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## **Intrahousehold Welfare**

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# Intrahousehold Welfare\*

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## **Abstract**

This paper investigates the determinants affecting the intrahousehold distribution of welfare in poor rural households. Using data from a detailed household survey, we show that many of the factors commonly thought to affect intrahousehold welfare have no significant effect. In particular, access to independent income, control over current decisions and expenditures, and expectations regarding the disposition of assets upon divorce have no systematic effect on nutrition, health, or leisure time. In contrast, intellectual capacity is a strong predictor of nutritional and health status.

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## 1. Introduction

Since the work of Haddad and Kanbur (1990), Dercon and Krishnan (2000a) and Alderman, Chiappori, Haddad, Hodinott and Kanbur (1995), it is increasingly recognized that the intra-household distribution of welfare is an important determinant of aggregate inequality. Using data from the Philippines, Haddad and Kanbur (1990) show that measured levels of inequality and poverty are off 30 percent if one ignores the allocation of scarce resources among household members, and particularly between husband and wife. Using detailed household level data, this paper examines the factors affecting the intrahousehold distribution of welfare in rural Ethiopia.

To explain inequality within households, the theoretical literature has focused on two main ideas: the functioning of the marriage market, and bargaining within the household. In a marriage market perspective, prospective spouses negotiate up front the distribution of future gains from household formation (Becker 1981). Because of competition between potential spouses, those who bring more to a union are promised a higher future utility; if they did not, they would simply marry someone else. Some empirical evidence indeed supports the view that spouses who bring more assets to a marriage indeed have higher welfare (e.g. Fafchamps and Quisumbing 2007, Quisumbing, Haddad and a 1995, Quisumbing 2003, Quisumbing and Hallman 2003).

The bargaining framework, in contrast, implicitly assumes that spouses cannot, at the time of marriage, precommit to a future distribution of utility.<sup>1</sup> Who gets what must be negotiated ex post (e.g. McElroy and Horney 1981, Manser and Brown 1980). Consequently, intrahousehold inequality is predicted to depend on bargaining power, which in turn depends on threat points.

Two main categories of threat points have been discussed in the literature: those based on the

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<sup>1</sup>Even if prospective spouses cannot explicitly contract on the future distribution of household welfare, they may seek to influence future bargaining by signing a prenuptial agreement, thereby changing the disposition of assets upon divorce and hence bargaining power. This point has been noted, for instance, by Lundberg and Pollak (1993).

threat of divorce, and those based on non-cooperation within marriage (Lundberg and Pollak 1993). The first category of threat points is influenced by the level of income and welfare that a spouse can guarantee himself or herself upon divorce, and hence depends on rules regarding the distribution of assets upon divorce. The second category of threat points is affected by the level of welfare that spouses can achieve in a non-cooperative marriage. This level of welfare is in turn affected by the spouses' financial independence and hence by rules regarding the management of household assets (e.g., financial independence, involvement in household business). This theory, for instance, predicts wives to be better off if they are more involved in household production and consumption decisions (McElroy 1990).

Some evidence has been found to support both view. Using time differences across US states regarding the introduction of new divorce legislation, Chiappori, Fortin and Lacroix (2002) for instance shows that intrahousehold inequality is affected by changes in rules regarding the devolution of assets upon divorce (see also Hoddinott and Adam (1997)). Using evidence from the United Kingdom, Lundberg, Pollak and Wales (1997) in contrast show that a change in the disbursement of children allowance from husband to wife resulted in a reorganization of consumption expenditures towards goods thought to be preferred by women.<sup>2</sup> Pezzini (2005) provides similar evidence based in on the introduction of the contraceptive pill and changes in the legal status of women in Europe (see also Maitra and Ray (2003) for South Africa).

This paper seeks to test all three sets of theoretical predictions using the same data set. For this purpose, a specifically designed household survey was conducted. Information was collected on assets and human capital at marriage, expectations of disposition of assets upon divorce, and intrahousehold involvement in production and consumption decisions. Data were also gathered on a variety of welfare indicators: anthropometric measurements for adults and children; health

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<sup>2</sup>Revisiting the same evidence, Hotchkiss (2005) finds different results and concludes that the data cannot reject either the income pooling or bargaining models.

indicators for adults and children; consumption expenditures; education of children; and time budgets to determine the division of leisure within the household. To our knowledge, such a comprehensive analysis of intrahousehold welfare has never been attempted.

Contrary to our expectations, we find no empirical evidence supporting the theory: neither assets brought to marriage nor disposition of assets upon divorce have a robust effect on intrahousehold welfare inequality. This is true for spouse nutrition and health, household consumption expenditures, as well as child nutrition, health, and schooling. Involvement in household decisions is associated with better nutrition and mobility, but also less leisure and personal time.

One finding of interest is that intrahousehold distribution of welfare may depend on relative intelligence. Information was collected on each spouse's depth of vocabulary. As we explain in the data section, in the context of our survey this information can be taken as proxy for intelligence. Results show that the less ignorant a wife is relative to her husband, the better is her individual nutrition and health and the better are her children's education and health. We interpret these findings as suggesting that relative ignorance may affect intrahousehold bargaining capability: a woman kept in a state of intellectual isolation is less capable to challenge decisions made by her husband. While not entirely surprising, this result suggest that adult literacy for women and other cultural and intellectual empowerment activities may be promising avenues for improving intrahousehold welfare. If our interpretation is correct, we also expect female education to improve the position of women within the household.

The paper is organized as follows. In Section 2, we present our conceptual framework and testing strategy. The data are presented in Section 3, together with a detailed descriptive analysis of the variables of interest. The econometric results are discussed in Section 4.

## 2. Conceptual framework

To motivate our empirical strategy, we begin by summarizing the key insights from the marriage market and bargaining models. We begin with a simple version of the marriage market model, which was pioneered by Becker (1981). Consider  $N$  men and women with pre-marital endowments  $A_i^m$  and  $A_j^f$ , respectively.<sup>3</sup> The endowment vector includes physical as well as human capital. The discounted future utility of being single is  $V(A)$  with  $V' > 0$ . For instance, if  $\beta$  is the common discount factor and there is no accumulation, we can write:

$$V(A) = \frac{E[U(Y(A_i^m))]}{1 - \beta}$$

where  $Y(A)$  is the income generated by endowment  $A$  and  $U(\cdot)$  is an instantaneous utility function.<sup>4</sup>

The discounted expected utility each prospective groom  $i$  derives from marriage with potential bride  $j$  is written  $W_i^m = W^m(A_j^m, A_i^f; \theta_{ij})$  where  $\theta_{ij}$  is a sharing rule (Chiappori 1997). Similarly, for the prospective bride the expected discounted utility is  $W_j^f = W^f(A_j^m, A_i^f; \theta_{ij})$ . With a common discount factor and no accumulation, we can for instance write:

$$\begin{aligned} W^m(A_j^m, A_i^f; \theta_{ij}) &= \frac{E[U^m(\theta_{ij}Y(A_i^m, A_j^f))]}{1 - \beta} \\ W^f(A_j^m, A_i^f; \theta_{ij}) &= \frac{E[U^f((1 - \theta_{ij})Y(A_i^m, A_j^f))]}{1 - \beta} \end{aligned}$$

Cohabitation generates economies of scope so that, for each potential match, there exist a range

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<sup>3</sup>Here we abstract from possible strategic bequest considerations by the parents at the time of marriage. This issue is discussed, for instance, by Fafchamps and Quisumbing (2005a).

<sup>4</sup>The utility function may in general vary between men and women. Since this does not affect our argument, we ignore this complication in order to keep the notation simple.

of values  $(\underline{\theta}_{ij}, \bar{\theta}_{ij})$  such that for all  $\theta \in (\underline{\theta}_{ij}, \bar{\theta}_{ij})$ , we have:

$$V_i^m < W_i^m \text{ and } V_j^f < W_j^f$$

that is, both spouses are better off being married with each other than remaining single.

Suppose that  $\theta$  is contractible at the time of marriage, either directly or via some commitment device such as a prenuptial agreement, transfer of ownership of assets, or any other binding contract. Competition in the marriage market sets limits on the sharing rule any prospective spouse is willing to accept. Without going into the details of the matching process,<sup>5</sup> we note that any stable equilibrium exhibits assortative matching: wealthy grooms marry wealthy brides, and vice versa. It follows that individual welfare is, in general, non-decreasing in pre-marital endowment of both spouses. Competition in the marriage market also implies that in equilibrium the sharing rule – and thus individual welfare  $W_i^m$  and  $W_j^f$  – depends on relative endowments. The reason is that, for a poor groom to convince a rich bride to marry him, he must guarantee her as least as much utility as she could obtain from marrying another available groom.

