Social Roles, Human Capital, and the Intrahousehold Division of Labor: Evidence from Pakistan

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Abstract[1]

Using detailed data from rural Pakistan, this paper investigates whether human capital, learning by doing, gender, and family status affect the division of labor within households. Results suggest the presence of returns to individual specialization in all farm, non-farm, and home based activities. The intrahousehold division of labor is influenced by comparative advantage based on human capital and by long-lasting returns to learning by doing, but we also find evidence of a separate effect of gender and family status. Households seem to operate as hierarchies with sexually segregated spheres of activity. The head of household and his or her spouse provide most of the labor within their respective spheres of influence; other members work less. When present in the household, daughters-in-law work systematically harder than daughters of comparable age, build, and education. Other findings of interest are that there are increasing returns to scale in most household chores, that larger households work more off farm, and that better educated individuals enjoy more leisure.

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Becker (1965, 1981) was the first economist to formally articulate the role that comparative advantage and learning by doing may play in the intrahousehold division of labor. In particular, he argued that, if one member of the household must stay at home to take care of domestic chores, economic efficiency dictates that it should be the one with the lowest expected wage relative to their productivity in domestic chores (e.g., Becker (1981)). This simple but powerful observation has sparked a voluminous empirical literature, the general conclusion of which is that, indeed, job market participation responds to the human capital characteristics of individual household members.

Non-economic explanations of the intrahousehold division of labor have also been proposed. These explanations emphasize the role of customs and social norms and argue that individuals perform the tasks assigned to them by society according to sex and status. A variant of the above argues that tasks themselves are not assigned by norms; rather individuals are assigned socially defined responsibilities, such as child care provider or bread winner. This interpretation leaves more room for free will as individuals choose tasks in order to fulfill their responsibilities. For the sake of the analysis presented here, we do not distinguish between these two interpretations of social norms.

Others have argued that men and women, young and old have different preferences. If men and women have systematically different preferences regarding, say, child care, giving responsibility for child care to women might be socially optimal.[2] Moreover, whose preferences are reflected in household choices depends on members' relative bargaining power. These ideas implicitly underlie much of the recent literature on the effect of female bargaining power on consumption and on child schooling and nutrition (e.g., Browning et al. (1994), Behrman (1997),

[2] Divergent preferences with respect to household public goods such as child nutrition and education may also lead to non-cooperative game outcomes which, although inefficient, assign responsibilities according to preferences. To see why, suppose one household member cares enough about the public good that he or she would provide it even if the other would not. For this person, the threat not to provide is not credible. Consequently, the only subgame perfect non-cooperative equilibrium is the one in which the person who cares the most provides all the public good (Fafchamps, 1998).

Heckman (1974), Kanbur (1991), Lundberg, Pollack and Wales (1997), Thomas, Contreras and Frankenberg (1997), Rose (1999)).

The objective of this paper is to investigate whether family status, human capital, and learning by doing can account for the observed division of labor within households. Family status is defined here as the relationship between individual household members and the head of household (e.g., son, wife, daughter-in-law). Much of the paper can be seen as an effort to test Becker's (1965, 1981) theory of the intrahousehold division of labor. In particular, we examine the role played by human capital in deciding who does what in the household, and we formally test whether individuals are locked into specific tasks as a result of their upbringing, as Becker argues in Chapter 2 of his Treatise on the Family. We also investigate whether the gender division of labor (that is not due to human capital or learning by doing) can be attributed solely to differences in preferences, or whether other factors such as social norms or incentive issues play a role as well. To this effect, we compare the tasks undertaken by parents and children as well as the work performed by daughters and daughters-in-law of similar build, age, and schooling. We also examine the extent of specialization and the presence of returns to household size.

This paper differs from other works in several important respects. First, we combine several approaches to generate a picture of intrahousehold labor allocation that is as complete as possible. Our conclusions are not based on a single regression model but rather on a fairly exhaustive examination of the data. Second, the literature on intrahousehold allocation of tasks often uses concepts such as specialization and learning by doing interchangeably. Here we adopt a more careful conceptual approach that keeps these different concepts apart. As a result, our findings are more informative and more detailed. Third, we rely on an original empirical methodology that estimates labor share equations in a consistent yet flexible manner. To our knowledge, this methodology has never been used elsewhere and provides a generally applicable estimation approach for share equations. The paper also contains other methodological innova-

tions, such as specialization indices and a formal test of learning by doing.

Finally, we use an unusually detailed panel data set that contains information on all aspects of intrahousehold labor allocation. In much empirical work, the study of intrahousehold division of labor has been hindered by the availability of data from developed countries which are nearly exclusively for households with at most one working adult male and female.[3] Furthermore, the existence of markets for utilities, food preparation, child care, and the like drastically reduce the number of tasks undertaken by households. In such small households with few tasks to perform, the prospect for intrahousehold division of labor is limited. The situation is quite different in developing countries where households are large, children actively participate in productive activities, and households provide much of their own food, fuel, water, and child care in addition to pursuing a multitude of income generating activities. In such households with multiple tasks and participants, there is sufficient room for specialization and plenty of scope for preferences and social norms to fashion what individuals do. These households are also likely to be more organizationally complex. In contrast to small nuclear households, large households offer more room for delegation of responsibilities, thereby creating incentive and information problems similar to those encountered in firms.

This paper investigates these issues within Pakistani rural households. We find that the allocation of tasks is partly determined by comparative advantage considerations reflected in differences in human capital among household members. In particular, better educated individuals participate more actively in non-farm work, in line with evidence presented in Fafchamps and Quisumbing (1998) for Pakistan. Results further indicate that experience in a specific task helps predict what future tasks individuals perform, controlling for human capital and household composition. The effect is strongest in non-farm activities, and weakest in household chores where the reallocation of tasks among household members is frequent. Becker (1981) hypothesized that

[3] For a review of time allocation studies, mostly in developed countries, see Juster and Stafford (1991).

returns to learning by doing lock individuals in the tasks and roles they have learned at early stages of life. Our results indicates that this is, by and large, not true for household chores in rural Pakistan: the constant reallocation of these tasks among women suggest that they are easy to learn; having acquired the necessary skills as young girls is thus unlikely to be what locks women in household chores later in life. If lock-in is present, it is in non-farm activities where males dominate and returns to schooling are high.

We also show that the allocation of tasks is not solely driven by comparative advantage and learning-by-doing considerations but also by gender and family status. In particular, we find overwhelming evidence of division of labor by gender after controlling for human capital and task-specific experience. Activities are organized into gender-specific spheres of influence: males are responsible for "market" work; females are responsible for home production activities. These categories correspond closely to the dichotomy between the "productive" and "reproductive" roles often assigned to men and women in traditional societies.

The gender division of labor is not the only notable characteristic of the data. We also find that the allocation of tasks within each gender group varies systematically with family status after controlling for human capital differences. Results show that the head of household and his spouse(s) provide most of the labor to most activities; other members work less. This suggests that surveyed households operate as hierarchies in which roles are partly determined by family status. We also find evidence that daughters-in-law work systematically harder than daughters of comparable age, build, and education.

Both theoretical and empirical work on time allocation traces its roots to Becker (1965), who first formulated a utility-maximizing model of Z goods which were produced by both time and market goods inputs. This model has been widely used to analyze choices of hours worked and later extended by Gronau (1977) and Kooreman and Kapteyn (1987) to include home production and leisure. In developed countries, empirical work has focused on married women's

time allocation between market work, home work, and leisure (e.g., Heckman (1974), Gronau (1980)). Because these analyses are usually conducted based on a sample of married women, the implicit household structure is nuclear. Recent tests of the collective model using developed country data have also been limited to nuclear households with both spouses in the labor market (Fortin and Lacroix (1997); Browning and Chiappori (1998); Chiappori, Fortin, and Lacroix (1998)). In contrast, empirical work on time allocation in developing countries, while taking the work of Becker and Gronau as a starting point, has had to deal with the realities of home production and household structure in these countries (e.g., Evenson (1978)).

One strand of work has examined the choice between household and market oriented activities (e.g., Alderman and Chishti (1991), Khandker (1987, 1988), Skoufias (1993). These choices have been shown to depend on the woman's age, her education, household demographic composition, parental wealth, and distance to schools, town, or market center. Another issue which has dominated the literature on time allocation in South Asia is the extent to which social norms, particularly patriarchy and the norm of female seclusion or *purdah*, dominate economic factors which affect time allocation (Khandker, 1988; Alderman and Chisti, 1991; Sultana, Nazli and Malik (1994)). This literature, however, is not fully conclusive because the authors lack sufficiently detailed data and convincing instruments for social roles.[4] Sathar and Desai's (1996) work on Pakistan explores interactions between gender, age, and class hierarchies in determining women's and men's time allocation. Using dummy variables to capture possible hierarchies associated with different household structures, they show that women living in nuclear families participate more intensively in economic and household work, possibly because the absence of economies of size hinders the division of labor. Controlling for household unobservables via conditional logit, they find that daughters-in-law are the least likely to be employed in productive or

[4] Alderman and Christi (1991) control for senior status with a dummy for women aged 50 and above, but this variable is not significant. Sultana, Nazli and Malik (1994) use district dummies to control for different societal expectations, but these dummies capture other district effects as well so that their interpretation is unclear.

market-oriented activities, especially within a household enterprise. In contrast, men's overall labor force participation is largely unaffected by their position in the household hierarchy.

Given the existing literature on social norms in South Asia, a collective model which allows for different preferences of men and women seems appropriate. Collective models have been developed to analyze men's and women's labor supply (Fortin and Lacroix (1997); Browning and Chiappori (1998); Chiappori, Fortin, and Lacroix (1998)). Unfortunately, these models can be used to analyze home production only under restrictive assumptions regarding the household production function (Apps and Rees 1997). Complete markets for domestic goods (Chiappori 1997) are also required to allow separation between production and consumption decisions (Singh, Squire, and Strauss 1986). These requirements are not satisfied in the data at hand. Our earlier work indeed rejects the assumption of separability in rural Pakistan (Fafchamps and Quisumbing 1998). Furthermore, the presence of young children in surveyed households introduces non-separable public goods which invalidate the restrictions imposed by the collective model (Chiappori, Fortin, and Lacroix 1998). Lastly, a large proportion of Pakistani women do not participate in market work. This suggests the existence of corner solutions for female labor supply, a complication that existing work on collective models has not yet satisfactorily addressed (Fortin and Lacroix 1997).[5]

For these reasons, we propose and test an alternative reduced form methodology to investigate whether human capital, learning by doing, gender, and family status affect the division of labor inside the household.[6] Our results largely confirm previous work but considerably refine our understanding of the factors influencing intrahousehold task allocation. We begin in section 1 by sketching our conceptual framework and testing strategy. The data are presented in section 2, together with descriptive statistics. Test results are discussed in sections 3 and 4. The framework

[5] At present, only the unitary model is amenable to an econometric treatment that allows both corner and interior solutions for labor supply.

[6] Given that our data lack suitable instruments for the fallback options of various household members, we do not investigate whether intrahousehold division of labor is affected by intrahousehold bargaining power.

is extended in section 5 to discuss dynamic effects and returns to learning by doing. Conclusions are presented at the end.

Section 1. The Conceptual Framework

Becker (1965) has argued that , in the presence of returns to specialization, it is optimal for households to divide tasks among their members. If tasks require different levels of human capital -- e.g., strength, experience, literacy -- household members should be allocated to those tasks for which they have a comparative advantage. Returns to specialization can result from learning by doing, in which case it is optimal for household members to learn and permanently specialize in certain tasks (e.g., Becker (1981)). They may also be purely static and result, for instance, from better coordination of effort (e.g., cooking is easier to organize if one person takes care of it instead of five)[7] and from easier monitoring. Clear delineation of responsibilities offers the added advantage of reducing the inevitable wrangling about who in the household is not pulling their weight, hence reducing tension.

Whether returns from specialization are static or dynamic has an effect on the division of labor over time: if specialization is motivated by the desire to capitalize on task specific experience, one should observe that household members perform the same tasks over time. In contrast, if tasks are easy to learn but returns to specialization arise from coordination and monitoring consideration, we would expect individuals to switch from one task to another over time, if only to break out of the monotony of routine.

As the above examples suggest, returns to specialization need not depend on differences in human capital or experience. Many tasks are simple enough that they can be performed by anyone with minimal tutoring. In this case, the matching of individuals with particular tasks becomes arbitrary although some matching is required to achieve returns from specialization.

[7] Gains from coordination arising from information processing and transmission costs are formalized and discussed, for instance, in Itoh (1991).

This arbitrariness complicates intrahousehold bargaining. If bargaining is costly and generates friction, society may simplify the allocation process by proposing an ideal division of labor that achieves (most of) the gains from specialization while satisfying some socially acceptable criteria of intrahousehold equity. These norms -- which we call social roles -- typically organize the intrahousehold division of labor around gender, age, and family status. They may be entirely arbitrary, or seek to match tasks with average group characteristics, such as physiological differences in body size and reproductive functions.[8] Alternatively, households may allocate tasks according to the preferences of its members for specific tasks. If preferences vary systematically with gender and age, one would observe a systematic relationship between gender, age, and the allocation of tasks even in the absence of social pressure. If preferences are identical but certain tasks are more pleasant, members with more bargaining power would allocate themselves the preferred tasks, leaving less appealing tasks to others. Within households, bargaining power is likely to be correlated with gender, age, and family status. If socially defined roles, bargaining power, or individual preferences affect the division of labor among otherwise identical individuals, then labor shares will be influenced by the gender and age composition of the household in ways that are not accounted for by differences in human capital and work experience. Testing this idea is the main objective of this paper.

It is also conceivable that intrahousehold division of labor is solely motivated by a desire to follow social norms or satisfy individual preferences, not by a effort to capture gains from specialization. For instance, it could be that Pakistani women do all the cooking and cleaning simply because they like it or tradition says so. In this case, we may not observe individual specialization by task: if working as a team is more productive or more pleasurable than working alone, women would tend to cook and clean jointly. A world in which gains from individual specialization are present and returns to/preference for teamwork are weak would display individual

[8] Some would argue that they also represent an instrument of power and domination (e.g., Folbre(1984)).

division of labor *within* sets of tasks. In contrast, a world in which intrahousehold division of labor is purely due to customs and preferences may display team work within sets of tasks. Patterns of labor sharing within each social category thus provide indirect evidence of the relative returns to specialization and team work. We use this insight as an indirect way to investigate whether returns to specialization -- as opposed to purely arbitrary social roles or preferences -- are the driving force behind intrahousehold division of labor.[9]

Formally, the decision problem of the household can be represented as an optimal allocation problem. Let C_m and C_z be vectors of market and home produced goods, respectively, and let T^i and L^i denote the total time endowment and total labor of individual i. Market goods are those for which a market exist; home goods must be produced by the household. Household welfare can be written:

$$\sum_{i=1}^{N} \omega^i V^i(C_m^i, C_z^i, T^i - L^i) \tag{1}$$

where V^i is the utility of individual i defined over consumption and leisure and ω^i stands for welfare weights. We treat these weights as exogenous to the task allocation process, which is formally equivalent to assuming either that the household is unitary (e.g., Alderman et al. (1995)), or that welfare weights represent the exogenously given bargaining power of individual household members (Browning and Chiappori (1998)).[10] Some market and home goods are consumed individually, in which case $\sum_i C_{m_c}^i = C_{m_c}$ and $\sum_i C_{z_c}^i = C_{z_c}$; others are household public goods, in

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[9] Of course, if there are no returns to teamwork and if most people prefer to work alone, we will observe little labor sharing as well. The interpretation of our indirect test thus rests critically on an implicit assumption about preferences (working alone vs. in a group) and technology (returns to team work). Testing these assumptions directly requires more research.

