in his farm income may elicit greater financial contribution towards the public good. But we rule it out on grounds of implausibility.

[17] For a theoretical analysis of how landlords allocate their time, depending on their land ownership, see Eswaran and Kotwal (1986).

[18] This is consistent with what Desai and Jain (1994) find in data drawn from eight villages in the south Indian state of Karnataka. Women there curtail their work in the labour market when the husband's landholding increases.

To address this issue, we posit that the independent income earning activity of women (poultry rearing) requires some irreversible investment. If a woman is observed to engage in this activity, we assume that she would continue in this activity should cooperation break down. This is because the infrastructure is already in place and the costs associated with it are sunk. Moreover, by engaging in this activity, the woman would have acquired the skills needed to earn an independent income. If, however, she is observed to work on her husband's farm in the cooperative outcome, we presume that production of the household public good is the only activity she could engage in were negotiations to break down between the couple. This is because working in the farm gives her no marketable skills—women in rural Bangladesh could not sell their services in the labour market.[19]

The upshot of the argument made above is that there should be no fundamental difference between the threat utilities of women who are observed in the cooperative endeavour to be pure housewives and those working on the husbands' farms. In the noncooperative outcome, these women would have the same options open to them and, therefore, would be engaged in the same activities. Since their autonomy is determined by their threat utilities, empirical measures of autonomy should be the same for women who are purely housewives and those who work on their husbands' farms. And these, in turn, should be definitely lower than the measures for women who are observed to earn independent incomes. Therefore, our first empirical conjecture is:

Conjecture 1. *Female autonomy, α, is (a) the same for women who work on their husband's farm compared to women who are housewives, and (b) higher for women who earn an independent income compared to women who are housewives.*

Our second main empirical conjecture follows from the analysis of Section 2. There, Corollary 1 implies:

Conjecture 2. *Female autonomy, α, is (a) increasing in both earned and unearned income of women, but (b) the impact of earned income may be larger than the impact of unearned income.*

This conjecture, informed by the simple theory presented in the previous section, captures the essential asymmetry between earned and unearned income in empowering women.

We now turn to testing Conjectures 1 and 2 with the data.

4. Data

The household level data used in this study are from the Matlab Health and Socio Economic Survey (MHSS) conducted in 1996.[20] The survey gathered information from approximately 4364 households in 2687 residential compounds (*baris*) in Matlab, a rural subdistrict (*Thana*) in Chandpur Zila (Chittagong division) of Bangladesh.[21] Matlab is located about 70 km southeast of Dhaka. The area is low-lying and the economy is largely based on agriculture. The data contain detailed information on the education, income, assets, and all labour activity of individuals. In addition to this standard information, women were asked numerous questions aiming to capture their degree of independence or autonomy within the household. We consider only couples who constitute the household head and his wife, who form a sample of roughly 3400 couples. This sample comprises 90% of the total sample of married individuals living together with their spouse[22] That is, the typical household is nuclear; only 7% of the women in the sample have entered a household by marrying the son of the household's head.[23]

Table 1
Characteristics of wives and husbands.[a]

Variable	Wives	Husbands
Age	40.2 (11.4)	49.2 (13.4)
Proportion with no education	0.58 (0.49)	0.46 (0.50)
Proportion with primary school	0.28 (0.45)	0.29 (0.46)
Proportion with middle school	0.06 (0.25)	0.12 (0.32)
Proportion with secondary school or more	0.04 (0.20)	0.15 (0.35)
Proportion with no work	0.18 (0.38)	0.07 (0.26)
Proportion working only on family farm	0.33 (0.47)	0.28 (0.45)
Proportion working only for independent income	0.24 (0.43)	0.44 (0.50)
Proportion working in both activities	0.24 (0.43)	0.20 (0.40)
Average annual independent earnings	710.9 (782.4)	17,738.8 (13,876.3)
Proportion owning assets	0.42 (0.49)	0.63 (0.48)
Average value of assets	14,013 (55,838)	101,920 (139,264)
Observations	3347	3347

[a] Standard deviations are in parentheses. Income values are in takas. There were approximately 45 takas to the U.S. dollar in 1996. Primary school comprises grades 1 to 5, middle school is grades 6 to 8, and secondary school is grades 9 and higher.

Table 1 below lists summary statistics on characteristics of wives and husbands.

Annual earnings are reported conditional on working for an independent income. Similarly total value of unearned assets is reported conditional on owning these assets. These are assets acquired either through inheritance or as a transfer at the time of marriage from parents. In the survey, individuals are asked if any other family member has any ownership rights to these assets and those included in the above table comprise only the ones which are exclusively self-owned. For men, these unearned assets comprise primarily inherited land (90%). For women, unearned assets are only comprised of 10% land, the primary component is jewelry from their dowries.[24] Accordingly, average assets for men are substantially higher than for women; this difference is even larger for median values which are 51,000 and 2000 takas respectively. As seen from Table 1, men are older, more educated, earn more and own more assets than their wives. The no work category for women reflects a woman who is primarily a housewife. Women who work at home to facilitate the generation of household income by working on the household farm, mainly performing the post harvest tasks of husking, drying and parboiling the paddy crop (78%).[25] Women who work for an independent earnings are also working on the homestead but earn an independent income from poultry rearing (84%).[26] Poultry is traditionally owned and managed entirely by women. It is one of the sole assets over which poor women actually have control (Saleque and Mustafa, 1996). Almost all households in the data, 88%, own some poultry. Production costs are very low as birds scavenge in and around the homestead to meet the major part of their feed requirements. Women typically sell their eggs (and their meat) to collectors who come directly to the house and then sell the goods at the local market (Fattah, 1999). Approximately 40% of both men and women also have a secondary work activity and as seen from the table, 24% of women perform both activities. In the estimations of work activity, we will use the total

[19] An anonymous referee has pointed out that this line of reasoning implicitly assumes a behavioral model; in a fully rational, forward-looking model, sunk costs should be irrelevant.