This immediately leads to a testable prediction: individual welfare should increase in assets brought to marriage. In particular, if we control for household income  $Y(A_i^m, A_j^f)$ , then individual assets  $A_i^m$  and  $A_j^f$  should affect  $W_i^m$  and  $W_j^f$  through their effect on the sharing rule  $\theta$ .

The above approach assumes that the sharing rule is contractible at the time of marriage. If it is not, the sharing rule needs to be constantly renegotiated. Following McElroy (1990)

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<sup>5</sup>There is an extensive literature of assortative matching algorithms and their properties. See for instance Gale and Shapley (1962) and Roth and Sotomayor (1990). Hatfield and Milgrom (2005) notes the formal similarity between matching algorithms and auctions and derives some general properties common to both.

In our model, there typically exist multiple equilibria, each with a vector of  $\theta$  for each union. As Hatfield and Milgrom (2005) and others have shown, which equilibrium gets selected depends on the details of the algorithm, and in particular who moves (makes an offer) first. We expect this to be true in our context as well, i.e., if grooms move first, the stable equilibrium that is selected guarantees grooms a higher  $\theta$ .

and Chiappori et al. (2002), let us assume that the bargaining process over the sharing rule depends on a set of environmental factors  $F_{ij}$  which, for now, we leave undefined. Assuming efficient bargaining, welfare maximization by the household can be defined as the solution to a optimization problem of the form:

$$\max_{\theta} \alpha(F_{ij})U^m(\theta Y) + (1 - \alpha(F_{ij}))U^f((1 - \theta)Y) \text{ subject to } Y = Y(A_j^m, A_i^f) \quad (2.1)$$

where  $\alpha$  is a welfare weight that depends on environmental factors  $F_{ij}$ .<sup>6</sup> Without loss of generality, let us assume that  $\alpha' > 0$ . Maximizing (2.1) yields a negotiated sharing rule  $\theta$  and hence a division of welfare between spouses. The first order condition takes the form:

$$\alpha \frac{\partial U^m}{\partial Y} - (1 - \alpha) \frac{\partial U^f}{\partial Y} = 0$$

Totally differentiating with respect to  $\alpha$  and  $\theta$  yields:

$$\frac{d\theta}{d\alpha} = - \frac{\frac{\partial U^m}{\partial Y} + \frac{\partial U^f}{\partial Y}}{SOC} > 0$$

which, since the second order condition is negative at an interior optimum, shows that  $\theta$  is increasing in  $\alpha$  and hence in  $F_{ij}$ . Environmental factors that raise the husband's welfare weight thus raise his share of household consumption and hence his utility relative to that of his wife, and vice versa.

The literature has predominantly thought of  $\alpha$  as the outcome of a bargaining game shaped by spouses' threat points. As pointed out in the introduction, two types of threat have been discussed: the threat of divorce and the threat of non-cooperation within marriage. McElroy

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<sup>6</sup> Altruistic preferences can be captured by (2.1) provided that husband and wife derive strictly more satisfaction from their own consumption than from their spouse's consumption. Of course, as the weight they give to their spouse's welfare approaches unity, testing the effect of environmental factors becomes highly problematic.



and Horney (1981) and Manser and Brown (1980), for instance, propose an intrahousehold bargaining model in which bargaining power depends on the level of utility that spouses can credibly guarantee themselves upon marriage dissolution. In this context, bargaining power – and hence the intrahousehold distribution of welfare – depends on human capital and divorce law: what assets women receive upon divorce and what income they can obtain from these assets and their human capital determines how much welfare they can bargain for themselves during marriage.<sup>7</sup> Bargaining power is also affected by entitlements such as alimony and child support payments (Lundberg et al. 1997) or the right to demand support from parents and relatives (Bloch and Rao 2002).

Lundberg and Pollak (1993), in contrast, argue that divorce is too strong a threat in most cases; non-cooperation within marriage is a more credible threat and can take a variety of forms (e.g., reduced contribution to household public goods, diversion of household funds, refusal to have sex). In this case, bargaining power depends on the details of household finances and internal organization: Do the spouses have separate finances, as for instance documented in Ghana by Goldstein (2000)? Who holds the household purse and oversees production and consumption decisions? Etc. Lundberg and Pollak (1993) call this the separate spheres hypothesis: husband and wife control separate spheres of household activity, and these shape their bargaining power during marriage.

As Fafchamps (2001) has argued, the two categories of threat are not independent of each other. To see why, suppose a wife would not receive any asset upon divorce and hence cannot credibly threaten to seek a divorce. For her threat of non-cooperation within marriage to be

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<sup>7</sup>As shown by Fafchamps and Quisumbing (2002), the devolution of assets upon divorce only loosely depends on the ownership of these assets prior to marriage or even during marriage. This is normal: many societies provide incentives for women to contribute to non-market household public goods (e.g., raising children, household chores) by making them partly residual claimants on the wealth accumulated by the couple. With this system, a wife who enables her husband to work hard by taking on many household chores is entitled to a share of the wealth he generates as a result.

credible, it must not be so harsh as to make the husband prefer divorce to non-cooperation. Changing the devolution of assets upon divorce thus puts limits on the threat of non-cooperation within marriage. Given that the two sets of threats are interrelated, both should be taken into account in empirical analysis.

Other bargaining variables have been discussed in the literature. Of interest is the possibility that spouses have different bargaining abilities. An intelligent spouse, for instance, is likely to negotiate a better outcome for himself or herself. It is also conceivable that an individual may use domestic violence to improve their bargaining position. Domestic violence is indeed common (e.g. Bloch and Rao 2002, Srinivasan and Bedi 2005), including in our study area (Fafchamps and Quisumbing 2002). To the extent that individuals appear to differ in their predisposition towards domestic violence, we can define another set of variables capturing what we shall call relative bargaining effectiveness  $B_i$ . We assume that  $\theta$  depends on  $B_i$ .

The above ideas form the basis of our testing strategy. Let  $H_i^m$  and  $H_j^f$  be spouse-specific welfare indicators with:

$$\begin{aligned} H_i^m &= g^m(\theta_{ij}Y_{ij}) \\ H_j^f &= g^f((1 - \theta_{ij})Y_{ij}) \end{aligned}$$

From the earlier discussion, we expect  $\theta_{ij}$  to depend on the spouses' share of assets brought to marriage, on their expected share of assets upon divorce  $D_i$ , on their involvement in household finances and decisions  $S_i$ , and on relative bargaining effectiveness. Variables  $D_i$  and  $S_i$  together form what we have earlier called environmental variables  $F_{ij}$ . By testing each set of variables separately we can ascertain which of the three dominant theories – if any – explains intrahousehold variation in welfare.

In some cases, we do not have an individual-specific measure of welfare but observe  $H_i^m + H_j^f$  instead. This is the case for consumption expenditures, which are not recorded by individual. If husbands and wives have systematically different preferences over consumption, it may nevertheless be possible to test intrahousehold welfare allocation. To see why, suppose that husbands on average spend  $\gamma^m$  of their share of household consumption  $\theta Y$  on good  $k$  while wives spend  $\gamma^f$  with  $\gamma^m > \gamma^f$ . Let  $E^k$  denote household consumption expenditure on good  $k$ . Suppose for a moment that expenditures are linear in income.<sup>8</sup> We can write:

$$\begin{aligned} E^k &= \gamma^m \theta Y + \gamma^f (1 - \theta) Y \\ &= \gamma^f Y + (\gamma^m - \gamma^f) \theta Y \end{aligned} \tag{2.2}$$

Equation (2.2) can similarly be used to test the effect of  $A_i, D_i$  and  $S_i$ . Note that, in this case, the validity of the test rests on the maintained hypothesis that  $\gamma^m \neq \gamma^f$ . For the test to work, men and women must have *systematically* different preferences; it is not sufficient that tastes vary across individuals. This is a strong requirement, particularly in poor societies where the scope for consumption choice is limited.<sup>9</sup> The test also requires that the data be sufficiently disaggregated to distinguish categories on which preferences differ by gender. In the literature, it is often assumed, for instance, that men like alcohol more than women and thus that alcohol consumption can be assumed to have  $\gamma^m \neq \gamma^f$  (Doss 1999). Gender-specific clothing has similarly been used as a individual-specific consumption Browning, Bourguignon, Chiappori and Lechene (1994), in spite of the fact that spouses partly 'consume' how their partner looks.<sup>10</sup>

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<sup>8</sup>In the econometric analysis, we assume instead that consumption shares are function of the log of income. The implication regarding bargaining variables is the same, however.