[10] Because our focus is on specialization in production, not on the intrahousehold allocation of welfare, this simplification is fairly innocuous. As long as households are efficient, they should divide tasks among themselves according to comparative advantage, whether they are unitary or not (Fafchamps (2002)). By the same token, social roles and individual preferences affect the intrahousehold allocation of tasks irrespective of whether decisions are made in a unitary or collective household model context. Of course, in collective models, bargaining power helps determine whose preferences are reflected in household choices. For our purpose, however, this important difference between the two models is irrelevant: since the data at our disposal do not provide convincing instruments for intrahousehold bargaining power, the collective model cannot be tested. Positing exogenous welfare weights for exposition purposes does not, therefore, detract from the generality of our conclusions.

which case $C^i_{m_p} = C_{m_p}$ and $C^i_{z_p} = C_{z_p}$. The household has at its disposal a series of partially intertwined production activities, some of which yield marketable output X_m, others yield home goods C_z. To allow for the possibility of economies of scope, the production technology of the household is written:

$$G(X_m, C_z, L^*_a, K_k) \geq 0 \tag{2}$$

where L^*_a denotes a vector of effective labor allocated to various tasks a, and K_k denotes a vector of semi-fixed inputs. Wage work is subsumed into function $G(.)$ as a distinct activity. Effective labor is given by:[11]

$$L^*_a = \sum_{i=1}^{N} e_a(H_i) L^i_a \tag{3}$$

where H_i is a vector of human capital characteristics of individual i and $e_h(.)$ is a function that determines labor effectiveness in task a. Since, by definition, market goods can be exchanged at a given market price, the household faces a cash budget constraint:

$$\sum_m p_m(C_m - X_m) = U \tag{4}$$

where U represents unearned income. Maximizing household welfare (1) subject to equations (2) to (4) plus a series of non-negativity constraints $L^i_a \geq 0$ yields a series of reduced-form labor allocation functions:[12]

$$L^i_a = f_a(K_k, U, H_1, ..., H_N, \omega_1, ..., \omega_N) \tag{5}$$

Comparative advantage dictates that individuals with the highest labor effectiveness in activity a fully specialize in that activity. (e.g., Becker (1981), chapter 2). The role of comparative advantage in the intrahousehold division of labor can thus be investigated by verifying whether the relative human capital and prior experience of household members determine what task they per-

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[11] For simplicity of exposition, we ignore hired-in labor. Given the very small proportion of hired-in labor in the survey area and the evidence that the labor market is not perfect (e.g., Fafchamps and Quisumbing (1998)), this assumption is adequate for our purpose.

[12] To the extent that markets are missing for certain domestic services and utilities -- or that households choose not to participate because of transactions costs -- separability between production and consumption decisions breaks down (e.g., Singh, Squire and Strauss (1986), de Janvry, Fafchamps and Sadoulet (1991)).

form. Whether social roles and preferences matter can be similarly analyzed by testing whether factors such as gender and family status affect labor allocation.

Estimating equation (5) directly is difficult when households differ dramatically in their composition and structure, as is the case in rural Pakistan.[13] To make estimation manageable, we rewrite (5) as $L_a^i = S_a^i L_a$ where $L_a \equiv \sum_i L_a^i$ denotes total labor and $S_a^i \equiv L_a^i/L_a$ stands for individual labor shares. Only certain factors affect labor shares S_a^i, such as social roles, preferences, and differences in human capital and task-specific experience. For instance, the household ownership of land and livestock is expected to affect total labor use in cultivation and herding, but not which household member participates in these activities. It is thus possible to investigate the intrahousehold division of labor by estimating the determinants of total labor L_a and individual labor shares S_a^i separately. This is the approach adopted here.

By summing equation (5) over all household members, total labor use can be written:

$$L_a = F_a(K_k, U, H_1, ..., H_N, \omega_1, ..., \omega_N) \qquad (6)$$

This equation can be econometrically estimated across households of different sizes and composition by replacing individual specific variables H_i and ω_i with household summary statistics, such as household size, the average human capital of household members, and family background variables potentially affecting welfare weights. To the extent that social roles constitute binding constraints on household optimization, total labor use depends on the composition of the household. One way to test whether social norms about the division of labor are constraining -- and have an efficiency cost -- is thus to test whether the composition of the household affects total labor use. If social norms were followed very strictly, their efficiency cost could be potentially very large. On the other hand, if there were many different tasks to be performed and households were large and diverse, social norms are unlikely to be constraining and the efficiency cost would

[13] It is theoretically possible to estimate equation (5) separately for each household structure, but in practice one quickly runs out of degrees of freedom.

be negligible.[14] Household composition might also affect labor use if preferences for various types of work vary systematically by age, sex, and family status.

A convenient parameterization for household composition is obtained by noting that:

$$N_1 + \sum_{j=2}^{J} (1+\alpha_j)\, N_j \approx N\, e^{\sum_{j=2}^{J} \alpha_j N_j/N} \tag{7}$$

where J is the number of categories, N_j is the number of household members in category j, N is total household size, and α_j is a parameter that expresses how different category j is from the omitted category, category 1:[15] if household members are equivalent in terms of labor supply and consumption demand, all the α_j's are 0. An $-1 \leq \alpha_j < 0$ means that category j counts for less than the omitted category, and vice versa if $\alpha_j > 0$. If $\alpha_j = -1$, adding a member of category j does not raise household total labor. Household composition effects can thus be tested using α_j estimates.

Thanks to this parameterization, it is also possible to ascertain whether there are increasing returns to household size in the provision of certain home goods. Increasing returns to size may arise (within a certain range) either because the consumption of certain goods is non-rival -- e.g., a kitchen -- or because their production is subject to increasing returns to scale -- e.g., meal preparation. Whenever returns to size are present in, say, task *a*, the labor allocated to that task should increase less than proportionally with household size. This is important because it has been argued that one of the reasons why households are formed is precisely to take advantage of returns to size.

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[14] The power of the above test is weakened by the fact that strict social norms would cause households to form. If, for instance, men are not allowed in the kitchen (and there is no market for food preparation), male-only households will not be observed since, by definition, they would starve. Similarly, female-only households will not be observed if women are not allowed to perform any work and to own any assets (and there is no social insurance). More generally, household will seek to minimize the efficiency cost of strict norms by adding or shedding members (by divorce, birth, adoption, and the like) so as to match their intended production plan. Our test is thus conservative: if norms are constraining *and* households cannot fully adjust, household composition influences total labor; if norms are constraining but households fully adjust, it does not.

[15] Equation (7) makes use of the fact that $1+x \approx e^x$ when x is small. See Fafchamps and Quisumbing (1998) for a similar application.

Equation (7) ignores valuable information on individual labor shares and cannot be used to test for gender and status effects when they are not constraining. To overcome these limitations, an analysis of the determinants of individual labor shares is needed. Theory suggests that labor shares, denoted S_a^i, vary with (1) an individual's human capital relative to other household members; (2) task-specific skills acquired from past experience; and (3) the gender and family status of the individual in the household. The first two effects correspond to Becker's idea of comparative advantage; the last effect controls for all the determinants of task allocation based purely on gender and family status. They can be tested by regressing individual labor shares on human capital differences, measures of past experience, and household composition. Details of the estimation method are presented in Section 4.

To summarize, we shall estimate two complementary sets of regressions, one on aggregate household labor per task, and one on labor shares per task. In the first set of regressions, the unit of observation is the household; in the second set, the unit of observation is an individual within the household. In the first set, household labor is regressed on: semi-fixed factors; unearned income; human capital; and the family status and age-sex composition of the household. If human capital partly determines what people do, human capital variables should be jointly significant. Family status variables should be significant only if socially defined roles are constraining or if preferences vary systematically with age and sex. The presence of increasing returns to size can be tested by verifying whether the elasticity of labor with respect to N is significantly smaller than one.

The share regressions are used to test whether gender and family status affect the intra-household allocation of labor separately from human capital differences. In particular, we examine whether the head of household and his wife (wives) take on a disproportionate share of all labor, an outcome that would suggest the presence of information and enforcement problems within the household. Finally, we investigate whether particular activities are characterized by

either returns to specialization or returns to team work by examining the proportion of households which fully specialize.

Section 2. The Data

The data on which our analysis is based come from 12 rounds of a household survey conducted by the International Food Policy Research Institute (IFPRI) in four districts of Pakistan between July 1986 and September 1989 (see Nag-Chowdhury (1991) for details). A panel of close to 1000 randomly selected households in 44 randomly selected villages were interviewed at 3 to 4 months intervals on a variety of issues ranging from incomes, agricultural activities, and labor choices to anthropometrics, education, land, and livestock (see Adams and He (1995), Alderman and Garcia (1993)). Responses to these questions were combined by the authors to generate a consistent data set containing annual information about household composition, income, assets, inherited land, human capital, and time allocation to various activities. All asset variables refer to the beginning of the year.

This data set is unusual in having four separate sources with which to analyze time allocated to various activities: (A) a recall of total labor, both household and hired, devoted to crops (by task), livestock, construction, and farm supervision for the kharif and rabi seasons on the household farm, as well as wage labor on others' farms;[16] (B) a non-farm activity survey recalling each member's primary and secondary non-farm activities in the previous week; (C) a one-week recall of up to 15 different household chores; and (D) a comprehensive, though less disaggregated, one-week recall on activities performed in the morning and afternoon, also including leisure. Total farm labor recall was asked in all rounds; the non-farm activity survey and the

[16] In all years, collected crop labor data refers to a specific season, e.g., 'kharif land preparation' or 'rabi harvesting'. Using this information, crop labor data by season was reconstructed by combining responses to farm related questions from multiple different visits (6 visits in year 1, 2 visits each in years 2 and 3). As a consequence of questionnaire design, farm supervision is not clearly distinguished from farm labor itself: respondents were essentially asked how many days since the last visit they inspected their farm. The questionnaire treats fractions of a day as a full day.

comprehensive one-week recall were conducted in years two and three. Questions about female time allocation to household chores were asked in the three survey years but questions about male participation in these chores were asked only in year three. Also, not to antagonize male respondents, questions about domestic chores that are locally regarded as exclusively female were asked only to women. This must be kept in mind when interpreting the results. No questions were asked on children aged 6 or less.

Efforts were made by the survey team to minimize reporting bias. All four labor questionnaires were divided into a male and female questionnaire, which were then asked separately to men and women. Enumerators were also instructed to ask labor questions for each individual on the household roster. These precautions do not constitute an absolute guarantee that reporting bias is absent from the data, but they provide some reassurance. Apart from these limitations, information is available for each household member, together with data on gender, age, schooling, height, and relation to the household head.

The data were used to construct three groups of variables: (1) market activities, that is, farm work from (A) (three years) and non-farm work from (B) (two years); (2) household chores from (C) (3 years for women, one year for men); and (3) general time allocation in January and September from (D) (two years). These variables form the basis of our analysis.

The basic characteristics of the surveyed households are presented in Table 1. The median household size is 8 people, half of which are adults. Each year is divided into two distinct cropping seasons, kharif and rabi, which differ in terms of rainfall and cropping patterns. The main crop during the drier rabi season, from mid-October to mid-April, is wheat, whereas the main crop during kharif, from mid-April to mid-October, is rice. Sources of income are quite varied. Crops account for about one fourth of average income; livestock accounts for another 15%. Non-farm earned income -- a mix of wages and self-employment income from crafts, trade, and services -- represents 30% of average income; rental income and remittances amount to another

30%. Agricultural wage income is negligible among sample households. As already noted by Alderman and Garcia (1993) and by Adams and He (1995), livestock and non-farm income are more equally distributed than crop income, rental income, or remittances. On average, households own 8 acres of land, half of which is either canal- or well-irrigated. The median is much smaller, however, indicating that land is unequally distributed. The data also shows large differences among households in inherited land and in the amount of land owned by the father of the head. These two variables, in addition to the education of the father and mother of the household head, are used throughout as proxies for family background -- upbringing and parental attributes.

Human capital variables are summarized in Table 2. They include: age; education measured in years of schooling, and childhood nutrition measured by height.[17] As measure of experience we use age and age squared rather than years of post-schooling wage work because, unlike in Alderman (1996), rates of school attendance are extremely low among older adult males and among adult females. Age and age squared are also more appropriate to capture life-cycle effects. Years of schooling is a measure of formal investment in human capital.[18] Height proxies for health and nutrition aspects of human capital.[19] Height, when evaluated for adults, captures the cumulative effects of childhood and adolescent nutrition as well as genetic endowment. Unlike BMI, it is not subject to short-term fluctuations. While we use height of non-adults, we also include age as a regressor to control for the upward trend in height due to growth. Table 2 shows that the average household head has spent 2.8 years in school; the median is zero. Female

[17] See Strauss and Thomas (1995) for a comprehensive review of attempts to account for various dimensions of human capital in measuring labor markets, health, and nutrition outcomes.

[18] Years of schooling also influence achievement as measured in test scores, e.g., Glewwe and Jacoby (1994). The impact of test scores on rural labor market outcomes in Pakistan has been investigated by Alderman (1996). Fafchamps and Quisumbing (1998) use Raven's test scores in addition to schooling to control for innate ability. They show that Raven's test scores have little influence on labor allocation. Since Raven's test scores are missing for many individuals, we do not use them here. We also do not use the math and reading scores collected in the survey because of the very small number of valid observations.

[19] Fafchamps and Quisumbing (1998), also used body mass index (BMI) as a measure of human capital. Because BMI is sensitive to work effort, it is likely to be correlated with time allocation, especially with the choice between more or less strenuous activities. To avoid potential endogeneity bias, we refrain from using BMI as a regressor.

members of the household have a much lower level of education than males. 40% of males have no education, vs. 86% for females. The average height for husbands and wives is 1.67 and 1.52 meters, respectively.

We use two variables to capture family status: (1) gender (male or female) and (2) relationship to the household head. Among males, we distinguish between the household head, sons, and other males; among females, we identify the wife, daughters, daughters-in-law, and other females. Children less than 7 are not distinguished by gender. It is likely that seniority is also associated with a greater importance within the household, but given our data, the effect of age on social status cannot be distinguished from that of experience.

Table 3 presents summary statistics on the average time spent by households in various activities, and the share contributed by males and females, respectively. Household tasks, leisure, and "market" work[20] (an aggregate of work on own farm, work on others' farms, and non-farm work) are the three main activities which occupy households' time. Males account for the dominant share of time spent in market work and leisure, while women have the major share of household tasks. These features are similar to those observed in developed economies, though they are more pronounced. Within each gender grouping, there appear to be strong differences across categories (Table 4a). Husbands account for the largest share of all market activity (around 55% of total male time), but they tend to devote more time to work on their own farm. Husbands and sons devote around the same proportion of their time to non-farm work and to household tasks (47% for husbands, 40% for sons). Wives also account for the bulk of female time in market activity (50%) and perform 40% of household tasks and marketing. Daughters account for a larger share of market activity (around 25%) than daughters-in-law (10 to 13%). These figures, however, do not control for household composition and differences in human capital.