[20] For details, refer to Rahman et al. (1999).

[21] Bari is the basic unit of social organization in Matlab. Bari translates to homestead but commonly refers to a cluster of households in close physical proximity. Heads of the households on a bari are typically related and the interdependence of the households on baris is an important aspect of life in rural Bangladesh (see, for example, Foster, 1993).

[22] Approximately 10% of married women are not living with their spouse. Of these women, two thirds are widows, and for the others, their husbands reside elsewhere. Almost all marriages are arranged (98%) and there is no polygyny in the data.

[23] This is common in Bangladesh where related adult males reside in independent households but within the same bari (residential compound).

[24] As specified by Islamic Law, daughters have the right to inherit the equivalent of half a son's share of the father's property in Bangladesh. However, in practice this is rarely enforced and daughters receive substantially less than they are entitled to.

[25] The remaining ones are rearing animals or helping in their husband's work.

[26] The remaining few women earn an income from handicrafts, working in a factory, or in farm labour.

Table 2
Household characteristics.[a]

Variable	
Household income (in taka)	31,006.3 (33,213.9)
Household size	5.7 (1.8)
Number of adults (aged more than 15)	3.2 (1.7)
Proportion cultivating paddy crop	0.48 (0.50)
Proportion with crop loss within past 2 years	0.23 (0.42)
Proportion with sickness within past 2 years	0.12 (0.32)
Rain in April	0.56 (0.50)
Rain in March	0.32 (0.47)
Rained same month for last two years	0.51 (0.50)
Observations	3347

[a] Standard deviations are in parentheses.

months per year worked in each activity.[27] For women who engage in an independent wage earning activity, they typically do this for all months of the year. For those who only work on their husband's farm, they perform this activity for an average of 9 months out of the year. If this work is their secondary activity, they do it for an average of 5 months.

For men who work primarily on the family farm, they typically do this activity for 12 months of the year. The few men who are not working are generally retired. Of the men who work at home, 75% are self cultivators; the remaining operate small businesses. The men who earn independent earnings are agricultural labourers (27%), run small businesses such as a grocery shop (18%), perform skilled labour like a rickshaw driver or fisherman (19%), or work for a government service (20%). Working for the government generates the highest income on average, followed by working in a business, which typically generates more than what a skilled worker earns. Labourers earn the least. Male land ownership seems to be the primary determinant of the work activity of both men and women. The more land a household owns the more likely is it that the man is a self cultivator and that his wife also works on the farm, consistent with the discussion in Section 3.

Table 2 below lists the summary statistics of the household characteristics.

Annual household income is computed from all wage income, own business and farm income. Even if the primary occupation of husbands is wage labour, the majority of households own some land to grow crops. The most common crop in the area is paddy.[28] As mentioned, households are typically nuclear. That the average number of adults is larger than two reflects mainly children in the household who are older than 15 years. For 15% of the households, the mother of the household head also resides with the family. The remaining two household level variables reflect shocks the household has suffered within the past two years which caused them economic hardship. Approximately 23% of households had experienced a crop loss within the past two years and in 12% of households at least one member suffered a health shock. The sickness category in the above table refers to a household member who fell ill and who is not a member of the married couple. (In what follows, we shall be using crop loss and family sickness shocks, together with rainfall patterns, as instrumental variables in our regressions.) The remaining three variables contain village level information on rainfall. Heavy rains arrive either in April or March in the majority of villages. The final variable is equal to one if the main rainfall arrived in the same month in the last two consecutive years (and equal to zero otherwise). We see from the above, that this was true for approximately half of the villages in the sample.

Table 3 below summarizes indicators of female autonomy.

In the survey, women were asked (in the absence of other family members) if they had any say in the decision to make certain purchases. The variables in the table above are equal to one if the woman had at least some say in the decision. The first three variables in Table 3 pertain

Table 3
Measures of female autonomy.

Variable	
Some say in decision to purchase cooking oil	0.51 (0.50)
Some say in decision to purchase coconut oil	0.52 (0.50)
Some say in decision to purchase ice cream	0.61 (0.49)
Some say in decision to purchase at the daily bazaar	0.37 (0.48)
Some say in decision to purchase betel leaf/nut	0.51 (0.50)
Some say in decision to purchase children's clothes	0.40 (0.49)
Some say in decision to purchase saree for themselves	0.36 (0.48)
Observations	3347

to small purchases. The first variable, cooking oil, reflects necessary goods for the household such as kerosene oil, cooking oil, spices for the family. The second variable, coconut oil, represents goods for herself such as coconut oil (for grooming), soap, and glass bangles. The third variable, ice cream, includes treats for children such as ice cream, sweets, and lace phita. The remaining four variables in the table capture a woman's decision making role in larger purchases.[29] It is important to note that, in general, the purchases listed in the above table were *not* made with money earned directly by the women.[30] Neither was it the case that a woman was allowed to make the purchases on her own (only 6% of women were able to make these purchases on their own). The rigid rules of purdah do not allow women to go to the market unaccompanied. In the data, 93% of women have never been to the local bazaar. It was the husband's money that was used to make these purchases. Therefore, the various responses speak to the degree of independence women exercise with regard to the allocation of their husbands' incomes.

Our key dependent variables include measures of female autonomy derived from asking women about their own behavior. A more direct method might instead come from observed behavior. A shortcoming of our strategy relates to the large literature in psychology on cognitive dissonance. Often people filter information that conflicts with their own beliefs so as to render them more compatible (Festinger, 1957). So it is conceivable that a woman who does not actually have autonomy may be prompted to pretend that she does in her answers to questions posed by her interviewer. Our data, however, cannot speak to these interesting issues.