<sup>9</sup>It is also not entirely clear why, beyond some trivial examples (e.g., wearing a skirt), consumption preferences of men and women should differ systematically, especially at the level of fairly aggregated consumption categories. While scientific analysis of the 'gendered brain' has yielded some interesting albeit relatively minor differences between the sexes, it is far from clear that these differences would result in systematically different choices over consumption aggregates.

<sup>10</sup>If female income is taken as measure of intrahousehold bargaining, tests based on female clothing become

So far, our reasoning has been centered around exclusive goods for which each person is competing for resources (e.g. Phipps and Burton 1998, Attanasio and Lechene 2002, Dekker and Hoogeveen 2002). Examples of exclusive goods include food and leisure time. Couples also produce and consume household public goods such as housing, food preparation, and the like. From the point of view of the couple, children and their welfare can also be seen as public, non-rival consumption goods. If women feel systematically more altruistic towards their children than men do, one would expect child welfare to be higher in households where women have more bargaining power. The strongest intrahousehold effects that have been documented in the empirical literature indeed concern children (e.g. Sahn and Stifel 2002, Duflo 2003). It is therefore possible that women care more than men about children health, nutrition, and education. This again can be tested by regressing child welfare outcomes  $H_{ij}^c$  – such as health, education, and nutrition – on household income and on variables  $A_i, D_i$  and  $S_i$ .

As Bergstrom (1997) has shown, the introduction of household public goods dramatically alters the nature of the intrahousehold welfare allocation process. Provided that certain conditions are satisfied – most notably, that utility be transferable – welfare will be equalized across spouses as long as both contribute voluntarily to a household public good. The intuition behind this result is that, if both spouses financially contribute to a common good, one spouse’s contribution will fall – and his or her private consumption will increase – if the other spouse’s income goes up, and vice versa. This means that, as long as both spouses contribute to some household public good, welfare will be equalized – and hence bargaining and marriage market variables will not matter. Welfare equalization only fails in the case of corner solutions, that is, when one spouse does not contribute anything to household public goods.

In our survey data, nearly everything husband and wife do can be construed as contribution

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spurious: working women need more clothes simply in order to go to work.

to some household public good. Corner solutions are therefore very unlikely. Whether or not the welfare equalization theorem applies then depends on whether utility is transferable or not. Bergstrom (1997) presents his theory in terms of financial contribution. In our data, this is nearly never the case. What spouses contribute is their time. The applicability of the welfare equalization theorem ultimately depends on the fungibility of time between public good provision and production for own consumption: put plainly, welfare equalization will obtain if (1) spouses can reduce the time spent on household public goods to increase consumption of leisure and/or of goods purchased from individual income generating activities and (2) the increase in utility obtained from diverting time is roughly equivalent to the utility value of the public good. If spouses cannot increase their own welfare (much) by reducing the time spent on household public goods, then utility is not transferable and the welfare equalization theorem does not apply.

### **3. The data**

Having presented our conceptual framework, we now turn to the data used to implement our testing strategy. Intrahousehold equity is an issue anywhere. But it is particularly salient in poor countries where, as Haddad and Kanbur (1990) have shown, slight differences in the intrahousehold allocation of resources can have dramatic nutritional and health effects. Dasgupta (1993) argues that when survival is at stake, households may even decide to sacrifice some of their members (see also Miguel (2003)). Dercon and Krishnan (2000a) and Goldstein (2000) further show that the sharing of risk within the household is not perfect and, in the Ethiopian case studied by Dercon and Krishnan, has repercussions on nutrition in the couple. Drawing upon the work of Bevan and Pankhurst (1996), they further argue that differences across regions and ethnic groups in patrimonial customs regarding marriage account for some of the differences in intrahousehold welfare allocation.

Based on these precedents, we propose to revisit intrahousehold welfare using the same data from rural Ethiopia as Dercon and Krishnan, augmented by an additional survey round dedicated to intrahousehold issues. The choice of country is dictated by the fact that Ethiopia is a low-income, drought-prone economy with the third largest population on the African continent. The country remains a primarily agrarian economy where external options for women are severely restricted. Consequently the welfare of women depends critically on what happens within rural farming households. An additional attraction of Ethiopia as a study site is that it has extensive agro-ecological and ethnic diversity, with over 85 ethnic groups and allegiance to most major world and animist religions (e.g. Bevan and Pankhurst 1996, Fafchamps and Quisumbing 2002, Webb, von Braun and Yohannes 1992). While some work has been done on intrahousehold welfare in Asia and West Africa, little is known about in East Africa apart from the already cited work of Dercon and Krishnan.

For our analysis, we rely on four rounds of the Ethiopian Rural Household Survey (ERHS). The first three rounds took place in 1993-95. They were undertaken in collaboration between the Department of Economics of Addis Ababa University (AAU) and the Centre for the Study of African Economies (CSAE) of Oxford University.<sup>11</sup> The fourth round took place in 1997 and resulted from a collaboration between AAU, CSAE and the International Food Policy Research Institute (IFPRI).

The ERHS covers approximately 1500 households in 15 villages across Ethiopia, capturing much of the diversity mentioned above. While sample households within villages are randomly selected, villages themselves are chosen so as to ensure that a great diversity of farming systems be represented. While the 15 sites included in the sample are not representative of rural Ethiopia

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<sup>11</sup>An initial survey round took place in some of the sites in 1989 under the supervision of IFPRI. Because the methodology was somewhat different and the political situation was quite distinct, we do not use these data here.

in a statistical sense,<sup>12</sup> they include all main agro-ecological, ethnic, and religious groups.

The ERHS questionnaire is very detailed LSMS-style questionnaire. In addition to the standard modules on consumption and income, it includes measurements of height and weight in each survey round, as well as detailed health questions. The 1997 questionnaire includes many of the same questions as previous rounds plus a special intrahousehold module. This module was pretested by the authors in February/March 1997 in four non-survey sites with a level of ethnic and religious diversity similar to the sample itself. Data collection took place between May and December 1997 under the direct supervision of one of the authors. Questionnaires were administered in several separate visits by enumerators residing in the survey villages for several months. Careful data cleaning and reconciliation across rounds were undertaken in 1998 and 1999 in collaboration with IFPRI staff. Further details regarding the 1997 survey round are discussed by Fafchamps and Quisumbing (2002) and Fafchamps and Quisumbing (2005a).

Descriptive statistics are presented in Tables 1 and 2 for the main variables used in the analysis. We limit our analysis to monogamous couples. Table 1 presents information available for each spouses. The first part of the Table contains personal characteristics that were collected in each survey round. We observe on average a ten years age difference between husband and wife. The Body Mass Index (BMI) is computed as weight in Kg divided by the square of height in meters. Average values of 20 are found for both husband and wife, with a standard deviation of 2.1-2.3. Regarding health status, it is well known that subjective questions regarding illness (e.g., were you ill last week?) are subject to income bias. To avoid this bias, we rely instead on five factual questions regarding mobility and capacity to work.<sup>13</sup> Answers to these questions are combined into mobility index taking values from 5 (good mobility) to 20 (severely restricted

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<sup>12</sup>In particular, Oromo villages are underrepresented.

<sup>13</sup>These questions were: can stand up after sitting down; sweep the floor; walk for 5 Km; carry 20 liters of water for 20 meters; hoe a field for a morning. Possible answers were: easily; with a little difficulty; with a lot of difficulty; or not at all. Summing all five answers yields an index varying between 5 and 20.

mobility). Variation in the value of the index is limited, however, as 85% of husbands and 78% of wives get a value of 5. As is well known, BMI and mobility are affected by pregnancy and, possibly, by breast-feeding. We see that 9.5% and 37% of wives were pregnant and breast-feeding, respectively.