[20] We borrow the expression from Brown and Haddad (1995).

The data on household chores show even sharper differences across gender and categories. Females are almost completely responsible for fetching water; males do most of the firewood collection, marketing, herding, fodder collection, and hunting (Table 3). Females account for almost 60% of time spent milking, the task which is least segregated by gender. As mentioned above, males were not asked about a whole set of activities which were asked only of females, so the female share is, by default, 100%. Among males, husbands spend the most time fetching wood and water, milking, hunting, and collecting fodder; sons spend a larger of time herding and making dung cakes (Table 4b). Among females, wives do most of the chores, and account for more than half the female share of marketing, milking, collecting fodder, and meal preparation. In the first two activities -- marketing and milking -- they may be residual claimants of the proceeds. While there is evidence of very strong differences across categories, it is unclear whether these differences result from differences in human capital (comparative advantage), social roles (arbitrary specialization), preferences (non-arbitrary specialization) or hierarchies (information and enforcement considerations in the household firm). Tables 3 and 4 also do not control for differences in household composition; as discussed in Section 1, they may be misleading indicators of relative labor shares. To sort out these various factors, a multivariate approach is required, to which we now turn.

Section 3. Total Time Use

We begin by examining the total time allocation of surveyed households. Table 5 presents tobit regressions of time allocated by households to farm work, non-farm work, household tasks, leisure, and two aggregates, farm work, and market work. Results are given for January (rabi season) and September (kharif season). September data are incomplete for year 2, which explains why only year 3 is used for certain regressions. Fewer surveyed households report working on their farm in the September interview than in the January interview, reflecting differences in crop calendar.

The regressors include the number of people in various age-sex categories (wife is the omitted category), their average human capital, stocks of land and livestock, unearned income, and family background variables potentially affecting welfare weights. Following the discussion above, we test whether household members are equivalent in terms of labor supply and consumption demand, or all α_j's are 0. In the rabi season (January), this is decisively rejected for non-farm work, household tasks and marketing, leisure, and market work as a whole; in the kharif season (September), this is rejected only for household tasks. The husband and other males contribute more than wives to non-farm work, market work, and leisure in the rabi season; sons and other males contribute significantly less to household tasks in both seasons. Households with fewer educated adult males spend more time in farm work, whether on the household farm or others'; households with higher average male education spend more time in non-farm work (e.g., Fafchamps and Quisumbing (1998)). Households with taller males are associated with more time in household activities, but less time in leisure. The reverse is true for females: households with taller females appear to spend more time in leisure, but leisure consumption is higher in households with younger females.

Even after controlling for human capital, gender and family status affect the total amount of time spent in non-farm work, market work, and leisure. We reject the hypothesis that all females are the same in non-farm work, leisure (in rabi), and market work, but, contrary to expectations, we cannot reject the null hypothesis that the presence of daughters or daughters-in-law has the same effect on total labor allocation, except in non-farm work. The coefficient on husbands, sons, and other males α_j is also significantly different from -1 in all categories except household tasks in the rabi season; these differences are significant only for leisure, farm work, and market work for sons and other males during kharif. This indicates that adding more adult males and sons does increase the household total in these categories. Gender differences are important in all broadly-defined categories (except farm work) in the rabi season; these differences are less important in

the kharif season, probably because it is the main cropping season and segregation by gender is more costly.[21]

Table 6 presents tobit regressions of the total time household members spend on household chores. For activities where both males and females participate, we restrict the analysis to year 3 since data on male time spent on chores was collected only in that year. For exclusively female tasks, we pool the three years of data. Regressors are unchanged. The coefficient on household size is an estimate of returns to scale in household chores: if it is larger than one, households must increase their labor more than proportionally with more members; if it is smaller than one, households benefit from increasing returns to scale; if the coefficient is zero, the labor required to perform a certain chore is a fixed cost independent on household size. Results show that household chores as a whole benefit from increasing returns: the coefficient of household size is 0.21 and significantly different from 0. For many chores, the estimated coefficient is small and non significant. This is particularly true for fetching water, collecting firewood, and visiting the market; these activities appear to represent fixed household costs. Cooking, washing clothes, and cleaning the house increase with household size, but at a less than proportional rate. Only herding time appears to increase faster than household size, but the standard error on the coefficient is sufficiently large that we cannot rule out constant or decreasing returns.

Next, we test whether household members are equivalent in terms of contribution to household chores, i.e., we jointly test whether all α_j's are 0. This is clearly rejected for most activities except herding, milking, and preparing ghee. For total household chores, cooking, and cleaning, the test is nearly significant (*p*-values around 0.12-0.14). Controlling for human capital, gender and family status thus appear to be important determinants of the total time households spend on various chores. Coefficients for all females are not significantly different from each other except

[21] This feature is somewhat reminiscent of the second world war in the U.S. during which time women joined the labor market, only to withdraw once the war was over.

in visiting the market and collecting fodder.

Finally, we conduct a similar analysis on time spent on market oriented activities such as crops, livestock, and various categories of non-farm work. Results are presented in Table 7.[22] The hypothesis that gender and family status do not matter is rejected for work on one's farm and that of others, and for non-farm work, especially government employment. In the latter case, the presence of other adult males and daughters-in-law in the household dramatically raises time allocated to government work, suggesting that the government employees captured in the surveys tend to be adult dependents, male or female.[23] As discussed in Fafchamps and Quisumbing (1998), households with better educated males spend less time in farming and livestock activities and more time in non-farm work -- particularly government employment and self-employment. They are also less likely to work as farm or non-farm casual workers. The education of the father of the head has an identical effect, suggesting that the effect of schooling on the propensity to engage in certain activities carries over across generations. Other regressors in general have the expected sign and often are significant: households with more livestock farm more and work less in non-farm activities; households with more unearned income work less in everything; etc.

Taken together, the results indicates that household composition in terms of gender and family status has a pervasive influence on the total time the household devotes to various activities, even after controlling for differences in human capital, assets, unearned income, and family background.

Section 4. Intrahousehold Allocation of Tasks

To further investigate these issues, we now examine the forces that shape who does what within the household. The extent to which gains from specialization are present in a particular

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[22] Detailed regressions on particular agricultural tasks were also estimated but are omitted for the sake of brevity.

[23] Since daughters-in-law, as a rule, stay around the home (see infra), it must be that their presence enables other females to work off farm; see Katz (1995) for a similar argument in Guatemala.

activity can be gauged by examining the distribution of labor shares. Figure 1 shows a frequency distribution of the share of total work performed by individual household members.[24] In terms of total work, the extent of complete specialization is low: less than 2 percent of the surveyed individuals perform all the work in their household; less than 8 percent of individuals aged 7 and above do no work at all. Conditional on incomplete specialization, shares follow a skewed, single-peaked distribution, suggesting quite a bit of variation in relative workload across individuals. As could be expected, average work shares decrease with household size: individuals in larger households perform a smaller share of total work.

While it is true that most household members participate in the total workload of the household, they do not necessarily participate in all the activities undertaken by the household. Figure 2, for instance, shows the distribution of individual shares of time spent fetching water. The Figure indicates that close to two thirds of individuals do not fetch water, while a large proportion fetch all the water for their household. Only a small proportion of all labor shares fall somewhere in between. A similar pattern can be observed for most activities, including aggregate categories such as total non-farm work or household chores.

To summarize the extent of specialization in all tasks, we construct two indices. The first one, which we call the index of complete specialization, is defined as the proportion of all households in which an activity is undertaken by a single individual We also compute a second, more general, measure which incorporates unequal distribution of workload in the case of incomplete specialization. It is constructed using the variance of labor shares. If every household member participated equally in a particular task, the variance of labor shares would be 0. On the other hand, if full specialization were universal, the variance of labor shares would be $(N^r-1)/(N^r)^2$. An index of specialization that is invariant to household size can thus be constructed by multi-

[24] Total work is computed as the sum of work on farm, livestock, non-farm, and household chores. Time spent on household chores is converted into man-days per year by assuming a 6 hour day and 52 weeks per year.

plying the sample variance by $(N^r)^2/(N^r-1)$: a value of 1 means complete specialization for all households; a value of 0 means equal sharing in all households.[25] Table 8 summarizes the extent of task specialization using these two indices. Results are dramatic: except for aggregate categories such as total household chores and leisure, most activities are undertaken by a single household member in most households. Incomplete specialization indices further confirm that task specialization is the rule.

From Tables 3 and 4, we suspect that gender and social roles affect who does what in the household, but we do not know whether observed differences in average workload are due to human capital, household composition by gender and family status, or a combination thereof. To disentangle these effects, we now conduct a multivariate analysis that controls for both household composition and human capital. Simply regressing S_a^i on human capital and household composition would fail to yield meaningful results when household structure is extremely varied and complex, as is the case in the data we analyze.[26] To get out of this quandary, we develop a representation for labor shares that controls for household composition but is parsimonious in parameters. We write the expected labor share of individual i in activity a, denoted $\overline{S}_a^i$, as:[27]

$$\overline{S}_a^i = \frac{1+\sum_h \beta_{ah}\,\Delta H_h^i}{N_r}\,\frac{n_r^{\gamma_a}}{\sum_{s\in R} n_s^{\gamma_a}} \tag{8}$$

The two parts of equation (8) correspond to human capital and household composition effects, respectively. The human capital term is $\frac{1+\sum_h \beta_{ah}\,\Delta H_h^i}{N}$ where β_{ah} is a parameter and ΔH_h^i denotes the difference between the human capital h of member i and that of other household

[25] For this statement to be exact, the maximum likelihood estimator of the variance must be used, i.e., the sample variance should be multiplied by $(T-1)/T$ where T is the number of observations.

[26] To make this clear, suppose that half the households have a wife; in these households the wife's share of food preparation is 1. The other half of the households have a wife and a daughter-in-law. Wives' share is then 1/3 while that of daughters-in-law is 2/3: daughters-in-law thus work harder than wives. Yet, over the entire sample, wives' average share is 4/6 while that of daughters-in-law is 2/6: regressing shares on dummies does not correct for household composition and leads to incorrect inference as to whether daughters-in-law work harder than wives.

[27] In case equation (8) yields a negative number (number greater than 1), $\overline{S}_a^i$ takes the value 0 (1).

members.[28] If a human capital characteristic h does not affect the allocation of tasks across household members, then β_{ah} is zero. Note that the correct regressor is the *difference* between individual i's human capital and that of other household members: if all members have the same human capital, it should not influence the allocation of tasks across members.

The household composition term is

$$\frac{1}{N_r}\frac{n_r^{\gamma_a^r}}{\sum_{s \in R} n_s^{\gamma_a^s}} \tag{9}$$

where N_r is the number of household members in the r category, $n_r \equiv N_r/N$ is the share of category r in household labor force, R is the number of categories, and $\gamma_a^r > 0$ is a parameter that represents category r's involvement in activity a. Functional form (9) has the following properties. First, if all household members belong to the same group, household composition has no effect on the allocation of tasks: work is shared equally and expected shares are equal to 1/N. This is true irrespective of the values of the γ parameters. Second, expression (9) is decreasing in household size: other things being equal, individuals in larger households undertake on average a smaller share of the total household labor allocated to any task. These two properties are highly desirable since, by construction, they are *always* exactly satisfied for average shares within each household.

Expression (9) is also easy to interpret. As illustrated in Figure 3, when the γ's are equal to 1, the second term in expression (9) boils down to N_r/N: the expected share of household work falling upon the shoulders of a particular group r is equal to the share of the household workforce that this group represents. Thus, for instance, if males and females have a γ of one in food preparation, then the average share of cooking time performed by all males together will be equal to the share of males in the household labor force. Next, if we normalize the γ's to sum to S, a

[28] This term can be seen as an approximation to a exponential formulation in which the expected labor share is equal to $exp\,(\sum_h \beta_{ah}\,\Delta\,H_h^i)/\sum_i exp\,(\sum_h \beta_{ah}\,\Delta\,H_h^i)$, using the fact that $exp\,(x) \simeq 1+x$ for x small.

value of γ greater than 1 for category r implies that members of that category perform less work than members of other groups (Figure 3). By the same token, a low value of γ_r^a implies that group r provides more than its share of household workforce to the labor required for activity a (Figure 3). Finally, the γ's indicate the order in which tasks are assigned to roles: those with the smallest γ_a^r are the most likely to undertake activity a; if they are absent from the household, those with the next smallest γ_a^r undertake it, etc.

Expression (9) yields easy tests of household composition effects. Since equal sharing requires that all γ's equal 1, household composition effects can be tested by examining whether all γ's are jointly equal to 1. By extension, if $\gamma_a^r = \gamma_a^s$ for $r \neq s$, this implies that, when present, the two groups r and s contribute equally to task a. One can thus examine whether family status influences labor allocation by testing whether different status categories have different γ parameters.

Having identified a suitable functional form for $\overline{S}_a^i$, we now turn to the distribution of actual shares S_a^i around their expected value. One possibility would be to assume that:

$$S_a^i = \overline{S}_a^i + \varepsilon_a^i \tag{10}$$

and to estimate equation (10) via non-linear least squares (NLS).[29] Actual shares, however, are bound to remain between 0 and 1. Thus, although NLS estimates might be consistent,[30] reported standard errors would be biased given that normality assumptions are violated. A tempting alternative would be to postulate the existence of a latent share and to estimate equation (10) using a (non-linear) two-limit tobit estimator. Tobit, however, is known to be sensitive to the normality assumption (e.g., Greene (1997), Powell (1984), Honore and Powell (1994)), which is likely to be violated for ε_a^i.[31]

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[29] We actually did estimate equation (10) by non-linear least squares. The results we obtained are qualitatively very similar to those reported below.

[30] By analogy with the linear probability model.

[31] Experimentation with tobit formulations confirmed these fears. For instance, regressing shares on 1/N using a two-limit tobit customarily yields coefficients superior to unity -- e.g., 3 or 4 -- even though, by construction, the average share is *exactly* one for each household. In contrast, OLS regression always yields a coefficient of one with infinite precision.

We therefore adopt an alternative approach and postulate a distribution for S_a^i as follows. We begin by assuming that, with some probability p_a, complete specialization arises for task a in the sense that a single household member provides all the labor required for that task. In this case, S_a^i follows a binomial 0-1 distribution with mean $\bar{S}_a^i$. Incomplete specialization obtains with probability $1-p_a$, in which case S_a^i takes a value strictly between 0 and 1. We assume that S_a^i then follows a Beta distribution with mean $\bar{S}_a^i$, i.e. that (dropping subscripts and superscripts for improved readability):

$$f(S \mid 0<S<1) = \frac{\Gamma(a+b)}{\Gamma(a)\,\Gamma(b)}\, S^{a-1}\,(1-S)^{b-1} \qquad (11)$$

where $\Gamma(.)$ is the usual Gamma function, parameter $a = \frac{\bar{S}\,b}{1-\bar{S}}$, and b is a variance-like parameter. The likelihood function for parameters p, b, γ, and β immediately follows from the above assumptions regarding the shape of $\bar{S}_a^i$ and the distribution of S_a^i around its conditional mean. Maximum likelihood estimates are computed by maximizing this function with respect to the parameters to be estimated.