5. Estimation strategy

Conjectures 1 and 2 of Section 3 provide testable predictions on the determinants of female autonomy, α. Let A denote an index function such that $A=1$ if a woman has autonomy with respect to a given decision, and $A=0$ otherwise. This function is represented by the following:

$$A = \beta_A X_A + \varepsilon_A \tag{5.1}$$

The vector X_A contains exogenous variables which affect the threat utilities of husbands and wives, $\bar{U}_{\mathrm{m}}$ and $\bar{U}_{\mathrm{f}}$. These include husband and wife characteristics such as age, education, and unearned income. The threat utilities are also functions of a wife's earned income in the noncooperative scenario. However, as pointed out in Section 3, what we observe in the data is the cooperative outcome with respect to the work activity of women. As argued earlier, we use the observed cooperative outcomes to infer the activities in the noncooperative equilibrium. In Eq. (5.1), ε_A is the error term.

Given that our measures of unearned income are captured by assets which are either inherited or given as marriage payments, we assume

[27] The data do not comprise information on hours worked in each activity, only months per year.

[28] Other significant crops are jute, wheat, and potato. Paddy and potato crops seem to generate the highest revenue.

[29] The dataset also included questions on women's decision making power with regards to major costs such as repairing the house, or purchasing land, livestock, or a vehicle. In these cases women had virtually no say.

[30] No women in the sample claimed that only their own money is used for these purchases and approximately 4% claimed that they contributed some of their own money to buy these items.

Table 4
First stage OLS estimations of women's work activity and earnings and household income.[a]

Variable	Months on farm	Months for income	Annual earnings	Household income
Woman's age	0.02 (0.02)	−0.09 (0.03)***	39.3 (33.2)	202.3 (124.0)*
Husband's age	−0.01 (0.02)	0.04 (0.02)**	−37.64 (24.8)	−325.0 (107.4)***
Woman's education	0.05 (0.05)	−0.01 (0.06)	696.1 (156.9)***	1359.0 (281.4)***
Husband's education	−0.02 (0.04)	0.002 (0.04)	14.5 (43.6)	1404.4 (190.6)***
Value of woman's assets	−0.0007 (0.003)	−0.002 (0.003)	−3.2 (3.2)	68.0 (35.0)*
Value of husband's assets	−0.0002 (0.0008)	0.0008 (0.001)	0.97 (2.3)	2.4 (6.3)
Household size	0.14 (0.07)**	0.31 (0.08)***	−67.9 (77.7)	2994.5 (368.3)***
Number of adults	0.01 (0.08)	−0.55 (0.08)***	129.1 (104.0)	2113.6 (456.1)***
Mother-in-law present	−0.02 (0.32)	−0.07 (0.37)	−1270.9 (496.7)*	−5299.5 (1826.0)***
Household cultivates paddy	1.15 (0.22)***	0.21 (0.24)	−758.8 (323.0)**	−5911.9 (1152.5)***
Crop loss<2 years ago	0.66 (0.25)***	−0.08 (0.28)	145.7 (378.6)	−2121.2 (1347.1)
Sickness<2 years ago	−0.24 (0.32)	−0.67 (0.35)*	−770.6 (386.4)**	−3005.9 (1605.8)*
Rain in March	0.46 (0.36)	0.83 (0.43)**	−2105.4 (1100.9)*	−6865.7 (2361.0)*
Rain in April	0.68 (0.35)**	0.51 (0.41)	−2477.9 (1120.9)*	−8232.6 (2268.8)***
Rain same month for 2 years	−0.42 (0.22)*	0.83 (0.25)***	451.8 (399.9)	2358.3 (1177.4)**
Constant	2.38 (0.61)***	6.44 (0.72)***	2687.5 (1329.8)*	16,918.8 (3619.7)***
Observations	3347	3347	3347	3347
$\bar{R}^2$	0.02	0.03	0.05	0.17
F-statistic	4.86	7.43	2.14	22.64

[a] A single asterisk denotes significance at the 10% level, double for 5%, and triple for 1%. Robust standard errors are in parentheses.

that these are an exogenous determinant of female decision making power within the household.[31] The variables that pertain to the work activity decisions within the household, however, are endogenous: they would depend upon female autonomy, α. To address this endogeneity, we employ a two-stage least squares procedure.

The key instrumental variables used to identify the first stage estimations on the work activity and earned income are variables reflecting household-level agricultural and health shocks the family suffered less than two years ago and village-level rainfall patterns (as summarized in Table 2). The reasoning is that, if the household suffered a crop loss or a rainfall shock, female labour would have been reallocated to the farm. Alternatively, if a family member (other than the husband or wife) fell ill, then women would have withdrawn their labour from income-generating activities to care for the sick instead. Regarding rainfall patterns, when the heavy rains arrive these will determine harvesting dates which in turn predict female labour patterns, given that women are mainly engaged in post-harvest activities. Men, on the other hand perform several agricultural tasks and work for all months of the year.

We expect that these instrumental variables will be correlated with women's work activities and earnings but not directly with their autonomy. It is possible, however, to argue otherwise. A health shock, for example, may directly affect female autonomy since the need to have a woman withdraw her labour and care for the effected member may also lead to her being more directly engaged in market transactions. For example, when the woman is out of the labour market and caring for the sick member she may now also be using her extra time to undertake some of the household purchases. However, it is important to note that this potential avenue is not what our measures of autonomy reflect. As already emphasized, our second stage independent variables do not capture whether women go to the market and make purchases or not, but instead how much say they have in the decision to make those purchases. As already noted, in this part of rural Bangladesh women are not allowed to leave the house unaccompanied and could never be undertaking such purchases in the market on their own.

6. Estimation results

We treat the months worked by women in the two different income-generating activities (own farm labour and wage labour), women's independent earnings, and total household income as endogenous in the estimations of measures of female autonomy. We do not have predictions on how different male work activities will impact female autonomy. Instead we control for husbands' unearned assets, which is essentially their inherited land, and total household income, which we treat as endogenous, in the estimations. Land ownership is a primary determinant of whether men work on the family farm and total household income is highly positively correlated with male's independent earnings. The results from the first stage estimations are listed in Table 4 below.