The rest of Table 1 presents information collected only in round 4. We begin with time use in the 24 hours preceding the survey. Time is divided into two broad categories: work, that for our purpose includes farm and market-related activities, participation in communal chores, and household chores; and leisure, that is divided into personal time (e.g., eating, washing, resting) and social time (e.g., wedding, church). We observe a sharp division of labor by gender, men focusing on farming and women focusing on household chores. In traditional ox-plow agriculture as practiced in Ethiopia, farm work requires significant physical strength, which probably explains why men are primarily responsible for it. This pattern has been observed elsewhere as well (e.g. Cleave 1974, Fafchamps and Quisumbing 2003). Market-related activities are divided more or less equally, while men tend to be more involved in communal chores. On average, men have more leisure than women. Both sexes divide their leisure time more or less in the same proportion between personal and social time, the latter accounting for 60% of leisure on average.

Next we present information regarding participation in production and consumption decisions. Decisions regarding what to plant and what to do with the proceeds of livestock sales are taken primarily if not exclusively by men. In contrast, women play a predominant role in deciding what to do with the proceeds from dairy sales. To capture involvement in consumption decisions, we construct an index as follows. For each of eight expenditure categories, we recorded whether expenditures are undertaken by the husband or the wife.<sup>14</sup> Summing over

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<sup>14</sup>The eight categories are: cereals and grains; spices and oils; meat and fish; clothing for men; clothing for women; clothing for children; school fees; and medical expenses. If both spouses participate, they are both counted



all eight categories yields an index taking values from 0 to 8. The Table shows that husbands undertake most consumption expenditures and thus play a leading role in the management of household finances. We also report the proportion of households in which the wife is engaged in one of a variety of income earning activities.<sup>15</sup> It is often believed that women who earn an independent income have more say in household decisions. In our sample, one quarter of wives have an income earning activity.

Table 1 then presents information regarding asset ownership. Two sets of two variables are reported. The first set refers to current *individual* ownership of land and livestock. Survey results show that husbands nearly always consider that farm land is theirs. In contrast, most livestock is considered as held jointly by both spouses. Ownership, however, is not synonymous with disposition upon divorce or death. Using data from Ethiopia, Fafchamps and Quisumbing (2002) indeed show that assets brought to marriage or owned during marriage are not a good predictor of disposition upon divorce. Respondents were asked how they expected household assets to be divided upon divorce. Results show that land is expected to go primarily to the husband. The husband average share – 75% – is smaller than his average ownership share. Husbands also expect to receive a little over half of the household’s livestock, with quite a bit of variation across households.

Bargaining variables are presented next. Two types of variables were collected. The first set seeks to differentiate individual according to their 'intelligence'; the second set comprises variables that may capture predisposition towards violence. We expect more intelligent individuals to be better at intrahousehold bargaining. The overwhelming majority of our sample is illiterate (66% of husbands and 86% of wives). Only 18% of husbands and 9% of wives have

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as one half for the purpose of constructing the index.

<sup>15</sup>Such as preparing various foods and alcoholic beverages for sale, selling charcoal, firewood or dungcakes, and making handicrafts for sale.

gone beyond primary school. In these circumstances, it is difficult if not impossible to administer intelligence questions that assume even basic numeracy. We therefore decided to use vocabulary as a measure of intelligence: presumably, more intelligent individuals can absorb and retain a richer vocabulary. In each household, husband and wife were asked to list as many names of trees and of child diseases as they could in their own language. Child diseases are included because we expect women to be more aware of phenomena that directly affect their children. The advantage of these questions is that formal schooling is not required to learn local taxonomies.<sup>16</sup> Anthropologists have indeed argued that traditional societies develop sophisticated taxonomies to describe their natural environment (Levi-Strauss 1962). Being able to name trees and children diseases can thus be seen as a measure of familiarity with one's own rural culture.

Results shown in Table 1 indicate that the average farmer can cite 12 tree names. There is a lot of variation in the data, however, with some respondents listing up to 78 tree names and one quarter of all husbands and one half of all wives listing only 6 or fewer tree names. This suggests that respondents are only moderately familiar with their own rural culture. The question regarding child diseases reveals that respondents have a very limited vocabulary to describe the health status of their child: on average, men and women can only list 3 child 'diseases' – typically, diarrhoea, fever, and coughing. In these conditions, it is not surprising that Ethiopia has one of the highest level of child mortality in the world.

The following questions seek to ascertain predisposition to violence. Respondents were first asked whether they ever were involved in a fight; some 40% of men and 14% of women answered positively. Respondents were then asked whether they ever witnessed their father beating up their mother; 40-45% of them did, suggesting that the incidence of domestic violence is quite high in rural Ethiopia. We expect that individuals growing up in an environment characterized

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<sup>16</sup>Responses to the tree and child disease questions are strongly correlated with the education variable, suggesting that they indeed capture some dimension of intelligence.

by domestic violence may be more prone to find it acceptable.<sup>17</sup>

The next part of the Table focuses on assets and human capital brought to marriage. As already documented by Fafchamps and Quisumbing (2005b), most assets brought to marriage come from the husband and his family. Husbands also tend to have more work experience at the time of marriage. In terms of family background, husbands are more likely to be born in the village; wives, in contrast, tend to come from neighboring villages, a sign of exogamy. Very few husbands and wives were born in an urban area. Respondents were asked to rank the prosperity level of their parents from 1 – very poor – to 5 – very rich. As expected, 'average' is the most common answer. Husbands and wives have two brothers and two sisters on average. We also see that 40% of husbands were no longer living with their parents at the time of marriage, compared to 25% of wives. This in part reflects the fact that one third of husbands and one fourth of wives were married before.

Table 2 presents variables only available at the level of the household. We begin with a number of child welfare measures. We first report the average height for age, weight for age, and weight for height scores for children in each household. Figures indicate that Ethiopian children tend to be short for their age, a common feature of poor countries. Weight for age is slightly better, resulting in high average weight for height scores. Mobility questions were asked for children aged seven and above, from which we constructed a mobility index as before. The value of the index is slightly higher than that for parents, reflecting the fact that children are less capable of carrying heavy loads and undertaking heavy agricultural tasks. School attendance is very low: among all children aged 5 to 15, the average proportion attending school is only 12%. In all child welfare dimension, there is substantial variation across households, as evidenced by high reported standard deviations.

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<sup>17</sup>If we regress being in a fight on exposure to domestic violence, we indeed find a strong and highly significant positive relationship.

The next part of the Table focuses on consumption expenditures. Consumption of self-produced food is included but housing, which is entirely self-provided, is not included. The prevalence of poverty in our sample population is immediately apparent from the high share of food in consumption. Non-food expenditures are dominated by clothing (23% of non-food), alcohol and tobacco (20%) and ceremonial expenses (15%) – mostly gifts at weddings and funerals.

Some household characteristics are presented at the bottom of the Table. Average household size is 6. The median farmer cultivates 1.4 hectares, with quite a bit of variation in landholdings across households.<sup>18</sup> Ethiopian farmers own a variety of livestock. The average number of oxen, used for land preparation in much of the country, is 0.9. As is immediately apparent, the value of assets other than livestock is small.

#### 4. Econometric analysis

We now turn to the econometric analysis. As we have seen in Section 2, the basic relationship we seek to investigate is of the form:

$$H_i^m = g^m(\theta_{ij}Y_{ij}) \tag{4.1}$$

We suspect that, as far as basic welfare indicators are concerned, the effect of income is decreasing. We therefore assume that (4.1) can be approximated as:

$$\begin{aligned} H_i^m &= \omega_0^m + \omega \log(\theta_{ij}Y_{ij}) \\ &= \omega_0^m + \omega \log \theta_{ij} + \omega \log Y_{ij} \end{aligned} \tag{4.2}$$

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<sup>18</sup>Some of the variation, however, is due to measurement error: Ethiopian farmers rely on a wide variety of local units to measure land. In spite of our best efforts, it is possible that enumeration error in recording land units has resulted in applying the wrong conversion factor.

We need to choose a suitable functional form for  $\theta_{ij}$ . Intuitively, if husband and wife have equal bargaining power, they should have equal welfare weights and  $\theta_{ij} = 0.5$ . What makes  $\theta_s$  deviate from  $\frac{1}{2}$  is the difference in bargaining power between spouses. To capture these ideas, we write:

$$\theta_{ij} = \frac{1}{2}e^{\gamma_1(B_i - B_j)} \quad (4.3)$$

where  $B_i$  and  $B_j$  are vectors of bargaining power variables for spouses  $i$  and  $j$ , respectively. We see that if  $B_i = B_j$ ,  $\theta_{ij} = 0.5$ . Inserting (4.3) into (4.2), we obtain our basic regression model:

$$H_i = \omega \log \frac{1}{2} + \omega_0 S_i + \omega \gamma_1 (B_i - B_j) + \omega \log Y_{ij} \quad (4.4)$$

where we have suppressed the male/female subscript and we have added a gender dummy  $S_i$ . Model (4.4) can be estimated on pooled husband and wife data.