This unusual formulation offers several advantages. First, unlike a two-limit tobit model, it does not require normality of a latent share variable.[32] Secondly, the Beta distribution is sufficiently flexible to accommodate skewed distributions such as the ones displayed in Figures 1 and 2. Finally, and most importantly, our formulation yields a parameter of interest, p_a, that measures the extent of complete specialization. This parameter can be interpreted as an indication of the relative strength of returns to specialization and returns to team work *irrespective* of human capital or social role effects since these effects are already controlled for via $\bar{S}_a^i$. In the estimation, we let p_a vary with household size to allow for systematic differences in specialization. We expect that larger households find it easier to let their members specialize in a few tasks for which they become fully responsible.

[32] Experimentation with a non-linear two-limit tobit estimator revealed that the normality assumption is highly problematic, especially in tasks for which complete specialization is frequent.

Results for market work are presented in Tables 9 and 10: Table 9 reports results for activities undertaken by both men and women; Table 10 reports for activities undertaken predominantly by men -- and for which female coefficients are therefore not identified. Results for household chores are presented in Table 11 for chores undertaken by both men and women, and in Table 12 for chores asked only to women. Table 13 contains results on general time allocation from the one week total recall interviews. To facilitate interpretation, the γ_a^r parameters are normalized to sum to the number of categories r participating in task a.[33] One observation per household is omitted to avoid correlation in the S_a^i's across observations.[34] To minimize numerical difficulties, estimation is organized so that it yields the β parameters in levels, and b and the γ's in logs. The corresponding γ's in level are reported at the bottom of the Tables. The dependence of p on household size is given the form:

$$p = \frac{1}{1 + e^{\alpha + \beta N}} \tag{12}$$

where N is the number of potential household participants the task being studied.[35] We also report the value of p at the sample median of eight participating household members and at half the median. A series of tests of gender and social role effects are included in the Tables. Parameter estimates and test results are, in general, highly significant.

As is clear from Tables 9 to 13, results confirm the extent of full specialization: the estimated probability of complete specialization p in general oscillates between 50 and 90%. Results also indicate that, except in a few cases, the extent of specialization increases with household size: the larger the household, the more likely it is to delegate the entire responsibility for a particular task to a single household member. This is consistent with the division of labor increasing with "firm", i.e., household size. Participation in household chores as a whole is the

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[33] Without this normalization, γ parameters are only identified by the curvature of the relationship between household composition and specialization. This complication is unnecessary and adds nothing to interpretation.

[34] Since, by construction, shares sum to one within each household.

[35] For most tasks, potential participants include all male and female members aged 7 and above. For exclusively female tasks, N is restricted to females aged 7 and above only. Similarly for exclusively male tasks.

only noticeable exception, with a probability of complete specialization of only 13%, decreasing with household size.

Results indicate that, as predicted by Becker (1981), human capital plays a significant role in determining who does what, as demonstrated by the high joint significance of the human capital variables in *all* regressions. In agreement with evidence presented in Fafchamps and Quisumbing (1998) and with the tobit regressions reported in Section 3, we find that individuals who are better educated are more likely to work off farm, particularly as self-employed workers, and are less likely to tend the livestock, to work as casual workers, and to perform household chores -- except visit the market. This is true also for activities that are exclusively male or female. Females members who have more schooling thus have a strong tendency to perform fewer household chores even though their participation in non-farm work remains minimal in rural Pakistan.

Schooling also raises leisure time, an outcome that is incompatible with equal welfare weights for all. Indeed, if all household members were weighted equally in the household's welfare function, members with a higher productivity should work harder and be compensated with more consumption.[36] The fact that this is not the case suggests that education is correlated with higher welfare weights.

That age and height influence participation in most activities is hardly a surprise given that individuals from age 7 and above are included in the regression.[37] We find that taller and older individuals are more likely to work on market related activities such as farm and non-farm activities. Age is significant in most other regressions as well. Older household members focus on activities that require travel outside the household, such as collecting fodder and firewood or

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[36] Joint utility maximization equates the marginal utility of leisure of each individual with their marginal return to labor. If the latter rises with education, leisure consumption must go down as long as welfare weights are equal and utility is not a function of education directly.

[37] Their inclusion is justified by the fact that their participation in total work is non-negligible.

visiting the market. Activities reserved for younger household members are essentially home-based chores such as cooking and washing dishes, washing and ironing clothes, cleaning the house, and knitting and stitching. This is consistent with the idea that households seek to protect children, who are difficult to leave unsupervised outside the home. Older household members also consume more leisure. Graphical analysis (not shown) further indicates that the reduction in work effort with age is gradual and steady; we find no evidence of a set "retirement age" threshold beyond which participation drops rapidly. Height also affects the chores in which household members specialize, but it has either no effect (Table 9) or a negative effect (Table 13) on participation in chores in general. Shorter household members focus on fetching water and cleaning the house while taller members focus on milking animals, gathering fodder and firewood, and preparing ghee. Shorter members -- mostly children -- also enjoy more leisure, a result consistent with the fact that they are probably less productive.

Our measures of human capital cannot, however, fully account for differences in work shares. There exist systematic differences that can be explained by differences in gender or family status. Pairwise comparisons of individual coefficients for husband and wife, sons and daughters, and other males and females are highly significant in most regressions, suggesting that gender is a major determinant of work allocation. In fact, for several of the activities for which we have data, gender differences are so strong that we observe no or virtually no involvement by the other sex, irrespective of household composition. Results are consistent with widely publicized and fairly common patterns: males focus on market oriented work (see Tables 3 and 4b). The only activities for which gender specialization is less significant (though still significant for some categories) are farm casual work, milking animals, gathering fodder, and, for the "other" males and females category only, non-farm self-employment. We also observe large gender differences in leisure consumption, with all male categories consuming more leisure than females.

Gender is not the only determinant of task allocation, however. Family status also matters. Several strong regularities emerge from the analysis. They are most easily seen by observing the parameter estimates themselves, and are confirmed by formal tests (Tables 9 to 13). First, husband and wife assume a major responsibility in most activities even after controlling for household composition. Second, household members who are not the head or his wife, their sons and daughters, or their daughters-in-law, participate less in all household activities. Third, daughters work less hard than daughters-in-law. In fact, daughters-in-law work harder on domestic chores and enjoy less leisure than the wife of the head herself. It is only in crop work, non-farm work, and certain specific chores that wives work harder than daughters-in-law. Results further suggest that daughters-in-law are discouraged from participating in activities that involve either travelling outside the household (e.g., crop work, herding, collecting firewood, carrying meals to workers in the field), earning an independent income (e.g., ghee preparation), or both (e.g., non-farm work, visiting the market).

Taken together, these results suggest that rural Pakistani households operate like firms. They have a hierarchical structure with a husband and wife couple at the top.[38] Since the husband is more involved in market oriented activities and therefore has better control over household finances, we speculate that he is the head of the household enterprise, a conclusion that is reinforced by the identification of the husband as head of the household whenever a husband and a wife are present.[39] Husband and wife each have a separate sphere of authority and influence, however. Husbands look after "market" oriented work. They occasionally enlist the help of female household members but, whenever male members are present, these take on the bulk of market work. Wives are responsible for most household chores, with the exception of collecting firewood and visiting the market. Within each sphere of influence exists a hierarchical structure

[38] There were only a handful of polygamous households in the sample so that the effect of a polygamous structure on labor allocation could not be studied.

[39] This is not automatic: in three of the surveyed households, the head is female although a husband or other adult male is present.

whereby subordinate household members fall under the supervision and management of the husband and wife. This hierarchical arrangement suffers from the usual moral hazard problems. As a result, husbands and wives end up taking on more tasks and working harder than all other household members. This is made clear in Table 14 which shows total days worked and the number of activities in which various household members are involved, either as sole participant or in collaboration with others.

The degree of involvement in household activities appears to be related to the stake a particular household member has in the prosperity of the household and with the claim this member is likely to have on household consumption. Husband and wife, for instance, are typically residual claimants of the household income. The fact that they work harder than their children and other male and female dependents constitutes indirect evidence that they are unable to motivate these dependents to work as hard as they do. Drawing inspiration from Becker (1981), Jones (1983, 1986), and Udry (1996), Fafchamps (2002) suggests commitment failure as one possible explanation for such a state of affairs, i.e., that husband and wife are unable to credibly commit to reward their dependents (or each other) for the work they have done. If enforcement of intra-household contracts is imperfect, delegation of tasks is incomplete and works gets concentrated in the hands of residual claimants -- the head and wife.

Household members who are likely to exit the household, such as sons and daughters, participate less intensively, especially as they get older. Bargaining power does not explain why children work less, since they are likely to have less bargaining power than their parents. Parents may simply be altruistic towards them. Another possibility is that children's commitment to the household is weakest -- what, in developed economies, we would call the "teenager syndrome". In contrast, daughters-in-law work extremely hard, often at par if not harder than the wife herself -- and certainly harder than daughters of similar age, education, and build. One possible interpretation is that daughters-in-law are in the household for the long haul and have a stake in its long

term prosperity -- more stake, in fact, than mothers-in-laws who are older and, therefore, likely to "exit" earlier. An alternative and often advocated interpretation is that daughters-in-law have little bargaining power in their new household and are exploited by their mother-in-law. Circumstantial evidence supports the bargaining power hypothesis: daughters-in-law are less likely to undertake market activities and to work outside the home since their threat point is lower, which may explain why they work harder.[40]

Section 5. Specialization and Learning by Doing

So far we have shown that the allocation of work within rural Pakistani households is influenced both by human capital differences and by gender and family status. In this section we investigate whether this specialization results from learning by doing. Becker (1981) argues that intrahousehold specialization can be seen as an effort to capture returns to learning by doing. If learning by doing is the reason for intrahousehold specialization, individual household members should undertake the same activities repeatedly over time, i.e., they get locked into a particular role. To the extent that skills specific to certain tasks are acquired during childhood, people may even be "programmed" into particular tasks from a very young age. This process may help reproduce gender casting across generations.

Whether intrahousehold specialization results from learning by doing can be tested by verifying whether the allocation of tasks across household members changes over time or not. If specialization is driven by returns to learning by doing, people should do more or less the same thing each year. Table 15 shows the percentage of household members switching in and out of activities from one year to the next.[41] At first glance, individuals appear to perform the same tasks repeatedly over time, consistent with the learning by doing hypothesis. This is especially true for

[40] Since exit is not a viable option for any of the female members of the household, threat points must be interpreted in the sense of a dysfunctional household in which individuals spend the income they control (e.g., Lundberg and Pollack (1993)). In this context, responsibility for market oriented tasks is a determinant of bargaining power.

[41] Only those activities for which data were collected in two or more subsequent years are reported.

market-oriented (e.g., non-farm employment) and farm management activities (e.g., farm supervision and field repairs). Still, there is a substantial proportion of individuals who switch tasks from year to year, especially in household chores.

The raw frequencies reported in Table 15 must, however, be interpreted with caution because they do not correct for household composition effects. Clearly, if cooking is performed by women and a household has a single working age female, this woman will cook; there will be no switch. This hardly constitutes evidence of learning by doing. A more detailed analysis is thus called for. To do so, we expand the model presented in Section 4 to account for possible lagged effects of intrahousehold allocation. Dropping activity and individual-specific subscripts to improve readability, we posit that conditional expected labor shares at time t can be written:

$$E[S_t \mid S_{t-1}] = \rho\, S_{t-1} + (1-\rho)\, \bar{S} \qquad (13)$$

where $\bar{S}$ is, as before, given by equation (8) in Section 2. The distribution of S_t around its conditional expectation is as before. Estimation results for ρ are presented in the last column of Table 15.[42] They all test significantly different from both 0 and 1 with very high levels of confidence. Except for certain non-farm activities (government and private sector employment, plus self-employment), estimated values of ρ are all below one half. They are particularly small for household chores and for specific crop related tasks. Other qualitative results are essentially unchanged -- except that some precision is lost due to smaller sample size.

Taken together these results indicate that once we control for household composition and differences in human capital, having undertaken a particular task in the past has a significant but relatively minor effect on the probability of performing the same task again in the future. The ease with which individuals switch tasks constitutes evidence that returns to learning by doing are not large, especially in simple chores such as making dung cakes and cleaning the house.

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[42] Detailed results are available from the authors upon request. We also estimated an ordinary least squares version of equation (13). Results confirm that, once we control for human capital and gender/family status (in the OLS case, via dummy variables), the estimated ρ parameter drops dramatically.

If there are returns to learning by doing in the many different tasks performed by rural Pakistani households, they are acquired sufficiently rapidly not to have a lasting impact on the intrahousehold allocation of tasks. We can therefore rule out the idea that individuals get locked into narrowly defined patterns of activity as a result of their upbringing. The rationale for intrahousehold specialization must thus be sought elsewhere, either in returns to learning by doing that are very rapid to acquire, or in static returns to specialization having to do with the organization of tasks and the delegation of responsibility. The only exception is non-farm work, where returns to experience appear higher and where women are penalized by their low level of schooling (e.g., Sawada (1998)).

Conclusions

Using detailed data from rural Pakistan, this paper has investigated whether human capital, learning by doing, and gender and family status affect the division of labor within households. Results concerning human capital confirm that households with better educated members are more involved in non-farm work (e.g., Fafchamps and Quisumbing (1998)). They also indicate that better educated household members work less on crops, livestock, and household chores and that they enjoy more leisure. This is true for both males and females, hence suggesting that schooling raises intrahousehold bargaining power and one's implicit welfare weight. Other dimensions of human capital such as age -- a proxy for experience -- and height -- a proxy for past nutritional status -- have the expected effect on intrahousehold allocation, with taller and older members taking on chores that are more physically demanding and require travelling outside the household.

After controlling for individual-specific human capital, we found overwhelming evidence of division of labor by gender and family status. Males are responsible for "market" work, females for home production activities. This pattern is not peculiar to rural Pakistan and has been observed in many other societies as well (e.g., Cleave (1974), Brown and Haddad (1995)) In

addition, the allocation of tasks within each gender group varies systematically with family status. The head of household and his or her spouse provide most of the labor to most activities; other adult members of the household work less. Similar results are reported by Fafchamps (1986). In agreement with popular perceptions in Pakistan, we also found that daughters-in-law work systematically harder than daughters of comparable age, build, and education.

Taken together, these results indicate that the allocation of tasks within households is not solely driven by comparative advantage considerations. Rather, households seem to operate as hierarchies with spheres of responsibility partially determined by gender and family status. The observed correlation between financial control and labor effort could be due to moral hazard considerations and long-term commitment to the household: individuals with more control over household finances and with a long-term stake in the household have an incentive to work harder. This issue deserves more research. Finally, we found some evidence of long-lasting returns to learning by doing in non-farm activities and farm management, but not in household chores. We can therefore rule out the idea that women get locked into these chores because they learned them as little girls. If lock-in is present, it is in non-farm activities where males dominate and returns to schooling are high.