A chief determinant of female time on the household farm is whether the household cultivates paddy. Household size has a positive impact on female time into both work activities. The education of women does not seem to determine whether they work, but it is a positive determinant of their annual earnings. Household income is positively related to the education of both the household head and his wife. If a family member other than husband or wife suffered a health shock, women put less time into their wage work. If the household suffered a crop shock, within the last two years, women are more likely to be working on the farm in order to compensate. Heavy rainfall in March is positively related to female wage labour and rainfall in April is positively related to their farm labour. This likely follows because the main harvesting season for paddy is in May. If these rain patterns are as expected, i.e., heavy rains have arrived in the same month in the past two consecutive years, then women are more likely to engage in wage labour than in farm labour. Weather and household shocks negatively affect household income. However, other variables which determine household farm income, such as crop choice and rainfall patterns have a negative effect on household income. This follows because, agricultural activity is negatively related to male wage earnings, which in turn is strongly positively correlated with total household income. In the above estimations, the five instrumented variables are jointly significant at the 1% level.

The results from the second stage estimation of Eq. (5.1) are listed in the tables below for several indicators of female autonomy. First we consider decision making power with respect to smaller purchases (cooking oil, coconut oil, and ice cream), as described in Table 3, then for larger purchases (bazaar, betel leaf, children's clothing, and sarees). Linear probability versions of Eq. (5.1) are estimated. In the first two tables the work hours of women and household income are treated as endogenous regressors. The subsequent two tables (Tables 5a and 5b) list the results from analogous estimations where we instead include women's annual earnings instead of work hours.[32]

[31] Several others have used pre-marital assets as an exogenous determinant of female bargaining power. Refer to Quisumbing and Maluccio (2003) for a study on how these assets affect household outcomes in Bangladesh.

[32] Pollak (2005) has recently argued that a woman's wage rate would be a better measure of her bargaining power than her earnings. Since there is no labour market for women in Matlab, we do not have their wages. But using earnings does not present a serious problem for us because we are accounting for its endogeneity.

Table 5a
IV-2SLS estimations of indicators of female autonomy.[a]

Variable	Cooking oil	Coconut oil	Ice cream
Woman's age	0.001 (0.002)	0.002 (0.002)	0.0007 (0.002)
Husband's age	0.0001 (0.002)	−0.0004 (0.002)	0.0001 (0.002)
Woman's education	0.002 (0.005)	0.003 (0.004)	0.002 (0.004)
Husband's education	0.002 (0.003)	0.004 (0.003)	0.005 (0.003)
Value of woman's assets	0.0007 (0.0002)***	0.0007 (0.0002)***	0.0007 (0.0002)***
Value of husband's assets	0.0001 (0.00008)	0.0001 (0.00008)	0.00004 (0.00007)
Mother-in-law present	−0.06 (0.03)**	−0.06 (0.03)**	−0.06 (0.03)**
Months worked on farm	0.007 (0.01)	0.01 (0.01)	0.008 (0.01)
Months worked for income	0.03 (0.01)***	0.03 (0.01)***	0.03 (0.01)***
Family income	0.0007 (0.0008)	0.0004 (0.0008)	0.0005 (0.0008)
Constant	0.21 (0.11)*	0.23 (0.11)**	0.33 (0.11)***
Observations	3347	3347	3347
F-statistic	4.03	4.14	4.75

[a] Robust standard errors are in parentheses. In Appendix B we report the same estimations where standard errors are clustered at the village level.

Table 5b
IV-2SLS estimations of indicators of female autonomy.

Variable	Daily bazaar	Betel leaf	Children's clothes	Saree
Woman's age	−0.003 (0.002)	0.001 (0.002)	−0.001 (0.003)	−0.001 (0.002)
Husband's age	0.002 (0.002)	0.003 (0.002)	0.0004 (0.002)	0.0006 (0.002)
Woman's education	0.004 (0.005)	−0.008 (0.005)	0.008 (0.005)	0.006 (0.005)
Husband's education	0.002 (0.004)	0.003 (0.004)	−0.0006 (0.004)	0.002 (0.004)
Value of woman's assets	0.0003 (0.0002)	0.0006 (0.0002)**	0.0004 (0.0003)	0.0007 (0.0003)***
Value of husband's assets	0.00001 (0.00008)	−0.0001 (0.00009)	−0.00006 (0.0001)	−0.00004 (0.00009)
Mother-in-law present	−0.09 (0.03)***	−0.07 (0.03)**	−0.08 (0.03)***	−0.07 (0.03)**
Months worked on farm	−0.01 (0.01)	−0.001 (0.01)	−0.01 (0.01)	−0.01 (0.01)
Months worked for income	0.03 (0.01)***	0.04 (0.01)***	0.05 (0.01)***	0.04 (0.01)***
Family income	0.0002 (0.0008)	0.002 (0.0008)**	0.001 (0.0009)*	0.001 (0.0008)
Constant	0.21 (0.12)*	0.03 (0.12)	0.09 (0.13)	0.11 (0.12)
Observations	3347	3347	3347	3347
F-statistic	4.42	5.32	6.42	5.92

As the model predicts, women's outside options, as reflected by their unearned assets, are positively related to their autonomy. Similarly, working for an independent income is a significant and positive determinant.[33] Perhaps a more surprising result is that working on the farm has no impact on female autonomy, compared to not working in any income generating activity. This is consistent with Conjecture 1 of Section 3. In general, husbands' characteristics do not consistently affect women's autonomy. We found this to be true also in several empirical specifications where we also included variables reflecting the work activity of husbands. We see from the above table that household (family) income is also an insignificant determinant of female autonomy. Of the variables reflecting household composition, the main significant determinant of female autonomy is whether her mother-in-law is present. The negative finding here is consistent with numerous accounts from South Asia of the subordinate relationship between a young woman and her mother-in-law. For many activities and decisions, a woman is closely supervised by her husband's mother. A woman gains increasing autonomy with age but a mother-in-law's authority continues to be felt. The cycle is complete only when a woman's first daughter-in-law enters the household (Cain et al., 1979).