Estimating model (4.4) would yield inconsistent results if  $B_{ij} \equiv B_i + B_j$  has an effect on  $H_i$  that is independent from bargaining power. Once we include  $B_{ij}$  as separate regressor, equation (4.4) can be rewritten equivalently as:

$$\begin{aligned} H_i &= \omega \log \frac{1}{2} + \omega_0 S_i + \omega \gamma_1 (B_i - B_j) + \omega_b (B_i + B_j) + \omega \log Y_{ij} \\ &= \omega \log \frac{1}{2} + \omega_0 S_i + 2\omega \gamma_1 B_i + (\omega_b - \omega \gamma_1) B_{ij} + \omega \log Y_{ij} \end{aligned}$$

In case we include a household fixed effect, the  $B_{ij}$  is subsumed in it.

In the analysis that follows, we investigate the effect of five groups of bargaining variables: (the log of) land and livestock brought to marriage, which capture marriage market effects; involvement in household purchases and whether the wife has a non-farm income, which capture participation in household finances; (the log of) expected land and livestock received upon

divorce, which capture exit option effects; (the log of) the number of trees and child diseases listed, which proxy for intelligence; and whether the spouse has been in a fight and whether his or her father beat up his or her mother, which proxy for predisposition towards violence. Regarding the divorce expectations variables, we expect their effect to vary with household wealth; if the household has no livestock, for instance, both spouses expect to receive no livestock upon divorce and hence do not derive any bargaining power from it. To capture this, divorce expectations variables are constructed by multiplying the shares reported in Table 1 by the current land and livestock wealth of the household.

Our first set of regression focuses on the Body Mass Index (BMI) and mobility index of the husband and wife. In very poor populations such as the one we study, BMI is generally taken as a useful measure of nutritional status: few people are overweight and even fewer diet purely for external appearance reasons.<sup>19</sup> Mobility is a crude index of long-term health status: individuals who have been underfed or in poor health for a long time eventually find physical exercise difficult or impossible.

Because both BMI and mobility are long term welfare measures, we include controls other than current income  $Y_{ij}$  to minimize the risk of omitted variable bias. Household size is controlled for, as well as current wealth – represented by operated land, number of livestock heads, value of livestock, and value of other productive assets. Long-lasting welfare effects are captured by including land and livestock at marriage: presumably, household that started with more assets achieved higher welfare in the past and hence should have higher BMI and mobility today. We also expect more intelligent couples to do better; to this effect, we include the sum of the number of trees and child diseases listed by the husband and wife.

We also control for various individual specific effects that may affect BMI or mobility without

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<sup>19</sup>Many rural Ethiopia eat vegetarian food much of the year for religious and economic reasons. This should not be construed as dieting in the Western sense, however.

necessarily reflecting bargaining power. In addition to a gender dummy, we control for age and age squared, education level, height, and whether the spouse is pregnant or breast-feeding.<sup>20</sup> We expect pregnant women to be less mobile and to weigh more – and thus have a higher BMI. We also expect older individuals to be less mobile.

Results is presented in Table 3. To facilitate interpretation, we have multiplied the mobility index by minus one, so that the signs of coefficients are immediately comparable across the two regressions. Because the mobility index is censored, we use a tobit estimator. We also report joint significance tests for each of the five groups of bargaining variables.

We find that, as could be expected, higher consumption expenditures and more wealth result in higher BMI. In contrast, mobility does not appear to depend on income or wealth. Women have a significantly lower BMI and mobility index. As expected, pregnant women have a higher BMI but are less mobile. We also find that older people are less mobile. Taller individuals have a lower BMI – possibly reflecting measurement error.<sup>21</sup> We also find better educated people to be more mobile, possibly because they have learned to take better care of themselves.

Turning to bargaining variables, we only find that two variables have a significant and robust effect: involvement in household purchases, and number of trees listed. Livestock upon divorce is significant, but with the wrong sign. It therefore appears that intelligence and involvement in household finances affect nutrition and mobility. Other bargaining variables are not significant.

To test the robustness of these findings, we reestimate the regressions using household fixed effects. Time invariant household variables such as assets at marriage or responses to round 4 intelligence questions drop out. Results are presented in Table 4. As could be anticipated, wealth is no longer significant once we control for household fixed effects; consumption expenditure

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<sup>20</sup>Education level is measured by an index going from 1 (no education) to 9 (college education). To minimize measurement error, we use average height as regressor, not individual measurements in each round. BMI is similarly computed using average height over the four rounds.

<sup>21</sup>BMI is computed by dividing weight by height squared. If height is overestimated, BMI will be underestimated.

retains its significance in the BMI regression. Age and pregnancy effects are confirmed, as well as the effect of height on BMI and mobility.

Regarding bargaining variables, involvement in household purchases and number of trees listed remain significant. Livestock upon divorce remains significant with the wrong sign. Land brought to marriage is significant in the mobility regression, but with the wrong sign. Finally, one of the violence variables is significant in the BMI regression, suggesting that domestic violence (or the threat thereof) may play a role in the intrahousehold allocation of food.

Nutrition is but one possible dimension of intrahousehold welfare. The distribution of work and leisure between husband and wife is another. To investigate whether work and leisure are affected by bargaining power, we regress the total amount of work and leisure of each spouse on household fixed effects and individual level variables. We also conduct the same analysis for the two dimensions of leisure in our study population, namely, social time and personal time.

Results are presented in Table 5. Since time use questions were only asked in round 4, all household variables drop out of the estimation.<sup>22</sup> We see that women work harder and enjoy less personal time. Pregnant women are also found to work longer hours, possibly because it takes them more time to get through their daily chores. Older people also work less and socialize more. We find that spouses who brought more land at marriage enjoy more leisure in the form of social time. Involvement in household purchases is seen to cut into people's personal time, resulting in less leisure. Individuals listing more child diseases work less and socialize more, while those listing more tree names enjoy less personal time. One of the violence variables is associated with more personal time.

Next we turn to consumption expenditures. We focus on consumption categories that are both excludable and, to some extent, attributable – namely, alcohol and clothing for men,

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<sup>22</sup>Less than 500 husbands answered the time use questionnaire, compared to more than 800 wives. This means that the regression results presented in Table 5 are based on 500 intrahousehold comparisons only.



women, boys and girls. In Ethiopia, it is reasonable to believe that men like alcohol and tobacco more than women. Following Browning et al. (1994), it is also possible that women like to purchase women clothing more than their husband. It is also conceivable that women care more about children and therefore prefer to spend more on children clothing, whether for boys or girls.

Regression results are presented in Table 6. In all cases, the dependent variable is the share of total consumption expenditures spent on each of five categories. Since total expenditure enters in log form and since we control for prices via village dummies, the regression model is akin to an almost ideal demand system. Because of heavy censoring, the estimator is tobit.

We find alcohol and tobacco to have a high income elasticity. As anticipated, household size has a negative effect on adult clothing but a strong positive effect on children clothing: larger households have more children and thus spend more to clothe them. Households with more livestock spend more on clothing and alcohol – possibly a long-term income effect. Households in which neither the husband nor the wife are involved in household purchases tend to spend less on children clothing.

Turning to bargaining variables, we find little evidence of systematic effect. The wife’s involvement in household purchases reduces expenditures on men’s clothing – a result consistent with intrahousehold bargaining power – but it also increases expenditures on boys while reducing those on girls and having no effect on women’s clothing or alcohol. Households in which wives brought relatively more livestock at marriage spend more on men’s clothing – a finding inconsistent with intrahousehold bargaining. Households in which women expect to receive more upon divorce spend more on women’s clothing – consistent with intrahousehold bargaining – but also on alcohol – a finding unlikely to reflect the preferences of rural Ethiopian women.

Our last set of regression results focuses on child welfare. We investigate three categories of child welfare indicators: nutritional status, school attendance, and physical mobility index.

Child nutrition is measured via three widely used scores: height for age score, weight for age, and weight for height. The first index is thought to capture, in addition to genetic variation, the effect of long-term nutrition. In contrast, in poor populations such as this one, weight for age and weight for height are thought to capture short-term nutritional status.