Throughout our analysis we have regarded household composition as given and we have sought to understand the intrahousehold allocation of tasks conditional upon gender and family status. The evidence we collected suggests that household composition affects what individuals do and how hard they work. To the extent that households form to maximize the gains from being together, our findings suggest that two fundamental forces shape household formation: gains from specialization, which favor larger households, and incentive issues, which penalize them (Becker (1981)). If gains from specialization are large, households should, on average, be larger. This seems to be the case in our study area: the wide variety of tasks that Pakistani rural households undertake leaves much room for a precise division of labor, which also helps mitigating

monitoring and shirking problems. In addition, large households benefit from returns to scale in household chores, enabling some members to fully specialize in non-farm work. Problems of of shirking and monitoring appear to limit household size, with the household head and his wife working harder than other members except daughters-in-law. In this respect, one cannot but notice the formal similarity between rural Pakistani households and firms: both solve internal organization problems via a complex hierarchical structure.

What remains unclear from this work is how households are formed over time. For instance, do individuals with a non-farm occupation join already existing households? Or do larger households let some of their members specialize is less subsistence oriented activities such as non-farm work? These issues deserve more research.

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Table 1. Characteristics of Sample Households

(computed from household annual data) **Household composition:**	**Nber obs.**	**Sample mean**	**Median**	**Standard deviation**
Total household size	2509	8.7	8	4.3
Adult males (20-65)	2509	2.0	2	1.2
Adult females (20-65)	2509	1.8	1	1.1
Young (6-20)	2509	3.1	3	2.3
Children (0-5)	2509	1.6	1	1.6
Old (>65)	2509	0.3	0	0.6
Income (in 1986 Rupees)				
Total income (1)	2202	29457	20584	34635
Net crop income	2202	7355	2138	21420
Net livestock income	2202	4566	3643	6176
Wages from agricultural work	2202	287	0	1210
Non-farm earned income	2202	8823	6036	10067
Rental income	2202	3876	0	14879
Remittances and transfers (2)	2202	4573	0	17427
Assets:				
Total land owned in acres (3)	2526	8.4	2.0	18.4
Irrigated land owned in acres	2526	3.8	0.0	9.7
Rainfed land owned in acres	2526	2.9	0.0	10.2
Total land owned by father in acres	2299	11.7	0.5	29.8
Inherited land in acres	2299	5.1	0.0	15.5
Value of farm tools and equipment in rupees	2374	9054	1011	27359
Number of cattle	2526	2.0	1	2.7
Number of buffaloes	2526	1.8	0	2.6
Number of bullocks	2526	0.3	0	0.8
Number of donkeys	2526	0.2	0	0.7
Number of sheep and goats	2526	2.9	2	4.9
Labor in days:				
Kharif family labor	2526	70	27	106
Rabi family labor	2526	46	20	68
Kharif hired labor	2526	7	0	38
Rabi hired labor	2526	7	0	26
Herding labor	2526	135	36	250
Agricultural wage labor	2526	0	0	7
Non-farm labor	2526	214	141	265

(1) Water tax is deducted from total income. (2) 96% of received transfers are remittances
(3) Difference between total land and irrigated and rainfed land is non-cultivable land — mostly pastures.

Table 2. Human Capital Summary Statistics

Husband and wife	Nber obs.	Sample mean	Median	Standard deviation
Age of head	2436	48.2	47.0	13.7
Years of education of head	2436	2.8	0.0	4.1
Height of head (in cm)	2395	167.3	168.0	6.5
Age of wife (1)	2242	41.5	40.0	12.1
Years of education of wife (1)	2242	0.3	0.0	1.5
Height of wife (in cm) (1)	2014	152.4	152.0	6.5
Household averages				
Average age of adult males	2497	38.0	37.0	8.6
Average years of education of adult males	2497	3.7	2.5	3.9
Average height of adult males (in cm)	2426	167.4	167.5	6.1
Average age of adult females	2493	37.1	36.0	8.2
Average years of education of adult females	2493	0.6	0.0	1.6
Average height of adult females (in cm)	2322	152.4	152.0	6.2

(1) In polygamous households, average over all wives.

Table 3. Time Allocation by Gender

1. General Time Allocation *A. January interview:*	No. of households reporting activity	Average time spent per household (1)	Male share of total	Female share of total
Work on own farm	890	0.48	93%	7%
Work on others' farm	117	0.06	76%	24%
Work on own or others' farm	926	0.54	91%	9%
Non-farm work	1035	0.65	94%	6%
Farm and non-farm work	1434	1.19	93%	7%
Home tasks/marketing	1611	2.74	16%	84%
Leisure and rest	1548	1.71	81%	19%
B. September interview:				
Work on own farm	634	0.35	73%	27%
Work on others' farm	27	0.01	21%	79%
Work on own or others' farm	654	0.36	71%	29%
Non-farm work	645	0.42	91%	9%
Farm and non-farm work	1000	0.78	79%	21%
Household tasks & marketing	1556	2.38	10%	90%
Leisure and rest	1128	1.12	76%	24%
2. Household Chores:				
A. Chores asked to men and women				
Fetch water	438	5.0	7%	93%
Collect firewood	468	5.0	76%	24%
Visit the market	575	5.9	89%	11%
Herd livestock	246	11.0	88%	12%
Milk animals	513	3.3	43%	57%
Gather fodder	539	12.8	60%	40%
Hunt	12	0.2	92%	8%
B. Chores asked only to women				
Prepare dung cakes	387	1.5	0%	100%
Carry meals to workers	125	0.9	0%	100%
Husk grain	43	0.5	0%	100%
Cook and wash dishes	748	24.4	0%	100%
Knit and sew	303	2.6	0%	100%
Prepare ghee	320	1.7	0%	100%
Wash and iron clothes	741	6.1	0%	100%
Clean the house	726	6.3	0%	100%

The unit of observation is the household. Multiple years are combined if data is available for more than one year.
(1) For general data from the January and September interviews, average is expressed in days during the week preceding the interview. Two years of data are combined. For household chores, the average is the total hours per household during the week preceding the interview. For household chores, only year 3 is used because it is the only year with both male and female data. Some activities are not reported (e.g., school, ill). Missing data is treated as zero for the purpose of the calculation of household averages.

Table 4a. Family Status and General Time Allocation

Share of total time spent by various family status categories.

1. Males	**Work on own farm**	**Work on others' farm**	**Work on own and other's**	**Non-farm work**	**Farm & non-farm work**	**Household tasks and marketing**	**Leisure and rest**
A. January interview:							
Husband	59%	52%	58%	47%	54%	47%	34%
Son	29%	31%	30%	40%	35%	40%	49%
Other males	12%	17%	12%	13%	11%	13%	17%
# of households with men reporting this activity	871	93	903	1001	1422	1215	1508
B. September interview:							
Husband	63%	42%	63%	42%	53%	46%	36%
Son	26%	8%	26%	44%	35%	41%	49%
Other males	11%	50%	11%	13%	11%	13%	15%
# of households with men reporting this activity	521	6	524	614	867	766	960

2. Females	**Work on own farm**	**Work on others' farm**	**Work on own and other's**	**Non-farm work**	**Farm & non-farm work**	**Household tasks and marketing**	**Leisure and rest**
A. January interview:							
Wife	56%	45%	54%	45%	50%	41%	28%
Daughter	19%	38%	23%	31%	27%	27%	36%
Daughter-in-law	10%	6%	9%	12%	11%	17%	7%
Other females	14%	11%	14%	12%	13%	15%	30%
# of households with women reporting this activity	109	32	137	107	232	1599	721
B. September interview:							
Wife	49%	57%	49%	51%	50%	42%	30%
Daughter	23%	14%	22%	29%	24%	25%	29%
Daughter-in-law	14%	15%	14%	11%	13%	17%	10%
Other females	14%	15%	15%	9%	13%	15%	30%
# of households with women reporting this activity	224	22	245	97	324	1548	475

Table 4b. Family Status and Household Chores
Share of total time spent on household chores by various family categories.

1. Chores asked to men and women:

Divison among males	**Fetch water**	**Collect firewood**	**Visit the market**	**Herd livestock**	**Milk animals**	**Gather fodder**
Husband	55%	57%	72%	33%	67%	58%
Son	33%	32%	21%	45%	23%	30%
Other males	12%	11%	7%	22%	9%	12%
# of household with men reporting this activity	43	409	542	221	279	366
Division among females	**Fetch water**	**Collect firewood**	**Visit the market**	**Herd livestock**	**Milk animals**	**Gather fodder**
Wife	41%	42%	57%	41%	62%	51%
Daughter	30%	33%	15%	34%	12%	17%
Daughter-in-law	19%	11%	8%	10%	16%	18%
Other females	11%	14%	19%	14%	10%	14%
# of household with women reporting this activity	420	163	125	35	347	284

2. Chores asked only to women:

Division among females	**Prepare dung cakes**	**Carry meals to workers**	**Husk grain**	**Cook and wash dishes**	**Knit and sew**	**Prepare ghee**	**Wash and iron clothes**	**Clean the house**
Wife	49%	52%	48%	47%	39%	64%	45%	37%
Daughter	21%	20%	12%	20%	26%	10%	23%	31%
Daughter-in-law	20%	14%	31%	23%	23%	13%	23%	20%
Other females	10%	14%	8%	9%	12%	13%	10%	12%
# of household with women reporting this activity	385	125	43	746	302	319	739	724

Table 5. Tobit Regression on General Time Allocation

Dependent variable is the total time devoted to particular activities by all household members, based on a one-week recall interview. Measured in half-days per week.

	January interview:										**September interview:**									
	Work on own farm		**Non-farm work**		**Farm and non-farm work**		**Hh tasks and marketing**		**Leisure and rest**		**Work on own farm**		**Non-farm work**		**Farm and non-farm work**		**Hh tasks and marketing**		**Leisure and rest**	
Household composition:	Coef.	t	Coef.	t	Coef.	**t**	Coef.	t	Coef.	**t**	Coef.	**t**	Coef.	**t**	Coef.	**t**	Coef.	**t**	Coef.	**t**
ln(household size)(1)	0.20	**2.44**	0.59	**6.76**	0.47	**7.71**	0.69	**17.33**	0.77	**13.93**	0.52	**2.15**	0.38	**3.12**	0.36	**4.71**	0.57	**11.82**	0.47	**5.94**
share male head	-0.18	-0.25	2.29	**3.04**	1.46	**2.74**	-0.51	-1.47	1.35	**2.81**	-1.24	-0.55	-0.21	-0.18	0.04	0.07	-0.32	-0.76	-0.14	-0.20
share sons	0.19	0.51	0.57	1.44	0.71	**2.57**	-0.97	**-5.41**	0.51	**2.08**	0.60	0.58	-0.14	-0.22	0.24	0.69	-0.91	**-4.21**	0.32	0.89
share other males	-0.10	-0.28	1.00	**2.72**	0.79	**3.06**	-1.05	**-6.31**	0.28	1.23	0.56	0.57	0.15	0.26	0.37	1.12	-0.84	**-4.14**	0.23	0.68
share daughters	-0.28	-0.77	0.05	0.12	0.26	0.95	-0.02	-0.09	-0.16	-0.63	0.33	0.31	-0.58	-0.91	-0.35	-0.98	0.30	1.39	0.17	0.46
share daug-in-law	-0.23	-0.64	0.69	**1.81**	0.57	**2.11**	-0.20	-1.15	-0.45	**-1.86**	0.50	0.46	0.41	0.69	0.09	0.25	0.06	0.29	0.13	0.38
share other females	-0.30	-0.87	-0.12	-0.34	-0.00	-0.00	-0.20	-1.23	0.11	0.48	-0.54	-0.51	-0.87	-1.49	-0.56	**-1.72**	-0.02	-0.11	0.21	0.64
share children	-0.35	-1.01	-0.04	-0.10	0.04	0.16	-1.30	**-7.97**	-0.40	**-1.76**	-0.72	-0.73	-0.32	-0.56	-0.30	-0.94	-1.02	**-5.18**	-0.37	-1.13
share young males	0.02	0.06	0.40	1.11	0.39	1.56	-1.08	**-6.65**	0.90	**4.01**	0.10	0.11	-0.22	-0.38	0.00	0.01	-0.90	**-4.61**	0.83	**2.53**
share young females	-0.39	-1.14	-0.07	-0.18	-0.04	-0.17	-0.20	-1.21	-0.02	-0.07	0.20	0.20	-0.61	-1.08	-0.48	-1.49	0.27	1.36	0.33	1.00
Human capital:																				
Males:																				
average age	-0.00	-0.27	0.01	0.65	0.00	0.33	-0.01	**-1.67**	-0.00	-0.59	-0.03	-1.48	0.01	0.86	0.00	0.21	-0.01	**-1.86**	-0.01	**-1.68**
average squared age	0.00	0.18	-0.00	-0.78	-0.00	-0.56	0.00	**1.78**	0.00	1.19	0.00	0.84	-0.00	-0.81	-0.00	-0.52	0.00	**1.71**	0.00	1.54
average education	-0.01	**-2.02**	0.01	**1.80**	-0.00	-1.23	0.00	0.76	0.00	0.82	-0.05	**-3.22**	0.02	**2.13**	-0.01	-1.20	0.00	0.31	-0.00	-0.20
average height	0.00	0.27	-0.00	-0.20	0.00	0.95	0.00	**1.86**	-0.00	**-2.46**	0.01	1.14	-0.00	-0.20	-0.00	-0.82	0.00	1.22	-0.00	-0.23
Females:																				
average age	0.00	0.09	-0.01	-1.06	0.00	0.14	0.00	1.20	-0.02	**-2.99**	-0.01	-0.50	0.01	0.51	0.00	0.19	-0.00	-0.11	-0.02	**-2.20**
average squared age	-0.00	-0.33	0.00	1.14	-0.00	-0.25	-0.00	**-1.65**	0.00	**3.32**	0.00	0.67	-0.00	-0.30	0.00	0.03	-0.00	-0.16	0.00	**2.80**
average education	-0.02	-1.55	-0.01	-0.78	-0.02	**-2.13**	-0.00	-0.67	0.00	0.39	-0.00	-0.07	0.00	0.04	-0.01	-1.20	-0.01	-1.40	0.02	1.53
average height	-0.00	-0.35	-0.00	-0.18	-0.00	-0.81	-0.00	-1.20	0.01	**3.52**	0.01	1.24	-0.00	-0.56	0.01	**1.95**	-0.00	-0.08	0.00	0.51
Assets:																				
ln(owned land)	-0.03	-1.56	0.02	0.80	-0.01	-0.88	-0.01	-0.69	0.03	**2.05**	0.04	0.68	0.01	0.35	-0.01	-0.40	-0.01	-0.69	0.03	**1.75**
share irrigated	0.18	**3.88**	-0.15	**-2.98**	-0.05	-1.57	0.04	**1.96**	-0.04	-1.30	0.10	0.78	-0.14	**-1.92**	0.01	0.26	-0.02	-0.74	-0.05	-1.03
ln(value of farm tools)	0.05	**4.58**	0.01	0.66	0.02	**3.31**	-0.01	-1.38	-0.01	-1.15	0.01	0.35	-0.01	-0.74	0.01	0.95	0.00	0.13	0.01	0.65
ln(number livestock)	0.22	**9.51**	-0.14	**-5.69**	0.02	1.22	0.03	**2.59**	0.02	1.58	0.12	**1.79**	-0.03	-0.97	0.07	**3.32**	0.03	**2.39**	-0.03	-1.40
share buffalo	0.02	0.33	-0.02	-0.44	0.00	0.08	0.01	0.56	0.02	0.48	-0.06	-0.38	0.02	0.18	-0.01	-0.11	-0.01	-0.22	0.06	1.26
share bullocks	0.28	**2.37**	-0.28	**-2.08**	-0.07	-0.78	0.02	0.33	-0.05	-0.54	0.10	0.33	-0.29	-1.38	0.23	1.58	-0.04	-0.55	0.06	0.47
share donkeys	0.07	0.46	0.28	**1.73**	0.14	1.18	-0.03	-0.36	0.19	**1.89**	-0.35	-0.48	-0.21	-0.81	-0.28	**-1.72**	0.06	0.64	0.29	**2.04**
share sheep and goats	-0.20	**-3.44**	0.11	**1.87**	-0.05	-1.20	-0.02	-0.90	0.02	0.67	-0.24	-1.29	0.03	0.36	-0.11	**-2.12**	-0.05	-1.40	0.07	1.28
Unearned income:																				
ln(total unearned inc)	-0.01	**-1.74**	-0.03	**-6.03**	-0.03	**-8.25**	-0.00	-1.07	-0.00	**-1.73**	-0.04	**-2.93**	-0.04	**-6.13**	-0.03	**-5.75**	0.00	1.40	-0.01	-1.43
share rental income	-0.05	-1.05	0.13	**2.62**	0.10	**2.82**	0.06	**2.57**	0.08	**2.81**	0.21	1.53	0.15	**2.16**	0.09	**1.92**	0.02	0.85	0.10	**2.44**
share pension	0.17	1.44	0.16	1.43	0.22	**2.66**	0.11	**2.12**	0.05	0.67	-0.18	-0.38	0.00	0.01	0.06	0.54	0.12	**1.81**	-0.03	-0.26
Family background:																				
ln(father's land)	0.03	**1.96**	-0.03	-1.45	0.00	0.25	0.00	0.20	-0.01	-0.73	-0.00	-0.07	-0.02	-0.84	0.00	0.04	0.00	0.28	0.01	0.35
ln(inherited acres)	-0.00	-0.13	-0.03	-1.44	-0.02	-1.35	0.00	0.43	0.01	0.38	-0.03	-0.60	0.00	0.04	0.01	0.65	-0.00	-0.18	-0.04	**-1.73**
educ of head's father	-0.01	-0.71	0.03	1.58	0.00	0.18	0.00	0.61	0.00	0.14	-0.00	-0.04	-0.01	-0.37	-0.01	-0.57	-0.00	-0.41	-0.00	-0.06
educ of head's mother	0.03	0.31	-0.05	-0.61	0.02	0.29	-0.05	-1.36	0.01	0.21	0.07	0.32	0.01	0.06	0.04	0.60	-0.03	-0.74	0.12	**1.70**
Year dummies:																				
Year 3	0.12	**4.61**	-0.04	-1.44	0.03	**1.73**	0.04	**2.87**	-0.19	**-10.92**	0.34	**3.37**	0.57	**12.59**			0.01	0.38	0.64	**24.60**
Intercept	-0.73	-1.02	-0.96	-1.24	-0.89	**-1.66**	0.26	0.74	-0.91	**-1.89**	-3.25	-1.64	-0.77	-0.66	-0.60	-0.86	0.28	0.66	-0.82	-1.18
Selection-term	0.42		0.48		0.35		0.23		0.32		0.56		0.61		0.32		0.28		0.43	
Number of observations	1335		1335		1335		1335		1335		571		1335		665		1335		1335	
of which, censored at 0	564		469		128		3		51		416		785		56		12		374	
Chi-square of regression	773		408		707		1500		966		210		509		412		1041		1127	
p-value	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
Pseudo R-square	0.3404		0.1747		0.3738		1.0932		0.5438		0.2835		0.2225		0.4624		0.7213		0.4116	