Table 5c
IV-2SLS estimations of indicators of female autonomy.

Variable	Cooking oil	Coconut oil	Ice cream
Woman's age	0.0007 (0.002)	0.001 (0.002)	−0.0003 (0.002)
Husband's age	0.0005 (0.002)	−0.00008 (0.002)	0.0006 (0.002)
Woman's education	0.003 (0.005)	0.004 (0.005)	0.003 (0.005)
Husband's education	0.003 (0.004)	0.004 (0.004)	0.007 (0.003)*
Value of woman's assets	0.0007 (0.0002)***	0.0007 (0.0003)***	0.0006 (0.0001)***
Value of husband's assets	0.0002 (0.00009)*	0.0002 (0.00008)**	0.00006 (0.00008)
Mother-in-law present	−0.06 (0.03)*	−0.06 (0.03)*	−0.05 (0.03)*
Woman's earnings	0.35 (0.16)**	0.41 (0.16)***	0.28 (0.15)*
Family income	0.0004 (0.0008)	0.0001 (0.0008)	−0.00006 (0.0008)
Constant	0.32 (0.09)***	0.32 (0.09)***	0.49 (0.09)***
Observations	3347	3347	3347
F-statistic	3.20	3.35	4.40

We see from Table 5b that the main results of Table 5a also hold for autonomy with respect to making larger purchases in the household. The results for women's work activity suggest that only if a woman has income in her hands (i.e., earns income directly), does it influence on the autonomy with which she can spend her *husband's income*.

The two subsequent tables (Tables 5c and 5d) list the results from analogous estimations where we include women's earnings instead of their work activities. The results from the first stage of this estimation are listed in column 3 of Table 4.

The results from the above table are essentially consistent with those in Table 5a.[34]

Before we can examine whether labour earnings have greater impact on women's autonomy than asset income, we need to obtain the latter from the estimated coefficient for value of woman's land. If we assume perfect capital markets in which the interest rate is r, the rental income associated with an asset of value V would be rV. If β_W is the coefficient associated with the value of woman's assets, then that associated with the return on her unearned income would be β_W/r. It is this number that must be compared with the estimated coefficient for a woman's labour income. For the three columns in Table 5c, we see that the impact of a woman's labour income on her autonomy is greater than that of her rental income if $r>0.25\%$.

The results from Table 5d (for larger purchases) are essentially consistent with those in Table 5b. For the four columns in Table 5d, we see that the impact of a woman's labour income is greater than that of her rental income if $r>0.14\%$.

The interest rates for which the impact on female autonomy of earned income relative to unearned income are negligible. Moreover, it is possible to get an idea of the relevant interest rates from the Matlab data. People who borrowed money paid an average annual interest rate that exceeded 70% if they borrowed from relatives and over 44% if they borrowed from others (private commercial banks, cooperative banks, etc.).[35] The lower interest rate charged by financial institutions is presumably because they invariably asked for collateral. Since the

[33] This result is consistent with Rahman and Rao (2004) who find evidence that village level female wages are positively related to some measures of female autonomy. Given the endogenous relationship between women's autonomy and work activity, this issue might be best explored in a dynamic framework. Where working in one period increases women's autonomy and hence possibly the ability to work even more in a subsequent period. Given the cross-sectional nature of this data, such an exercise must be left for future research.

[34] Similar results obtain if we also include women's work activities (as in Table 5a), but of course these variables are highly correlated with female earnings.

[35] These average interest rates come from a total sample of 369 loans (114 informal (friends and relatives) and 248 formal (other sources such as banks)). If we exclude those observations with interest rates of 100% or higher, the average interest rate is still high, at 36% for informal loans and 24% for formal loans.

Table 5d
IV-2SLS estimations of indicators of female autonomy.

Variable	Daily bazaar	Betel leaf	Children's clothes	Saree
Woman's age	−0.005	−0.002	−0.005	−0.004
	(0.002)**	(0.002)	(0.002)**	(0.002)**
Husband's age	0.004	0.005	0.003	0.003
	(0.002)**	(0.002)**	(0.002)*	(0.002)
Woman's education	0.0004	−0.008	0.006	0.005
	(0.005)	(0.005)***	(0.005)	(0.005)
Husband's education	0.002	0.004	0.0002	0.002
	(0.004)	(0.004)	(0.004)	(0.004)
Value of woman's assets	0.0003	0.0006	0.0004	0.0007
	(0.0002)	(0.0002)**	(0.0003)*	(0.0003)***
Value of husband's assets	0.00005	−0.00008	−0.000006	0.00002
	(0.00009)	(0.00009)	(0.0001)	(0.00009)
Mother-in-law present	−0.08	−0.08	−0.08	−0.07
	(0.03)***	(0.03)***	(0.03)***	(0.03)**
Woman's earnings	0.55	0.51	0.61	0.56
	(0.17)***	(0.17)***	(0.17)***	(0.16)***
Family income	0.0005	0.002	0.001	0.001
	(0.0009)	(0.0009)*	(0.0009)	(0.0008)
Constant	0.20	0.18	0.24	0.20
	(0.09)**	(0.09)**	(0.10)**	(0.09)**
Observations	3347	3347	3347	3347
F-statistic	4.03	4.92	5.45	4.97

annual inflation rate in Bangladesh in 1996–97 was 3.9%, the real interest rate was around 40%. Thus, for this interest rate, our estimates from Tables 5c and 5d indicate that the impact of earned income on a woman's autonomy is an order of magnitude higher than that of the return on unearned income. This relationship is consistent with Conjecture 2 from Section 3.