Results are presented in Table 7. Because of censoring, tobit is used for school attendance – constrained to be between 0 and 1 – and for mobility index – taking values between -20 (extreme lack of mobility) to -5 (full mobility). Household income is found to have a significant effect on school attendance but none on child nutrition or mobility. Land brought to marriage by both spouses is even found to have a negative effect on long term nutritional status and on child mobility. Households in which the wife is older have better fed children. Violence variables at the household level appear to raise child welfare, except for school attendance.

Regarding bargaining variables, we find that households in which the wife brought more land or livestock at the time of marriage tend to have better fed children. Wives who could list more children diseases also tend to have better fed children. Livestock expectation upon divorce has a significant positive effect on child mobility but not in other regressions.

## **5. Conclusion**

In this paper, we have investigated the effect of bargaining power on the intrahousehold allocation of welfare. We tested all the leading theories of intrahousehold bargaining on many dimensions of welfare, including the nutrition and mobility of husband and wife, their work and leisure time, household consumption patterns, and child nutrition, mobility, and school attendance. To our knowledge, this is the first time that intrahousehold welfare has been investigated in such a comprehensive manner.

Contrary to our initial expectations, the results presented here do not suggest that bargaining

variables have a strong and systematic effect on intrahousehold welfare allocation. Variables that significantly raise welfare in one regression – e.g., involvement in household purchases in the BMI and mobility regression – lower it in another – e.g., less leisure. Assets brought to marriage by the wife do not have a strong effect on the relative welfare of husband and wife but tend to benefit child nutrition. Intelligence – measured here as respondents’ vocabulary in vernacular languages – appears to play a role in intrahousehold allocation, possibly because more intelligent people know how to take better care of themselves. We also find beneficial effects on child welfare. These findings, combined with the extremely low levels of education found in the survey, suggest that one possible avenue to raise intrahousehold welfare is to better inform rural dwellers, particularly on health and nutrition issues.

Following Dercon and Krishnan’s claim that differences in intrahousehold nutrition in Ethiopia can be traced to differences in bargaining power, we expected to find strong bargaining effects. Instead, we found weak and largely inconsistent effects. What are the possible explanations for this result?

One possible explanation is that our data are marred by measurement error. Without denying that any data collected on poor rural households are subject to substantial error of measurement, we have many reasons to believe that, if anything, the Ethiopian rural household surveys are above average in terms of quality. All questionnaires have been extensively pre-tested with the help of local and foreign researchers quite familiar with Ethiopian realities. Enumerators are highly qualified and motivated;<sup>23</sup> they spent several weeks if not months in the survey villages. As a result of such care, there has been very little if any attrition in the sample. Data cleaning and manipulation have also been undertaken by highly qualified staff. Moreover, the surveys have successfully been used by many other researchers (e.g. Dercon and Krishnan 2000b, Dercon and

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<sup>23</sup>Most enumerators are Masters students in economics from the Addis Ababa University.

Krishnan 1996, Dercon, Bold, De Weerd and Pankhurst 2004, Kebede 2005, Weir and Knight 2004). The intrahousehold data from the fourth survey round have themselves been analyzed elsewhere and shown to yield valuable insights (e.g. Fafchamps and Quisumbing 2002, Fafchamps and Quisumbing 2005a, Fafchamps and Quisumbing 2005b). All in all, there is no reason to believe that measurement error is more a problem here than in any other household survey of this kind.

Another possibility is that in an environment as poor as rural Ethiopia, individual welfare has strong externalities: because the survival of the household so much depends on team work, it is against the interest of selfish husbands to starve their wife and neglect their health. Competition for food and health may thus be much less stark than sometimes suggested (e.g. Dasgupta 1993, Dercon and Krishnan 2000a). Only when the immediate survival of household members is directly threatened may spouses compete for insufficient food. But this is an extreme situation unlikely to be captured in a household survey.

It is also conceivable that husbands have 'patronizing' preferences regarding wife consumption, a bit like in Becker's Rotten Kid theorem. One such example is the practice of *purdah* by which married women are confined to the home, arguably to shelter them from hard work in the fields (Fafchamps and Quisumbing 2003). By the same token, husbands may derive pride from having a well fed and fashionably dressed wife. In a society where women are regarded as permanently dependent on an adult male – a bit like children – one would expect husbands to develop the same kind of paternalistic values and feelings towards their dependent wife as they develop towards their children. Social norms regarding the 'proper' way to treat one's wife may further reinforce these attitudes.

Yet another possibility is that rural Ethiopian households are too poor for individual preferences to express themselves in any meaningful way. If income is so restricted as to limit spending

on private consumption to the strict minimum, there may be no room for disagreement or competition over expenditures. While a US couple may quarrel over where to spend their vacation or which TV show to watch, these consumption choices are not available to Ethiopian rural dwellers. Intrahousehold disagreement over consumption may simply be a luxury they cannot afford.

For these reasons, the results presented here should not be construed as the final word on intrahousehold welfare and bargaining power. But they nevertheless lead us to suspect that bargaining power is probably not as strong a determinant of intrahousehold equity as we once thought it was.

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**Table 1. Descriptive statistics: individual data**

Personal characteristics (all rounds)	Unit	Male			Female		
		Mean	Median	Std.dev.	Mean	Median	Std.dev.
Age	years	46.0	44.5	14.9	35.5	34.0	12.2
Height	cm	167.5	167.5	6.7	156.2	156.0	6.4
Education	index 1-9	2.1	1.0	1.7	1.4	1.0	1.2
Body mass index (BMI)	index	20.1	20.1	2.1	20.3	20.2	2.3
Mobility index (*)	index 5-20	5.8	5.0	2.5	5.8	5.0	2.1
Pregnant	yes=1	n.a.			9.5%		
Breastfeeding	yes=1	n.a.			37.1%		
<b>Time spent on in last 24 hours:</b>							
Total work, of which:	%	57.3%			65.9%		
Farm related activities	%	40.0%	40.7%	31.0%	11.4%	0.0%	17.0%
Market related activities	%	8.6%	0.0%	19.6%	8.0%	0.0%	14.5%
Communal activities	%	5.5%	0.0%	14.8%	1.3%	0.0%	6.3%
Household chores	%	3.3%	0.0%	7.9%	45.2%	44.8%	21.9%
Total leisure, of which:	%	42.0%			32.8%		
Personal time	%	16.7%	12.8%	16.2%	14.0%	11.1%	13.1%
Social activities	%	25.3%	20.0%	23.4%	18.8%	13.5%	19.8%
Miscellaneous	%	0.5%	0.0%	5.0%	1.1%	0.0%	5.3%
<b>Participation in decisions</b>							
Participate in decision on what to grow	yes=1	67%	100%	44%	1%	0%	9%
Keep the money from livestock sale	yes=1	44%	0%	48%	4%	0%	19%
Keep the money from sale of dairy prod.	yes=1	11%	0%	30%	34%	0%	45%
Involvement in hh purchases	index 0-8	5.7	6.0	2.0	1.4	0.5	1.8
Wife earns non-farm income	yes=1				26%		
<b>Asset ownership</b>							
Share of land individually owned	%	95%	100%	19%	5%	0%	19%
Share of livestock individually owned	%	26%	0%	42%	3%	0%	14%
Share of land on divorce	%	75%	100%	27%	23%	0%	26%
Share of livestock on divorce	%	56%	50%	28%	35%	50%	24%
<b>Bargaining variables</b>							
Number of trees listed	number	12	10	8	7	6	5
Number of child disease listed	number	3	3	2	3	3	2
Whether ever was in a fight	yes=1	40%			14%		
Saw father beat up mother	yes=1	45%			40%		
<b>Assets and human capital at marriage</b>							
Land brought to marriage	EBirr	1795	361	4368	84	0	802
Livestock brought to marriage	EBirr	1120	265	2131	281	0	1119
Other assets brought to marriage	EBirr	859	434	1620	12	0	121
Farming experience before marriage	years	11.3	10.0	10.0	3.7	1.0	5.7
Non-farm wage exper. before marriage	years	0.9	0.0	2.9	0.1	0.0	0.8
Non-farm self-employment exper. b.m.	years	0.9	0.0	3.0	0.3	0.0	1.6
<b>Family background</b>							
Born in this village	yes=1	72%			44%		
Born in this woreda	yes=1	14%			29%		
Born in this region	yes=1	6%			16%		
Born in other rural area	yes=1	7%			9%		
Born in urban area	yes=1	1%			2%		
Prosperity level of parents	index 1-5	2.9	3.0	0.8	3.0	3.0	0.8
Education level of father	years	0.1	0.0	0.3	0.1	0.0	0.3
No longer living with parents at marriage	yes=1	40%			25%		
Number of previous unions	number	0.6	0.0	1.1	0.4	0.0	0.9
Number of brothers	number	2.2	2.0	1.9	2.3	2.0	1.8
Number of sisters	number	2.1	2.0	1.8	2.2	2.0	1.6

Except for personal characteristics, all variables only collected in round 4.