Testing Household Composition:

	(4)	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value
daughter=d-in-law	1	0.03	0.852	**4.36**	0.037	2.06	0.152	1.82	0.178	2.37	0.124	0.06	0.801	**4.59**	0.032	2.52	0.113	2.12	0.145	0.01	0.904
(3) dgtr=inlaw=oth. fem.	2	0.06	0.971	**7.26**	0.027	**6.32**	0.042	2.55	0.279	**7.59**	0.022	1.79	0.409	**7.73**	0.021	**5.05**	0.080	4.32	0.115	0.08	0.962
all adult fem. same	3	0.27	0.849	**2.52**	0.056	**2.44**	0.063	1.28	0.278	**2.64**	0.048	0.60	0.618	**2.69**	0.045	2.02	0.110	1.47	0.221	0.14	0.937
all adult males same	3	0.81	0.487	**5.08**	0.002	**3.52**	0.015	**17.29**	0.000	**3.36**	0.018	0.43	0.733	0.29	0.831	0.67	0.570	**9.15**	0.000	0.61	0.606
all adults same	6	1.55	0.160	**4.83**	0.000	**4.77**	0.000	**17.62**	0.000	**4.81**	0.000	0.78	0.584	**1.91**	0.077	**3.39**	0.003	**14.62**	0.000	0.31	0.932

t-statistics significant at the 10% level or better appear in boldface.

(1) Omitted category is wife. Other categories are thus compared to wives.

(2) Complete data only available for year 3.

(3) Chi-square test statistic reported instead of F statistic.

(4) Number of tested parameter restrictions, i.e., degrees of freedom of the numerator.

Table 6. Tobit Regression on Household Chores

Dependent variable is the total time devoted to particular home activities by all household members. Measured in days per year.

	Total household chores		A. Chores asked to both men and women: *Fech water*		*Collect firewood*		*Visit the market*		*Herd livestock*		*Milk animals*		*Gather fodder*		B. Chores asked exclusively to women: *Prepare dung cakes*		*Carry meals to workers*		*Cook and wash dishes*		*Knit and sew*		*Prepare ghee*		*Wash and iron clothes*		*Clean the house*	
Household composition:	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t
ln(household size)(1)	0.21	**2.04**	-0.46	-1.55	-0.05	-0.16	-0.04	-0.14	1.65	**1.73**	0.17	0.73	0.26	0.80	-0.03	-0.17	-0.89	-1.60	0.37	**4.33**	0.09	0.29	0.22	1.08	0.69	**6.47**	0.42	**3.51**
share male head	-1.76	**-2.02**	-7.56	**-2.95**	-2.76	-1.06	-4.90	**-2.12**	6.34	0.74	3.17	1.56	7.12	**2.55**	-0.84	-0.51	-10.72	**-1.93**	-0.48	-0.66	-5.64	**-2.01**	-1.16	-0.62	-1.44	-1.56	-0.36	-0.35
share sons	-0.83	**-1.74**	-2.24	-1.62	0.21	0.15	-2.31	**-1.84**	5.70	1.32	0.61	0.56	2.78	**1.87**	-1.04	-1.20	-3.08	-1.09	-0.68	**-1.82**	-2.18	-1.52	-0.98	-1.01	-1.43	**-3.00**	-1.03	**-1.93**
share other males	-1.00	**-2.26**	-2.47	**-1.95**	-0.94	-0.72	-0.60	-0.52	4.85	1.23	0.62	0.62	1.67	1.21	-0.52	-0.65	-5.51	**-1.99**	-0.67	**-1.89**	-2.48	**-1.81**	-1.11	-1.18	-1.46	**-3.25**	-1.04	**-2.07**
share daughters	-0.29	-0.60	-2.08	-1.43	1.57	1.11	-1.88	-1.49	1.22	0.28	-0.17	-0.16	4.42	**2.98**	1.17	1.38	-2.04	-0.73	-0.19	-0.51	1.72	1.19	-0.79	-0.82	-0.47	-0.98	-0.14	-0.27
share daug-in-law	-0.04	-0.10	-1.02	-0.73	0.22	0.16	-2.41	**-1.98**	1.56	0.38	0.20	0.19	4.14	**2.88**	0.95	1.17	-1.51	-0.54	-0.26	-0.71	2.02	1.46	-0.33	-0.36	-0.89	**-1.94**	-0.38	-0.73
share other females	-0.35	-0.82	-2.18	**-1.68**	-0.02	-0.02	-2.99	**-2.62**	-1.09	-0.26	-0.13	-0.13	2.25	1.64	-0.10	-0.13	-3.04	-1.11	-0.03	-0.09	0.99	0.77	-0.89	-1.01	-0.38	-0.88	-0.47	-0.98
share children	-0.83	**-1.93**	-2.60	**-2.07**	-0.01	-0.01	-2.29	**-2.01**	2.01	0.51	0.36	0.37	1.97	1.47	-1.10	-1.40	-2.37	-0.89	-0.70	**-2.05**	-1.81	-1.38	-1.10	-1.23	-1.43	**-3.29**	-1.00	**-2.06**
share young males	-0.49	-1.13	-2.43	**-1.92**	0.11	0.09	-2.11	**-1.85**	4.19	1.05	0.55	0.56	3.29	**2.45**	-1.21	-1.55	-2.25	-0.85	-0.56	**-1.66**	-1.00	-0.78	-1.27	-1.44	-1.43	**-3.32**	-0.94	**-1.95**
share young females	0.11	0.25	-0.56	-0.44	1.20	0.95	-1.37	-1.20	1.87	0.47	1.41	1.43	3.66	**2.70**	0.10	0.12	-1.37	-0.52	-0.19	-0.55	1.53	1.18	-0.39	-0.45	-0.56	-1.30	-0.26	-0.54
Human capital:																												
Males:																												
average age	-0.00	-0.42	-0.04	-1.35	-0.06	**-2.06**	-0.04	-1.34	0.10	1.11	0.05	**2.12**	0.03	0.94	0.01	0.58	-0.06	-1.12	0.00	0.41	-0.01	-0.45	0.01	0.38	-0.00	-0.11	0.01	1.22
average squared age	0.00	0.37	0.00	0.94	0.00	1.59	0.00	1.15	-0.00	-1.07	-0.00	**-2.15**	-0.00	-1.13	-0.00	-0.52	0.00	0.68	-0.00	-0.11	0.00	0.51	0.00	0.22	0.00	0.25	-0.00	-1.30
average education	-0.02	**-3.46**	-0.09	**-4.22**	-0.05	**-2.21**	0.04	**2.19**	-0.27	**-4.09**	0.00	0.14	-0.04	-1.61	-0.00	-0.32	-0.13	**-3.46**	-0.01	-1.61	0.04	**2.00**	0.01	0.55	0.00	0.49	0.00	0.44
average height	0.00	0.57	0.01	1.20	-0.01	-1.30	-0.00	-0.21	0.01	0.23	-0.00	-0.41	0.02	**2.13**	-0.00	-0.39	-0.00	-0.05	-0.00	-0.56	0.01	1.29	0.01	0.84	0.00	0.60	0.00	0.65
Females:																												
average age	0.00	0.03	-0.00	-0.03	-0.01	-0.25	-0.01	-0.46	-0.10	-1.02	0.00	0.14	0.00	0.04	0.05	**2.81**	-0.06	-1.00	-0.00	-0.38	-0.08	**-2.43**	-0.01	-0.68	0.00	0.24	-0.01	-0.80
average squared age	-0.00	-0.53	-0.00	-0.01	0.00	0.31	0.00	0.48	0.00	1.02	-0.00	-0.39	-0.00	-0.21	-0.00	**-2.92**	0.00	0.98	-0.00	-0.28	0.00	**1.94**	-0.00	-0.01	-0.00	-0.90	0.00	0.46
average education	-0.04	**-2.64**	-0.06	-1.40	-0.05	-1.04	-0.00	-0.09	-0.16	-1.19	-0.00	-0.04	-0.20	**-4.27**	-0.00	-0.17	-0.11	-1.24	-0.00	-0.08	0.07	**1.82**	-0.02	-0.60	-0.02	-1.16	-0.02	-1.38
average height	-0.01	-1.62	0.01	1.14	-0.01	-0.52	-0.00	-0.32	-0.01	-0.19	0.01	0.95	0.01	0.59	0.00	0.50	-0.01	-0.52	-0.00	-1.42	0.00	0.44	0.00	0.36	-0.00	-1.31	-0.01	-1.35
Assets:																												
ln(owned land)	0.01	0.29	-0.19	**-2.39**	-0.12	-1.47	0.07	0.99	-0.52	**-2.21**	0.03	0.51	0.01	0.08	-0.12	**-2.49**	-0.29	**-2.12**	0.06	**2.96**	-0.08	-0.98	0.12	**2.32**	0.06	**2.18**	0.01	0.39
share irrigated	-0.12	**-1.98**	0.01	0.07	-0.32	**-1.72**	-0.07	-0.43	-0.41	-0.76	-0.01	-0.08	-0.06	-0.31	-0.16	-1.55	0.50	**1.73**	-0.15	**-3.24**	0.10	0.56	-0.16	-1.41	-0.10	**-1.69**	-0.05	-0.75
ln(value of farm tools)	0.01	0.52	-0.02	-0.59	-0.02	-0.43	0.00	0.09	-0.21	**-1.69**	-0.03	-0.93	0.02	0.44	-0.00	-0.13	0.15	**2.04**	-0.00	-0.28	0.06	1.62	-0.00	-0.07	-0.01	-0.76	-0.01	-0.43
ln(number livestock)	0.24	**7.94**	0.22	**2.55**	0.26	**2.84**	0.09	1.17	1.66	**6.04**	0.98	**13.43**	1.11	**11.30**	0.76	**13.66**	0.66	**4.16**	0.01	0.26	-0.09	-1.03	0.83	**12.47**	0.04	1.31	-0.00	-0.01
share buffalo	0.13	**1.84**	0.16	0.76	0.38	**1.80**	0.14	0.74	0.35	0.53	0.38	**2.31**	0.95	**4.22**	0.39	**3.26**	-0.22	-0.64	-0.07	-1.28	0.03	0.16	0.94	**7.02**	0.06	0.94	-0.00	-0.05
share bullocks	0.24	1.24	-0.46	-0.85	0.51	0.91	0.01	0.03	0.42	0.25	-0.71	-1.61	0.20	0.33	-0.16	-0.50	1.25	1.51	0.14	0.97	0.28	0.55	0.26	0.77	0.69	**3.79**	0.53	**2.60**
share donkeys	0.07	0.32	0.45	0.71	0.62	0.94	-0.55	-0.95	0.68	0.33	-0.58	-1.08	-0.40	-0.56	-1.19	**-3.32**	-0.66	-0.65	0.10	0.61	-0.43	-0.68	-0.25	-0.57	0.08	0.37	-0.02	-0.09
share sheep and goats	-0.07	-1.06	0.01	0.04	-0.25	-1.12	0.12	0.63	-0.51	-0.77	-0.66	**-4.04**	-0.89	**-3.99**	-0.89	**-6.88**	-0.83	**-2.14**	0.04	0.67	0.23	1.15	-1.15	**-7.15**	0.18	**2.57**	0.16	**2.03**
Unearned income:																												
ln(total unearned inc)	-0.00	-0.14	-0.01	-0.59	-0.04	**-2.23**	0.01	0.39	-0.05	-0.87	-0.01	-0.50	0.02	1.10	-0.02	**-1.79**	-0.02	-0.88	-0.00	-0.97	-0.01	-0.33	-0.01	-0.74	-0.01	-0.98	0.00	0.81
share rental income	0.05	0.80	0.38	**2.04**	0.13	0.68	0.09	0.58	0.20	0.34	0.10	0.72	-0.12	-0.64	0.03	0.35	-0.67	**-2.16**	0.09	**2.07**	0.13	0.82	0.10	0.90	0.10	**1.74**	0.01	0.15
share pension	0.27	**1.77**	0.61	1.40	-0.21	-0.42	0.55	1.38	0.65	0.46	0.09	0.23	0.22	0.45	-0.41	**-1.81**	0.55	0.77	0.21	**2.11**	0.16	0.45	0.19	0.74	0.27	**2.20**	0.18	1.26
Family background:																												
ln(father's land)	0.01	0.36	0.01	0.12	0.08	1.16	-0.12	**-1.97**	0.57	**2.97**	0.03	0.53	0.01	0.12	-0.02	-0.54	0.16	1.32	-0.01	-0.48	-0.06	-0.79	-0.05	-1.03	-0.02	-0.67	-0.01	-0.22
ln(inherited acres)	0.02	0.51	0.05	0.51	0.06	0.74	0.13	**1.72**	-0.09	-0.37	-0.01	-0.15	-0.11	-1.22	-0.02	-0.43	-0.11	-0.74	0.02	0.67	0.17	**1.99**	0.06	1.14	-0.00	-0.03	0.02	0.47
educ of head's father	0.03	1.51	-0.09	-1.34	-0.05	-0.83	-0.06	-1.13	0.12	0.62	-0.01	-0.14	0.02	0.32	-0.11	**-3.17**	0.05	0.44	-0.00	-0.10	-0.01	-0.16	-0.01	-0.30	-0.01	-0.31	-0.04	-1.60
educ of head's mother	-0.01	-0.10	-0.27	-0.62	0.28	0.92	-0.03	-0.13	-2.17	-1.38	-0.17	-0.70	0.52	1.57	-0.00	-0.02	-0.55	-0.76	0.08	1.04	0.24	0.84	-0.20	-0.80	0.12	1.21	-0.06	-0.52
Year dummies:																												
Year 2	(2)		(2)		(2)		(2)		(2)		(2)		(2)		0.87	**11.05**	-0.82	**-3.47**	0.17	**4.80**	0.42	**3.25**	0.10	1.13	-0.14	**-3.13**	-0.27	**-5.33**
Year 3															0.37	**4.59**	-0.39	**-1.68**	-0.26	**-7.21**	-0.12	-0.88	0.08	0.91	-0.09	**-1.90**	-0.18	**-3.55**
Intercept	5.15	**5.55**	0.53	0.19	5.39	**1.96**	5.72	**2.33**	-5.85	-0.70	-2.59	-1.22	-7.99	**-2.71**	-1.11	-0.68	7.72	1.57	3.80	**5.15**	-1.22	-0.44	-1.17	-0.63	1.73	**1.85**	2.31	**2.20**
Selection-term	0.44		1.12		1.18		1.11		2.90		0.94		1.30		1.11		2.41		0.59		1.88		1.21		0.74		0.84	
Number of observations	665		665		665		665		665		665		665		2003		2003		2003		2003		2003		2003		2003	
of which, censored at 0	3		285		260		170		449		209		201		1011		1651		30		1149		1129		184		208	
Chi-square of regression	495		569		445		260		286		335		470		1005		408		437		306		977		696		330	
p-value	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Pseudo R-square	0.36		0.28		0.22		0.13		0.17		0.18		0.20		0.20		0.14		0.11		0.06		0.20		0.13		0.06	