The main results from Tables 5a–5d are the same if instead probit estimations are run.[36] The results are also unchanged in IV-2SLS estimations using only subsets of the instrumental variables.[37] We ran similar estimations to those in Tables 5a and 5b, where instead of months worked in each activity we use dummy variables which reflect the primary work activity of women in the past year. These estimations generated similar results. Linear (OLS) estimations which do not use instrumental variables are reported in Appendix B. Coefficients from the OLS estimations are smaller than those from the IV-2SLS estimation. It is difficult to sign the bias in the OLS estimations. We might expect that women with more autonomy choose more leisure and engage less in income earning activities all together which could be consistent with the estimates here. However, we need a dynamic model of the household to properly uncover the causal relationship between female autonomy and different time allocation decisions.

6.1. Alternative measures of female autonomy

The empirical results of this paper appear to support Conjectures 1 and 2 of the theoretical model. The main finding is that income directly in the hands of women has a significant impact on her decision making power within the household. This result does not simply follow because a woman who is earning income is directly making purchases with that income. As mentioned in Section 4, for all of the possible purchases analysed here, it is almost always the husbands' income which is used. Therefore, the key dependent variables analysed here truly capture female autonomy and do not merely reflect the fact that women can spend more because they have more.

Below we perform similar estimations in which the dependent variables are alternative measures of autonomy such as wearing a burqua. In these estimations, the variables reflecting their work activity or their income (earned and unearned) have no significant impact on women's autonomy. This demonstrates that their work activity impinges on their autonomy in the economic sphere (that is, their clout in allocating resources) but hardly at all in the cultural and religious spheres.

[36] These estimations were run using the *ivprobit* command in STATA.

[37] For one estimation, we used the three exogenous shocks to the household (health, crop, and weather), then in another we used the three variables reflecting rainfall patterns.

Table 6
Additional measures of female autonomy.[a]

Variable	
Cover head outside of bari in the presence of men	100.0 (0.06)
Cover head inside bari in the presence of men	0.99 (0.09)
Cover head inside bari in the presence of outsider men	0.97 (0.18)
Wear burqua outside of bari	0.24 (0.43)
Wear burqua for visit or festival	0.26 (0.44)
Not have meals with husband	0.08 (0.28)
Observations	3347

[a] Standard deviations are in parentheses.

Table 6 summarizes the proportion of women who undertook the following activities, which can perhaps be interpreted as additional (inverse) measures of female autonomy.

We see from Table 6 that almost all women seem to cover their head inside and outside of their bari (residential compound) in the presence of men and typically do eat meals with their husband. Only the activity of wearing a burqua exhibits some variation. We report below estimations analogous to those in Tables 5a and 5b, for only those variables in Table 6 that exhibit some variation (Table 7).

These results stand in sharp contrast to those in Tables 5a and 5b. Wearing a burqua is positively correlated with education of both members of the couple and also to an extent to the asset ownership and age of the husband. The work activity of women and their asset ownership have no significant effects on the dependent variables. Though not reported here, female labour earnings also had no effect.

Our results indicate that the key dependent variables analysed in Tables 5a to 5d strongly impinge on female autonomy in the realm of economic decision making within the household. There is no evidence, however, that this influence extends beyond the economic sphere; norms determined by cultural, social, and religious factors seem to be relatively impervious to this influence and can be taken as exogenous. Consistent with the general position of Dyson and Moore (1983), the causality would go from the latter to autonomy.

7. Conclusion

In this paper, we first set out a simple model to address the issue of whether it is earned income or unearned income that is more effective in enhancing the autonomy of women within the household. Our model offered a reason to favour earned income. We find evidence from rural Bangladesh that is consistent with this: wage

Table 7
Additional IV-2SLS estimations of indicators of female autonomy.[a]

Variable	Wear burqua outside bari	Wear burqua for visits
Woman's age	0.003 (0.002)	0.002 (0.002)
Husband's age	0.002 (0.002)	0.003 (0.001)**
Woman's education	0.02 (0.004)***	0.02 (0.004)***
Husband's education	0.01 (0.003)***	0.01 (0.003)***
Value of woman's assets	0.0003 (0.0003)	0.0002 (0.0003)
Value of husband's assets	0.0001 (0.00007)	0.0001 (0.00007)*
Mother-in-law present	−0.03 (0.02)	−0.038 (0.024)
Months worked on farm	0.01 (0.01)	0.01 (0.01)
Months worked for income	−0.016 (0.01)	−0.009 (0.01)
Family income	−0.0007 (0.0007)	−0.0005 (0.0007)
Constant	−0.004 (0.10)	−0.06 (0.11)
Observations	3347	3347
F-statistic	17.17	23.96

[a] Robust standard errors are in parentheses. Regression disturbance terms are clustered at the village level.

income is seen to have a larger effect on women's autonomy than does the return from unearned income.

From a theoretical point of view, the results of this paper underline the importance of choosing the appropriate threat point in the analysis of female autonomy. Our results support the contention of Woolley (1988), Lundberg-Pollak (1993), and Chen-Woolley (2001) that it is the noncooperative outcome within marriage, not divorce, that defines the relevant threat point. This contention leaves open the possibility that women may benefit more from earned income than they could from unearned income; divorce as the threat scenario, in contrast, unambiguously points to unearned income as more efficacious.

Our empirical work also reveals that employment on their husbands' farms gave Bangladeshi women no more autonomy than doing housework. A woman's housework is deemed a household public service; her work on the farm, our results suggest, is deemed to be of no additional worth—despite the fact that it generates income. That women's participation in income-generation does not necessarily have a salutary effect on their autonomy may come as no surprise to economists, who would argue that what does not impinge on the threat option should have no effect on autonomy. Nevertheless, the robustness of this finding —as reassuring as it may be to economists—reveals an aspect of the bleak reality confronting women in developing countries. Women working on their husbands' farms appear to exercise no control over the income they help generate. It is when the income is possessed by women that it contributes to their autonomy. These findings are consistent with those of Kantor (2003), who found in the context of women working in the Indian garment industry in the city of Ahmedabad, that home-based work did not empower women much. Anderson and Baland (2002), using data from a slum of Kibera (Kenya), found evidence supporting the hypothesis that married women tended to join rotating credit and savings institutions as a way of keeping savings outside the reach of their husbands. Possession, it would appear, is more than nine-tenths of the law that determines women's autonomy.