(\*) not available for round 1

**Table 2. Descriptive statistics: household data**

	Unit	Mean	Median	Std.dev.
<b>Child welfare</b>				
Mean height for age score	score	-2.1	-2.2	1.5
Mean weight for age score	score	-1.6	-1.7	1.1
Mean weight for height score	score	2.7	2.2	3.5
Average mobility index for children	index 5-20	6.8	6.0	2.4
Median mobility index for children	index 5-20	6.4	5.0	2.5
Share of school age children in school (*) %		12%	0%	26%
<b>Consumption expenditures</b>				
Total consumption expenditures	EBirr	659.5	385.6	2658.1
Food	%	75.0%	79.0%	0.19
Alcohol and tobacco	%	5.1%	0.0%	0.11
Clothing for men	%	1.9%	0.0%	0.04
Clothing for women	%	2.1%	0.0%	0.04
Clothing for boys	%	1.3%	0.0%	0.03
Clothing for girls	%	1.1%	0.0%	0.02
Health care	%	1.5%	0.0%	0.04
Education	%	0.3%	0.0%	0.02
Services	%	1.6%	0.8%	0.03
Household durables	%	2.0%	0.2%	0.06
Ceremonial expenses	%	3.7%	0.6%	0.08
Funeral society	%	0.7%	0.2%	0.02
Other	%	3.6%	2.4%	0.04
<b>Household characteristics</b>				
Household size	number	6.2	6.0	2.6
Operated land area	Ha	4.0	1.4	29.1
Number of livestock heads, of which:	number	8.1	5.0	10.6
Number of oxen	number	0.9	0.0	1.2
Number of cows	number	0.9	1.0	1.3
Value of livestock	EBirr	2116.4	1350.0	3645.5
Value of other assets	EBirr	250.7	119.5	603.5

(\*) information available only for rounds 1 and 4

**Table 3. BMI and health of husband and wife**

Estimator		BMI		Mobility index	
		OLS		Tobit	
		Coef.	t stat.	Coef.	t stat.
<b>Household characteristics</b>					
Household size	log	0.230	<b>2.77</b>	0.316	0.72
Total consumption expenditures	log	0.100	<b>2.44</b>	-0.077	-0.35
Operated land	log	0.092	1.24	-0.024	-0.06
Number of livestock heads	log	0.173	<b>2.76</b>	-0.349	-1.03
Value of livestock	log	-0.046	<b>-1.93</b>	0.106	0.85
Value of other productive assets	log	0.132	<b>4.63</b>	0.072	0.46
Land at marriage	log	-0.013	-1.24	0.019	0.36
Livestock at marriage	log	0.003	0.28	-0.065	-1.18
Sum of trees listed	log	-0.039	-0.69	-0.287	-0.98
Sum of child diseases listed	log	0.137	<b>2.50</b>	0.055	0.20
<b>Individual characteristics</b>					
Gender	female=1	-0.327	<b>-2.41</b>	-1.413	<b>-2.04</b>
Pregnant	yes=1	1.830	<b>12.65</b>	-3.109	<b>-4.26</b>
Breastfeeding	yes=1	0.103	1.09	0.365	0.73
Age	years	-0.053	<b>-4.37</b>	0.058	0.97
Age squared	years	0.000	<b>3.43</b>	-0.003	<b>-5.67</b>
Height	cm	-0.030	<b>-6.00</b>	0.076	<b>2.84</b>
Education level	index 1-9	0.012	0.60	0.341	<b>2.57</b>
<b>Bargaining variables – all variables at the individual level</b>					
Land brought to marriage	log	0.028	1.60	0.034	0.37
Livestock brought to marriage	log	-0.013	-0.69	0.084	0.85
Involvement in household purchases	index 1-8	0.027	<b>1.76</b>	0.245	<b>3.10</b>
Wife earns non-farm income	yes=1	0.086	0.81	-0.556	-1.00
Land upon divorce	log	-0.017	-0.18	0.271	0.53
Livestock upon divorce	log	-0.047	<b>-2.34</b>	-0.063	-0.61
Number of trees listed	log	0.193	<b>1.76</b>	1.001	<b>1.72</b>
Number of child disease listed	log	-0.098	-0.79	0.801	1.22
Saw father beat up mother	yes=1	0.072	1.18	-0.079	-0.24
Whether ever was in a fight	yes=1	-0.029	-0.41	0.105	0.28
Round dummies				included but not shown	
Peasant association dummies				included but not shown	
Intercept		24.211	<b>27.20</b>	-10.341	<b>-2.18</b>
Number of observations, of which:		5290		4129	
lower censored				15	
uncensored				754	
upper censored				3360	
R square		0.082		0.118	
<b>Joint significance test</b>		test stat.	p-value	test stat.	p-value
assets brought to marriage		1.320	0.266	0.580	0.563
participation to household decisions		2.100	0.123	<b>4.850</b>	0.008
disposition upon divorce		<b>3.050</b>	0.048	0.230	0.794
intelligence		1.600	0.202	<b>2.880</b>	0.056
predisposition to violence		0.710	0.494	0.090	0.913

**Table 4. BMI and health of husband and wife – with household fixed effects**

		<b>BMI</b>		<b>Mobility index</b>	
		Coef.	t stat.	Coef.	t stat.
<b>Household characteristics</b>					
Household size	log	-0.089	-0.52	-0.047	-0.21
Total consumption expenditures	log	0.076	<b>1.78</b>	-0.060	-1.12
Operated land	log	0.062	0.78	-0.094	-1.01
Number of livestock heads	log	0.080	0.87	-0.087	-0.79
Value of livestock	log	0.008	0.24	-0.009	-0.25
Value of other productive assets	log	0.060	1.54	0.026	0.58
<b>Individual characteristics</b>					
Gender	female=1	0.090	0.56	0.263	1.36
Pregnant	yes=1	1.280	<b>9.30</b>	-0.524	<b>-2.88</b>
Breastfeeding	yes=1	-0.138	-1.48	0.080	0.70
Age	years	-0.092	<b>-4.67</b>	0.128	<b>5.33</b>
Age squared	years	0.001	<b>5.63</b>	-0.002	<b>-8.16</b>
Height	cm	-0.026	<b>-3.89</b>	0.018	<b>2.14</b>
Education level	index 1-9	-0.015	-0.52	0.051	1.48
<b>Bargaining variables – all variables at the individual level</b>					
Land brought to marriage	log	0.017	1.07	-0.040	<b>-2.07</b>
Livestock brought to marriage	log	0.009	0.55	0.006	0.31
Involvement in household purchases	index 1-8	0.035	<b>2.36</b>	0.035	<b>1.96</b>
Wife earns non-farm income	yes=1	-0.072	-0.72	-0.188	-1.48
Land upon divorce	log	-0.054	-0.59	0.069	0.65
Livestock upon divorce	log	-0.070	<b>-3.66</b>	-0.015	-0.67
Number of trees listed	log	0.273	<b>2.20</b>	0.455	<b>3.02</b>
Number of child disease listed	log	0.058	0.41	0.252	1.47
Saw father beat up mother	yes=1	0.186	<b>1.82</b>	-0.119	-0.96
Whether ever was in a fight	yes=1	0.077	0.73	0.017	0.13
Round dummies			included but not shown		
Intercept		24.711	<b>18.67</b>	-11.735	<b>-7.13</b>
sigma_u		1.518		1.406	
sigma_e		1.705		1.831	
rho		0.442		0.371	
<b>R2</b>					
within		0.056		0.062	
betweenhold		0.033		0.245	
overall		0.047		0.146	
Nobs		5290		4129	
<b>Joint significance test</b>					
assets brought to marriage		0.930	0.394	2.160	0.116
participation to household decisions		<b>2.860</b>	0.057	<b>2.630</b>	0.072
disposition upon divorce		<b>8.050</b>	0.000	0.340	0.711
intelligence		<b>2.750</b>	0.064	<b>6.630</b>	0.001
predisposition to violence		2.080	0.125	0.460	0.631