Testing Household Composition:

	(4)	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value
daughter=d-in-law	1	0.44	0.51	0.85	0.36	1.52	0.22	0.30	0.58	0.01	0.92	0.20	0.66	0.06	0.81	0.14	0.71	0.09	0.76	0.05	0.82	0.08	0.78	0.45	0.50	1.36	0.24	0.32	0.57
(3) dgtr=inlaw=oth. fem.	2	0.70	0.71	1.20	0.55	2.58	0.27	1.35	0.51	0.68	0.71	0.22	0.90	3.97	0.14	4.55	0.10	0.56	0.76	0.58	0.75	0.90	0.64	0.67	0.71	2.02	0.36	0.69	0.71
all adult fem. same	3	0.35	0.79	1.14	0.33	0.88	0.45	**2.52**	0.06	0.23	0.87	0.07	0.97	**3.62**	0.01	1.64	0.18	0.46	0.71	0.25	0.86	0.77	0.51	0.45	0.72	1.35	0.26	0.49	0.69
all adult males same	3	1.95	0.12	**3.10**	0.03	1.28	0.28	**3.24**	0.02	0.62	0.60	0.95	0.41	**2.54**	0.06	0.69	0.56	**2.48**	0.06	1.50	0.21	1.54	0.20	0.48	0.69	**3.87**	0.01	**2.16**	0.09
all adults same	6	1.62	0.14	**1.83**	0.09	**1.88**	0.08	**2.18**	0.04	1.25	0.28	0.84	0.54	**2.98**	0.01	**2.53**	0.02	**1.97**	0.07	1.70	0.12	**4.92**	0.00	0.39	0.88	**3.74**	0.00	1.68	0.12

t-statistics significant at the 10% level or better appear in boldface.

(1) Omitted category is wife. Other categories are thus compared to wives.

(2) Complete data only available for year 3.

(3) Chi-square test statistic reported instead of F statistic.

(4) Number of tested parameter restrictions, i.e., degrees of freedom of the numerator.

Table 7. Tobit Regression on Market Activities

Dependent variable is the total time devoted to particular activities by all household members, based on a one-week recall interview. Measured in half-days per week.

	Farm work:						**Non-farm work:**													
	Work on own crops		***Herding own livestock***		***Farm supervision***		***Construction & field repair***		***Casual wage work***		***Non-farm self-employed***		***Government wage work***		***Private sector wage work***		***Casual wage work***		***Total non-farm***	
Household composition:	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t
ln(household size)(1)	0.29	1.19	0.20	0.35	0.57	**1.87**	0.36	1.07	-0.18	-0.23	3.18	**3.72**	2.34	**1.87**	2.82	**1.87**	2.68	**2.38**	2.78	**5.76**
share male head	0.04	0.02	2.57	0.54	1.01	0.39	1.86	0.63	3.15	0.46	-0.75	-0.10	-10.74	-1.05	11.93	0.89	4.22	0.42	4.27	1.03
share sons	0.02	0.02	3.94	**1.66**	-0.70	-0.54	0.06	0.05	5.58	**1.69**	-5.46	-1.38	-2.99	-0.53	7.86	1.23	-0.80	-0.17	-1.23	-0.58
share other males	-0.72	-0.74	5.21	**2.35**	-0.71	-0.59	-0.65	-0.48	4.71	1.58	-2.78	-0.75	6.81	1.28	10.44	**1.79**	2.20	0.50	3.93	**1.99**
share daughters	0.25	0.24	2.50	1.05	-0.63	-0.49	-0.02	-0.01	7.06	**2.14**	-0.95	-0.24	-5.19	-0.91	1.75	0.27	-0.36	-0.07	-2.14	-1.00
share daug-in-law	-0.01	-0.01	2.30	1.01	-2.01	-1.59	1.34	0.95	-0.34	-0.11	-3.02	-0.81	3.54	0.65	9.43	1.58	-2.55	-0.56	-1.05	-0.51
share other females	-1.33	-1.41	0.07	0.03	-2.08	**-1.77**	-0.60	-0.45	4.19	1.34	-4.92	-1.38	-8.95	**-1.78**	4.54	0.77	-5.41	-1.19	-5.18	**-2.71**
share children	-1.15	-1.21	1.43	0.66	-1.52	-1.29	-0.34	-0.26	4.79	1.62	-5.07	-1.40	-6.04	-1.17	-0.34	-0.06	-7.52	**-1.71**	-3.62	**-1.88**
share young males	-0.39	-0.42	6.45	**3.00**	-0.75	-0.64	0.62	0.47	4.57	1.53	-6.62	**-1.85**	-7.24	-1.41	3.31	0.57	-3.17	-0.72	-3.30	**-1.72**
share young females	-0.86	-0.92	2.42	1.13	-1.58	-1.35	-0.65	-0.49	1.82	0.61	-5.81	-1.63	-4.95	-0.97	4.28	0.74	-3.14	-0.73	-3.38	**-1.77**
Human capital:																				
Males:																				
average age	-0.02	-0.91	0.03	0.63	0.01	0.48	-0.05	**-1.85**	-0.01	-0.16	-0.03	-0.38	0.11	0.89	0.07	0.53	-0.18	**-1.84**	0.02	0.36
average squared age	-0.00	-0.04	-0.00	-0.81	-0.00	-0.51	0.00	1.41	0.00	0.06	0.00	0.74	-0.00	-1.11	-0.00	-0.63	0.00	1.02	-0.00	-0.79
average education	-0.08	**-5.23**	-0.08	**-2.34**	-0.05	**-2.54**	-0.02	-1.13	-0.23	**-4.26**	0.19	**3.67**	0.69	**8.44**	-0.04	-0.47	-0.55	**-7.11**	0.11	**3.84**
average height	0.01	1.10	0.02	1.31	0.00	0.33	0.01	0.97	0.03	1.50	-0.07	**-2.59**	0.09	**2.16**	-0.04	-1.07	-0.04	-1.47	-0.01	-0.64
Females:																				
average age	0.06	**2.47**	-0.05	-0.94	-0.01	-0.41	0.04	1.28	0.12	1.53	-0.07	-0.81	-0.13	-1.07	0.17	1.18	0.04	0.37	-0.04	-0.87
average squared age	-0.00	**-2.78**	0.00	1.24	0.00	0.48	-0.00	-1.55	-0.00	-1.46	0.00	0.49	0.00	1.49	-0.00	**-1.69**	-0.00	-0.67	0.00	0.67
average education	-0.09	**-2.98**	-0.09	-1.30	0.04	1.17	0.01	0.26	-0.18	-1.32	-0.39	**-3.55**	0.31	**2.28**	-0.29	-1.57	-0.38	**-2.32**	-0.13	**-2.12**
average height	-0.01	-0.68	-0.01	-0.44	0.01	1.50	-0.00	-0.29	-0.03	-1.09	-0.03	-0.97	0.02	0.43	-0.01	-0.25	0.05	1.63	0.01	0.44
Assets:																				
ln(owned land)	0.11	**1.95**	0.13	0.97	0.06	0.89	-0.14	**-1.79**	-0.67	**-3.56**	-0.43	**-2.03**	1.01	**3.32**	-0.06	-0.17	-0.84	**-3.05**	-0.09	-0.78
share irrigated	0.03	0.27	0.05	0.18	0.41	**2.56**	0.09	0.51	-1.52	**-3.74**	-0.10	-0.21	-1.22	-1.64	0.13	0.16	-0.74	-1.28	-0.60	**-2.28**
ln(value of farm tools)	0.18	**6.63**	-0.06	-1.00	0.15	**4.40**	0.20	**5.08**	-0.10	-1.01	0.63	**6.69**	-0.51	**-3.54**	-0.46	**-2.70**	-0.35	**-2.55**	0.01	0.26
ln(number livestock)	0.87	**13.82**	1.60	**11.09**	0.51	**6.43**	0.56	**6.31**	0.13	0.62	-1.58	**-6.99**	-0.13	-0.38	-1.45	**-3.89**	-0.67	**-2.42**	-1.01	**-8.01**
share buffalo	0.12	0.81	0.91	**2.67**	0.12	0.63	-0.14	-0.68	0.19	0.40	0.69	1.29	-1.45	**-1.73**	0.23	0.25	-0.42	-0.65	-0.28	-0.93
share bullocks	-0.48	-1.29	1.56	**1.82**	3.45	**7.46**	-0.70	-1.48	1.85	**1.88**	-0.19	-0.14	2.50	1.15	-1.41	-0.62	-1.88	-1.20	-0.87	-1.15
share donkeys	-0.19	-0.43	1.66	**1.71**	-0.16	-0.28	-1.24	-1.61	0.41	0.21	2.39	1.59	1.33	0.54	1.47	0.56	-1.24	-0.53	1.66	**1.87**
share sheep and goats	-0.69	**-4.43**	-0.53	-1.50	-0.27	-1.39	-0.82	**-3.67**	0.30	0.58	1.91	**3.51**	0.82	0.99	3.21	**3.59**	0.87	1.30	1.33	**4.34**
Unearned income:																				
ln(total unearned inc)	-0.02	-1.43	-0.02	-0.93	-0.02	-1.42	-0.01	-0.53	-0.11	**-2.76**	-0.15	**-3.65**	-0.16	**-2.57**	-0.15	**-2.11**	-0.12	**-2.36**	-0.16	**-6.70**
share rental income	-0.75	**-5.90**	0.11	0.41	-0.13	-0.83	-0.05	-0.30	0.68	1.53	1.51	**3.34**	-0.10	-0.15	1.46	**1.94**	-0.56	-0.88	0.77	**3.03**
share pension	0.36	1.33	-0.10	-0.16	-0.04	-0.11	0.24	0.62	1.05	1.18	1.03	1.11	0.41	0.32	1.56	0.97	1.14	1.00	1.00	**1.87**
Family background:																				
ln(father's land)	0.17	**3.30**	0.00	0.03	0.18	**2.83**	0.17	**2.59**	0.19	1.21	-0.79	**-4.03**	-0.30	-1.09	0.24	0.79	0.45	**2.04**	-0.05	-0.49
ln(inherited acres)	-0.03	-0.53	-0.05	-0.33	-0.00	-0.03	-0.17	**-2.00**	-0.22	-1.04	0.21	0.89	-0.05	-0.17	-0.15	-0.41	-0.13	-0.42	-0.23	**-1.81**
educ of head's father	-0.07	**-1.66**	-0.24	**-2.45**	0.03	0.60	-0.11	**-1.71**	-0.28	-1.41	0.13	0.84	0.37	**1.86**	-0.37	-1.32	-0.70	**-2.41**	0.15	**1.67**
educ of head's mother	0.25	1.14	-0.04	-0.07	0.10	0.36	0.52	**1.73**	-1.22	-0.88	0.15	0.20	0.99	1.11	2.45	**2.16**	0.74	0.55	0.06	0.15
Year dummies:																				
Year 3	0.18	**2.24**	-0.48	**-2.60**	0.97	**9.48**	0.31	**2.75**	0.22	0.85	-0.02	-0.08	-0.51	-1.17	-0.45	-0.93	0.04	0.11	-0.22	-1.37
Intercept	0.49	0.24	-2.82	-0.60	-3.42	-1.33	-4.29	-1.52	-5.98	-0.90	10.79	1.43	-23.60	**-2.05**	-4.78	-0.38	7.07	0.76	2.27	0.55
Selection-term	1.61		3.41		1.99		1.86		3.33		4.88		5.94		6.90		5.11		3.19	
Number of observations	2003		2003		2003		2003		2003		2003		2003		2003		2003		2003	
of which, censored at 0	378		827		496		1119		1565		1293		1606		1609		1515		612	
Chi-square of regression	1683		701		1144		1432		948		437		567		219		676		480	
p-value	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Pseudo R-square	0.196		0.086		0.136		0.238		0.237		0.073		0.141		0.056		0.146		0.055	

Testing Household Composition:

	(4)	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value	F stat	p-value
daughter=d-in-law	1	0.11	0.745	0.01	0.91	1.90	0.168	1.57	0.211	**8.13**	0.004	0.50	0.480	**3.95**	0.047	2.52	0.113	0.38	0.538	0.45	0.504
(3) dgtr=inlaw=oth. fem.	2	4.18	0.124	2.08	0.354	2.80	0.247	2.87	0.239	**8.17**	0.017	1.84	0.398	**8.14**	0.017	2.57	0.277	1.70	0.427	**6.16**	0.046
all adult fem. same	3	1.57	0.195	0.82	0.485	1.86	0.134	0.96	0.411	**3.16**	0.024	1.06	0.364	**2.99**	0.030	1.30	0.273	0.81	0.488	**3.25**	0.021
all adult males same	3	0.70	0.554	**2.30**	0.075	0.48	0.698	0.65	0.580	1.28	0.281	1.20	0.307	**4.72**	0.003	1.21	0.304	0.64	0.591	**7.88**	0.000
all adults same	6	**2.48**	0.022	1.73	0.109	1.47	0.186	1.31	0.247	**1.85**	0.086	0.86	0.523	**3.52**	0.002	1.32	0.244	0.82	0.557	**6.06**	0.000

t-statistics significant at the 10% level or better appear in boldface.