Having said this, we must mention that, in the our data, we do not know precisely whether women maintained direct control over their earnings. However, we do know that these are the earnings that were self-reported by them and for family farm work they did not report any independent earnings. Additionally, 87% of women in our data report that they do not need to seek permission to spend their own earnings. Moreover, our results that women gain autonomy from their earnings from poultry rearing are consistent with findings elsewhere. Because poultry rearing is culturally acceptable and traditionally in the direct control of women, agencies aimed at reducing poverty and improving the livelihood of women in Bangladesh have specifically targeted programs to increase productivity in this activity. Since the 1980s, NGOs such as the Bangladesh Rural Advancement Committee (BRAC) and the better known Grameen Bank have been developing programs particularly aimed at women to train them in poultry farming and disease prevention (Permin et al., 2000). Many reports confirm that women are able to retain direct control over their earnings from this traditional work (Goetz and Gupta, 1996). For example, Kelkar et al. (2004) interview women who confirm that because they carry out the sales from poultry production at their doorstep, they receive the income directly and can decide how to spend it. Purchase of the daily necessities continues to be carried out by men but as one woman stated "…as we do have access to money, men seem to care for us and get us more sarees and have begun to consult us in day-to-day matters…". Our findings are exactly in accordance with these sentiments. The possibility of controlling their own earnings in the noncooperative outcome within marriage is sufficient to increase women's autonomy in household decisions.

Appendix A

In this appendix, we provide the Proofs of Propositions 1 and 2, and of Corollary 1.

Eliminating the wife's budget constraint by substituting $x_f = (w_f e_f^2 + R_f)/p_f$ into her objective function, the first order conditions under Nash conjectures for her optimization problem stated in Eq. (2.4) of the text are given by:

(A.1) e_f^1: $\gamma_f b/(y_m + be_f^1) - \delta_f/(1 - e_f^1 - e_f^2) \le 0$; $e_f^1 \ge 0$,
(A.2) e_f^2: $\beta_f w_f/(R_f + w_f e_f^2) - \delta_f/(1 - e_f^1 - e_f^2) \le 0$; $e_f^2 \ge 0$.

Eliminating the husband's budget constraint by substituting $x_m = (w_m e_m + R_m - y_m)/p_m$ in his objective function, the first order conditions under Nash conjectures for his optimization problem stated in Eq. (2.5) of the text are given by:

(A.3) e_m: $\beta_m w_m/(R_m + w_m e_m - y_m) - \delta_m/(1 - e_m) \le 0$; $e_m \ge 0$,
(A.4) y_m: $-\beta_m/(R_m + w_m e_m - y_m) + \gamma_m/(y_m + be_f^1) \le 0$; $y_m \ge 0$.

(In all of the above four Kuhn–Tucker conditions, it is understood that if one inequality of the pair is strict, the other weak inequality must hold as an equality.)

In the fully interior Nash equilibrium, all the decision variables are strictly positive and the four first order conditions yield equations that turn out to be linear and, therefore, are readily solved explicitly. The Nash equilibrium solution is given by:

(A.5a) $e_f^1 = [b\gamma_f(R_f + w_f) - \gamma_m(\beta_f + \delta_f)w_f(R_m + w_m)]/[bw_f(\gamma_f + \gamma_m(\beta_f + \delta_f))]$;
(A.5b) $e_f^2 = [\beta_f\gamma_m w_f(R_m + w_m) - bR_f(\gamma_f + \gamma_m\delta_f) + b\beta_f\gamma_m w_f]/[bw_f(\gamma_f + \gamma_m(\beta_f + \delta_f))]$;
(A.5c) $e_m = \{w_f[w_m(\gamma_m + \beta_m\gamma_f) - \gamma_f\delta_m(b + R_m)] - b\gamma_f\delta_m R_f\}/[w_f w_m(\gamma_f + \gamma_m(\beta_f + \delta_f))]$;
(A.5d) $y_m = [\gamma_m w_f(R_m + w_m) - b\gamma_f(\beta_m + \delta_m)(R_f + w_f)]/[w_f(\gamma_f + \gamma_m(\beta_f + \delta_f))]$.

Proof of Proposition 1. Taking partial derivatives of the explicit solution to the Nash equilibrium values with respect to R_f yields the following:

(a) $\partial e_f^1/\partial R_f = \gamma_f/[w_f(\gamma_f + \gamma_m(\beta_f + \delta_f))] > 0$
(b) $\partial e_f^2/\partial R_f = -(\gamma_f + \gamma_m\delta_f)/[w_f(\gamma_f + \gamma_m(\beta_f + \delta_f))] < 0$
(c) $\partial l_f/\partial R_f = -\partial e_f^1/\partial R_f - \partial e_f^2/\partial R_f = \gamma_m\delta_f/[w_f(\gamma_f + \gamma_m(\beta_f + \delta_f))] > 0$
(d) $\partial y_m/\partial R_f = -b\gamma_f(\beta_m + \delta_m)]/[w_f(\gamma_f + \gamma_m(\beta_f + \delta_f))] < 0$
(e) $\partial e_m/\partial R_f = -b\gamma_f\delta_m/[w_f w_m(\gamma_f + \gamma_m(\beta_f + \delta_f))] < 0$. □

Proof of Proposition 2. Taking partial derivatives of the explicit solution to the Nash equilibrium values with respect to w_f yields the following:

(a) $\partial e_f^1/\partial w_f = -\gamma_f R_f/[(w_f)^2(\gamma_f + \gamma_m(\beta_f + \delta_f))] < 0$
(b) $\partial y_m/\partial w_f = b\gamma_f R_f(\beta_m + \delta_m)/[(w_f)^2(\gamma_f + \gamma_m(\beta_f + \delta_f))] > 0$
(c) $\partial e_m/\partial w_f = b\gamma_f\delta_m R_f/[(w_f)^2 w_m(\gamma_f + \gamma_m(\beta_f + \delta_f))] > 0$
(d) $\partial x_m/\partial w_f = (w_m/p_m)\partial e_m/\partial w_f - (1/p_m)\partial y_m/\partial w_f = -b\beta_m\gamma_m R_f/[p_m(w_f)^2(\gamma_f + \gamma_m(\beta_f + \delta_f))] < 0$. □

Proof of Corollary 1. The private consumptions can be obtained by substituting the solution in (A.5a)–(A.5d) into the respective budget constraints. Substituting the endogenous variables into the utility functions, we obtain the utilities of the wife and husband, $\bar{U}_f$ and $\bar{U}_m$, respectively, in the Nash equilibrium. We do not present these unwieldy expressions. Differentiating these expressions with respect to R_f and w_f, respectively, we get the following expressions:

(a) $\partial\bar{U}_f/\partial R_f = \partial\bar{U}_m/\partial R_f = b/[b(R_f + w_f) + w_f(R_m + w_m)] > 0$,
(b) $\partial\bar{U}_f/\partial w_f = [\beta_f w_f(R_m + w_m) + b\beta_f w_f - b(\gamma_f + \delta_f)R_f]/(w_f[b(R_f + w_f) + w_f(R_m + w_m)])$,

so that $Sgn[\partial\bar{U}_f/\partial w_f] = .Sgn[\beta_f w_f(R_m + w_m) + b\beta_f w_f - b(\gamma_f + \delta_f)R_f]$.

Because $e_f^2 > 0$ (since the solution is interior), it follows that the numerator of the expression on the right hand side of (A.5b) is positive. On dividing this numerator by γ_m, it means that

$$Sgn[\beta_f w_f(R_m + w_m) + b\beta_f w_f - b(\gamma_f + \delta_f)R_f] > 0.$$

Since $0 < \gamma_m < 1$, this implies that $Sgn[\beta_f w_f(R_m + w_m) + b\beta_f w_f - b(\gamma_f + \delta_f)R_f] > 0$, so that

$$\partial \overline{U}_f / \partial w_f > 0.$$

Finally,

$$\partial \overline{U}_m / \partial w_f = -bR_f / (w_f[b(R_f + w_f) + w_f(R_m + w_m)]) < 0. \quad \square$$

Appendix B

The tables below list results from analogous estimations on indicators of female autonomy as in Section 6. We report only those for female decision making power with respect to small purchases, similar results are found for larger purchases. The first table lists identical estimations to those of Table 5a except that standard errors are clustered at the village level.

Table 8a
IV-2SLS estimations of indicators of female autonomy.[a]

Variable	Cooking oil	Coconut oil	Ice cream
Woman's age	0.001 (0.002)	0.002 (0.002)	0.0007 (0.002)
Husband's age	0.0001 (0.002)	−0.0004 (0.002)	0.0001 (0.001)
Woman's education	0.002 (0.005)	0.003 (0.005)	0.002 (0.004)
Husband's education	0.002 (0.004)	0.004 (0.004)	0.005 (0.003)
Value of woman's assets	0.0007 (0.0002)***	0.0007 (0.0002)***	0.0007 (0.0002)***
Value of husband's assets	0.0001 (0.00008)	0.0001 (0.00008)	0.00004 (0.0008)
Mother-in-law present	−0.06 (0.02)**	−0.06 (0.02)**	−0.06 (0.02)**
Months worked on farm	0.007 (0.01)	0.01 (0.01)	0.008 (0.01)
Months worked for income	0.03 (0.01)*	0.03 (0.01)*	0.03 (0.01)**
Family income	0.0007 (0.0009)	0.0004 (0.0008)	0.0005 (0.0009)
Constant	0.21 (0.11)*	0.23 (0.13)*	0.33 (0.12)***
Observations	3347	3347	3347
F-statistic	3.98	4.65	6.48

[a]Robust standard errors are in parentheses. Regression disturbance terms are clustered at the village level.

The table below lists the OLS estimations without instrumenting.

Table 8b
OLS estimations of indicators of female autonomy.[a]

Variable	Cooking oil	Coconut oil	Ice cream
Woman's age	−0.001 (0.002)	0.002 (0.002)	−0.001 (0.002)
Husband's age	0.0003 (0.001)	−0.0001 (0.001)	0.0007 (0.001)
Woman's education	0.004 (0.005)	0.004 (0.004)	0.003 (0.004)
Husband's education	0.004 (0.003)	0.005 (0.003)	0.006 (0.003)
Value of woman's assets	0.0007 (0.0002)***	0.0007 (0.0002)***	0.0006 (0.0001)***
Value of husband's assets	0.0001 (0.00008)	0.0001 (0.00008)*	0.00007 (0.00007)
Mother-in-law present	−0.08 (0.02)**	−0.07 (0.03)***	−0.06 (0.02)***
Months worked on farm	−0.0006 (0.002)	−0.001 (0.002)	0.0007 (0.002)
Months worked for income	0.006 (0.002)***	0.006 (0.002)***	0.006 (0.002)***
Family income	−0.0002 (0.0002)	−0.0003 (0.0002)	−0.0002 (0.0002)
Constant	0.44 (0.04)***	0.47 (0.04)***	0.56 (0.04)***
Observations	3347	3347	3347
F-statistic	6.16	7.29	8.12

[a]Robust standard errors are in parentheses. Regression disturbance terms are clustered at the village level.

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