Table 5. Work and leisure time for husband and wife – household fixed effects

	Work time		Leisure time		Social time		Personal time	
	Coef.	t stat.	Coef.	t stat.	Coef.	t stat.	Coef.	t stat.
<b>Individual characteristics</b>								
Gender								
	female=1	<b>1.92</b>	0.092	0.12	1.068	1.55	-0.976	<b>-1.95</b>
Pregnant	yes=1	<b>1.82</b>	-1.402	-1.36	-0.944	-1.05	-0.458	-0.70
Breastfeeding	yes=1	1.34	-0.572	-1.03	-0.526	-1.08	-0.047	-0.13
Age	years	1.65	-0.138	-1.50	-0.132	-1.64	-0.006	-0.10
Age squared	years	<b>-2.13</b>	0.001	<b>1.80</b>	0.001	<b>1.91</b>	0.000	0.21
Height	cm	-1.47	0.033	0.99	0.034	1.18	-0.001	-0.06
Education level	index 1-9	0.42	0.166	1.17	-0.021	-0.17	0.187	<b>2.08</b>
<b>Bargaining variables – all variables at the individual level</b>								
Land brought to marriage	log	-0.057	-0.64	<b>1.69</b>	0.163	<b>2.26</b>	-0.023	-0.44
Livestock brought to marriage	log	0.140	1.59	-1.38	-0.097	-1.37	-0.016	-0.30
Involvement in household purchases	index 1-8	0.017	0.21	<b>-1.94</b>	-0.016	-0.24	-0.127	<b>-2.72</b>
Wife earns non-farm income	yes=1	-0.095	-0.15	-0.308	-0.52	-1.02	0.216	0.58
Land upon divorce	log	-0.544	-1.26	0.100	0.201	0.58	-0.101	-0.40
Livestock upon divorce	log	0.058	0.57	-0.061	-0.035	-0.42	-0.026	-0.43
Number of trees listed	log	-0.339	-0.51	-0.022	0.793	1.48	-0.815	<b>-2.10</b>
Number of child disease listed	log	-1.350	<b>-1.77</b>	1.302	1.182	<b>1.93</b>	0.120	0.27
Saw father beat up mother	yes=1	-0.823	-1.56	0.644	0.116	0.27	0.528	<b>1.70</b>
Whether ever was in a fight	yes=1	0.213	0.39	-0.455	0.005	0.01	-0.460	-1.45
Intercept		14.667	<b>2.17</b>	1.275	-3.314	-0.61	4.589	1.16
sigma_u		3.177		3.141	2.820		1.862	
sigma_e		3.203		2.959	2.582		1.877	
rho		0.496		0.530	0.544		0.496	
Number of observations		1018		1018	1018		1018	
R2 within		0.322		0.082	0.087		0.075	
betweenhold		0.042		0.003	0.002		0.001	
overall		0.115		0.001	0.008		0.002	
<b>Joint significance test</b>								
assets brought to marriage		test stat.	p-value	test stat.	p-value	test stat.	p-value	test stat.
participation to household decisions		1.300	0.274	1.930	0.148	<b>2.900</b>	0.057	0.190
disposition upon divorce		0.030	0.971	2.190	0.114	0.600	<b>3.720</b>	0.026
intelligence		0.820	0.443	0.210	0.811	0.200	0.240	0.786
predisposition to violence		1.970	0.141	1.780	0.171	<b>3.700</b>	0.026	0.112
		1.290	0.277	1.290	0.278	0.040	<b>2.510</b>	0.083





Table 7. Child welfare

	Height for age		Nutrition		Weight for height		Schooling		Mobility	
	Coef.	t stat.	Coef.	t stat.	Coef.	t stat.	Coef.	t stat.	Coef.	t stat.
<b>Household characteristics</b>										
Total consumption expenditures	log	1.12	0.042	1.33	0.048	0.55	0.098	1.79	-0.038	-0.37
Household size	log	1.45	0.123	1.69	0.272	1.34	0.623	4.71	-1.030	-5.04
Wife is pregnant	yes=1	-0.97	-0.063	-0.77	-0.512	-2.28	-0.248	-1.80	-0.041	-0.15
Wife is breastfeeding	yes=1	-0.158	-0.002	-0.04	-0.651	-4.42	-0.264	-2.85	0.089	0.52
Age of husband	years	0.000	0.001	0.42	0.022	2.51	0.004	0.85	-0.014	-1.42
Age of wife	years	0.020	3.77	0.009	2.13	0.064	0.000	0.07	-0.017	-1.41
Education level of husband	index 1-9	0.005	0.26	0.004	0.29	0.020	0.021	0.84	-0.006	-0.13
Education level of wife	index 1-9	-0.017	-0.65	0.044	2.23	-0.048	0.028	0.82	0.025	0.38
<b>Bargaining variables – controlling for total effect</b>										
Land at marriage	log	-0.021	-2.37	-0.014	-2.04	0.012	0.64	0.33	-0.048	-2.24
Livestock at marriage	log	0.016	1.51	0.004	0.54	0.038	1.70	-0.16	-0.053	-2.00
Involvement of husband and wife in pur	index 1-8	0.060	2.00	-0.006	-0.27	0.165	2.62	3.44	0.023	0.33
Operated land	log	-0.099	-1.37	0.039	0.73	0.280	1.84	0.001	0.047	0.28
Value of livestock	log	0.004	0.26	0.002	0.13	-0.017	-0.49	-1.94	0.011	0.28
Sum of trees listed	log	-0.227	-2.15	-0.168	-2.10	0.061	0.28	-0.67	0.137	0.53
Sum of child diseases listed	log	-0.128	-1.43	-0.101	-1.48	-0.004	-0.02	0.96	-0.217	-0.89
Husband and wife saw father beat up m	index 0-2	0.074	0.53	-0.030	-0.29	0.373	1.29	-0.357	-2.01	1.79
Husband and wife in a fight	index 0-2	0.321	2.38	0.211	2.06	0.092	0.33	0.134	0.611	1.79
<b>Bargaining variables – wife values</b>										
Land brought to marriage	log	0.058	2.36	0.033	1.79	0.108	2.09	1.00	-0.059	-1.03
Livestock brought to marriage	log	0.038	2.15	0.018	1.35	-0.027	-0.73	0.022	1.01	0.13
Involvement in household purchases	index 1-8	-0.021	-1.13	-0.017	-1.19	-0.005	-0.12	0.018	0.80	0.34
Wife earns non-farm income	yes=1	-0.142	-0.88	-0.227	-1.86	0.287	0.85	0.058	0.30	-0.02
Land upon divorce	log	0.091	0.73	-0.104	-1.10	-0.270	-1.03	-0.167	-0.97	-1.63
Livestock upon divorce	log	0.008	0.31	0.027	0.72	1.38	0.001	-0.04	0.126	2.08
Number of trees listed	log	0.126	1.13	0.098	1.15	-0.055	-0.24	0.052	0.35	-0.037
Number of child disease listed	log	0.388	3.05	0.338	3.49	0.368	1.38	0.020	0.12	0.58
Saw father beat up mother	yes=1	-0.002	-0.01	0.118	1.32	-0.401	-1.63	0.220	1.48	-0.056
Whether ever was in a fight	yes=1	-0.142	-1.09	-0.082	-0.83	-0.431	-1.58	-0.006	-0.102	-0.32
Round dummies						included but not shown				
Peasant association dummies						included but not shown				
Intercept		-3.693	-9.28	-2.403	-7.98	-3.460	-4.14	-3.130	-2.161	-2.12
sigma_u		0.494		0.285		0.571		0.894		
sigma_e		1.409		1.078		2.954				
rho		0.109		0.065		0.036				
Number of observations, of which:										
lower censored		2456		2492		2452		1139	2357	
uncensored								856	2	
upper censored								221	1389	
R square		0.048		0.041		0.139		0.125	0.027	
Estimator		OLS		OLS		OLS		Tobit	Tobit	
<b>Joint significance test</b>										
assets brought to marriage		test stat.	6.090	test stat.	2.990	test stat.	2.260	test stat.	1.200	p-value
participation to household decisions			0.002		2.490		0.105		0.302	0.588
disposition upon divorce			0.349		0.610		0.695		0.689	0.942
intelligence			0.698		8.260		1.290		0.609	0.055
predisposition to violence			0.002		1.120		0.960		0.090	0.845
			0.547		1.120		0.327		1.110	0.928

Note: school attendance data only available for round 1 and 4.