(1) Omitted category is wife. Other categories are thus compared to wives.

(2) Complete data only available for year 3.

(3) Chi-square test statistic reported instead of F statistic.

(4) Number of tested parameter restrictions, i.e., degrees of freedom of the numerator.

Table 8. Specialization indices for farm and wage work

1. Market Activities	*Complete specialization index*	*Incomplete specialization index*	*No. households in which activity is undertaken*	*Data available for:*
A. Farm work				
Work on own crops	21.5%	0.482	1984	year 1, 2, 3
Herding own livestock	64.7%	0.809	1463	year 1, 2, 3
Farm supervision	72.2%	0.868	1761	year 1, 2, 3
Construction & repairs of fields	48.1%	0.696	988	year 1, 2, 3
Casual wage work	43.3%	0.644	514	year 1, 2, 3
B. Non-farm work				
Self-employment	71.8%	0.836	877	year 1, 2, 3
Government wage work	81.2%	0.877	482	year 1, 2, 3
Private sector wage work	79.9%	0.886	491	year 1, 2, 3
Casual wage work	65.7%	0.799	596	year 1, 2, 3
Total non-farm work	56.7%	0.747	1709	year 1, 2, 3
2. Household chores				
A. Chores asked to men and women				
Fetch water	43.4%	0.623	438	year 3
Collect firewood	58.2%	0.758	467	year 3
Visit the market	70.4%	0.878	575	year 3
Herd livestock	73.9%	0.882	245	year 3
Milk animals	67.4%	0.868	513	year 3
Gather fodder	50.6%	0.735	539	year 3
Total household chores	5.9%	0.461	767	year 3
B. Chores asked only to women				
Prepare dung cakes	69.7%	0.824	1226	year 1, 2, 3
Carry meals to workers	85.8%	0.915	422	year 1, 2, 3
Husk grain	72.5%	0.835	171	year 1, 2, 3
Cook and wash dishes	40.6%	0.654	2382	year 1, 2, 3
Knit and sew	75.6%	0.860	1030	year 1, 2, 3
Prepare ghee	95.0%	0.972	1015	year 1, 2, 3
Wash and iron clothes	53.7%	0.724	2208	year 1, 2, 3
Clean the house	53.1%	0.723	2177	year 1, 2, 3
3. General time allocation				
A. January interview				
Work on own farm	45.6%	0.652	890	year 2, 3
Work on others' farm	67.5%	0.789	117	year 2, 3
Work on own or others' farm	43.5%	0.636	926	year 2, 3
Non-farm work	59.9%	0.753	1035	year 2, 3
Farm and non-farm work	38.1%	0.574	1434	year 2, 3
Home tasks/marketing	7.7%	0.298	1611	year 2, 3
Leisure	14.1%	0.359	1546	year 2, 3
B. September interview				
Own farm work	49.1%	0.663	634	year 2, 3
Work on others's farm	57.7%	0.725	26	year 2, 3
All farm work	49.1%	0.662	654	year 2, 3
Nonfarm work	59.6%	0.746	644	year 2, 3
All market work	39.2%	0.589	1000	year 2, 3
Household tasks/marketing	16.3%	0.375	1556	year 2, 3
Leisure	24.0%	0.457	1127	year 2, 3

Table 9 . ML Estimates of Market Activities — with Male and Female Participation

		Work on own crops		***Farm casual work***		***Non-farm self-employed***		***Non-farm casual work***		***Total non-farm***	
Human capital:		Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z
Difference in age		0.01	**8.05**	0.00	**1.85**	0.01	**3.71**	-0.00	-0.31	0.00	**3.11**
Difference in education		0.01	1.46	-0.04	**-2.86**	0.04	**4.21**	-0.02	-1.05	0.05	**12.16**
Difference in height		0.02	**35.51**	0.02	**9.03**	0.03	**13.05**	0.04	**11.33**	0.03	**28.29**
Gender and social roles:		*(coefficients reported in logs)*									
Wife		0.06	**3.38**	-0.12	**-2.31**	0.06	1.23	0.40	**6.02**	0.17	**5.82**
Daugher		0.39	**14.67**	0.08	1.04	-0.05	-0.71	0.29	**3.24**	0.22	**4.96**
Dauther in law		0.13	**4.39**	0.12	1.53	0.07	1.05	0.40	**4.01**	0.28	**6.23**
Other female		0.32	**10.91**	0.26	**3.42**	0.28	**3.85**	0.28	**2.51**	0.41	**8.17**
Son		-0.50	**-14.07**	-0.15	**-1.99**	-0.24	**-3.25**	-0.98	**-6.65**	-0.80	**-11.88**
Other male		-0.20	**-5.85**	0.07	0.91	0.15	**2.08**	-0.83	**-5.14**	-0.32	**-5.62**
Husband (1)	df	-0.65		-0.39		-0.45		-0.61		-0.59	
Test husband=0 (2)	1	2396	0.00	105	0.00	170	0.00	127	0.00	720	0.00
Distribution parameters:											
Ln(b)		1.49	**77.71**	1.14	**22.29**	0.76	**14.40**	1.10	**16.17**	1.00	**31.41**
Coef. of hh size in p		-0.04	**-7.94**	-0.07	**-4.91**	-0.01	-0.95	0.03	**1.71**	-0.02	**-2.95**
Constant in p function		0.36	**6.72**	-0.32	**-2.57**	-1.92	**-16.54**	-1.97	**-12.64**	-1.26	**-17.51**
p at median hh size		0.50		0.71		0.88		0.85		0.81	
p at half median size		0.52		0.48		0.48		0.56		0.47	
Number of observations		8214		1849		3898		2098		7143	
Log-likelihood		-5512		-1666		-2836		-1496		-5344	
Testing Equal Allocation:											
Human capital:	df	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value
all jointly	3	4051.0	0.00	141.3	0.00	488.6	0.00	145.1	0.00	2774.7	0.00
Gender:											
husband=wife	1	698.9	0.00	16.4	0.00	61.8	0.00	77.5	0.00	305.3	0.00
son=daughter	1	342.0	0.00	4.1	0.04	3.3	0.07	56.1	0.00	158.8	0.00
oth.males=oth.fem.	1	103.7	0.00	2.3	0.13	1.2	0.27	27.3	0.00	69.9	0.00
Family status among females:											
wife=daugther	1	77.4	0.00	4.3	0.04	1.5	0.22	1.0	0.33	1.0	0.31
wife=daughter-in-law	1	2.9	0.09	5.8	0.02	0.0	0.88	0.0	0.98	3.9	0.05
wife=other female	1	46.4	0.00	14.6	0.00	5.9	0.02	0.8	0.36	15.5	0.00
daugher=d-in-law	1	35.7	0.00	0.1	0.76	1.3	0.25	0.6	0.44	0.6	0.43
all females	3	102.0	0.00	17.6	0.00	8.7	0.03	1.6	0.66	17.6	0.00
Family status among males:											
husband=son	1	15.3	0.00	6.5	0.01	5.9	0.02	10.3	0.00	11.8	0.00
husband=other males	1	103.6	0.00	17.4	0.00	31.1	0.00	2.3	0.13	17.5	0.00
all males	2	120.4	0.00	24.3	0.00	37.9	0.00	11.3	0.00	30.8	0.00
Gender and family status:											
all coefficients	6	6536.2	0.00	159.4	0.00	282.3	0.00	1026.8	0.00	3045.9	0.00
Coefficients (in levels):											
Wife		1.07		0.88		1.06		1.50		1.18	
Daugher		1.47		1.08		0.95		1.33		1.25	
Dauther in law		1.14		1.12		1.07		1.50		1.33	
Other female		1.38		1.30		1.33		1.32		1.51	
Son		0.60		0.86		0.78		0.37		0.45	
Other male		0.82		1.08		1.17		0.44		0.73	
Husband		0.52		0.68		0.64		0.54		0.55	

Estimator is Maximum likelihood. Likelihood function presented in the text. One observation per household is omitted. Dependent variable is the share of a particular activity undertaken by individual household member. t-statistics significant at the 10% level or better appear in boldface. (1) Coefficient of husband is implied by the other coefficients. (2) Chi-square test of whether the log of implicit coefficient of husband is different from 0, i.e. whether the implicit coefficient is 1.

Table 10. ML Estimates of Market Activities — Predominantly Male Activities

		Livestock labor		***Construction & field repair***		***Farm supervision***	
Human capital:	df	Coef.	z	Coef.	z	Coef.	z
Difference in age		0.00	**2.59**	0.01	**3.09**	0.01	**10.00**
Difference in education		-0.05	**-7.12**	-0.01	-1.46	-0.01	**-2.62**
Difference in height		0.01	**4.21**	0.02	**6.36**	0.01	**5.06**
Gender and social roles:		*(coefficients reported in logs)*					
Son		-0.18	**-2.23**	-0.22	**-3.06**	0.16	**3.32**
Other male		0.41	**8.55**	0.41	**10.07**	0.38	**10.14**
Husband (1)		-0.41		-0.39		-0.99	
Test husband=0 (2)	1	113.13	0.00	129.81	0.00	540.96	0.00
Distribution parameters:							
Ln(b)		0.62	**13.55**	1.30	**30.24**	0.71	**15.15**
Coef. of hh size in p		-0.21	**-9.57**	0.03	1.28	-0.10	**-5.20**
Constant in p function		-0.06	-0.47	-0.06	-0.48	-0.73	**-6.70**
p at median hh size		0.75		0.48		0.78	
p at half median size		0.64		0.50		0.73	
Number of observations		2955		1635		3130	
Log-likelihood		-2704		-1480		-2481	

Testing Equal Allocation:

Human capital:	df	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value
all jointly	3	100.90	0.0000	72.28	0.0000	168.79	0.0000
Family status among males:							
husband=son	1	4.89	0.0271	3.81	0.0510	140.09	0.0000
husband=other males	1	91.95	0.0000	113.58	0.0000	271.43	0.0000
all males	2	126.20	0.0000	144.92	0.0000	551.40	0.0000
Coefficients (in levels):							
Son		0.83		0.81		1.17	
Other male		1.50		1.51		1.46	
Husband		0.66		0.68		0.37	

Estimator is Maximum likelihood. Likelihood function presented in the text. One observation per household is omitted. Dependent variable is the share of a particular activity undertaken by individual household member. t-statistics significant at the 10% level or better appear in boldface. (1) Coefficient of husband is implied by the other coefficients. (2) Chi-square test of whether the log of implicit coefficient of husband is different from 0, i.e. whether the implicit coefficient is 1.

Table 11. ML Estimates of Household Chores Asked to Men and Women

		Fech water		***Collect firewood***		***Visit the market***		***Herd livestock***		***Milk animals***		***Gather and prepare fodder***		***Total household chores***	
Human capital:		Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z
Difference in age		-0.00	-1.52	0.01	**3.08**	0.01	**4.59**	-0.00	-0.27	0.02	**6.32**	0.01	**3.72**	0.00	**1.82**
Difference in education		-0.05	**-3.93**	0.01	0.88	0.04	**3.91**	0.01	0.35	-0.05	**-3.31**	-0.03	**-2.63**	-0.04	**-5.94**
Difference in height		-0.02	**-5.90**	0.01	**3.51**	0.02	**6.27**	0.02	**3.34**	0.02	**3.51**	0.02	**9.06**	0.00	0.12
Gender and social roles:															
Wife		-0.78	**-9.08**	0.04	0.60	0.08	1.22	0.16	1.28	-0.62	**-7.80**	-0.28	**-4.92**	-0.42	**-13.56**
Daugher		-0.81	**-7.35**	0.15	1.59	0.46	**4.67**	0.71	**4.01**	0.16	1.61	0.21	**2.67**	-0.17	**-3.81**
Dauther in law		-1.32	**-8.15**	0.17	**1.74**	0.42	**3.67**	0.35	**1.96**	-0.57	**-4.36**	-0.20	**-2.35**	-0.57	**-11.07**
Other female		-0.62	**-4.62**	0.37	**3.68**	0.26	**2.45**	0.42	**2.21**	0.29	**3.20**	0.27	**3.34**	0.09	**2.18**
Son		0.71	**8.81**	-0.30	**-2.65**	-0.90	**-4.91**	-1.56	**-2.48**	0.14	1.49	-0.01	-0.15	0.31	**8.03**
Other male		0.62	**6.00**	-0.20	-1.50	-0.20	-1.60	-1.64	**-2.30**	0.41	**3.66**	0.21	**2.23**	0.41	**8.46**
Husband (1)	df	0.33		-0.49		-1.26		-0.84		-0.33		-0.42		-0.04	
Test husband=0 (2)	1	15.02	0.00	84.18	0.00	501.60	0.00	48.14	0.00	40.85	0.00	103.03	0.00	2.44	0.12
Distribution parameters:															
Ln(b)		1.48	**23.63**	0.99	**14.44**	0.76	**9.63**	0.84	**6.03**	0.76	**10.23**	0.82	**14.85**	1.47	**50.44**
Coef. of hh size in p		0.05	**3.42**	-0.02	-1.22	-0.05	**-2.35**	-0.04	-1.19	-0.03	-1.33	-0.01	-0.43	-0.08	**-4.96**
Constant in p function		-1.23	**-8.29**	-1.14	**-6.82**	-1.35	**-7.52**	-1.97	**-6.31**	-1.38	**-7.91**	-0.88	**-5.98**	2.55	**16.05**
p at median hh size		0.69		0.79		0.85		0.91		0.83		0.72		0.13	
p at half median size		0.57		0.47		0.43		0.42		0.47		0.49		0.69	
Number of observations		1290		1367		1654		785		1467		1537		2086	
Log-likelihood		-1026		-1242		-1179		-505		-1372		-1587		-421	
Testing Equal Allocation:															
Human capital:	df	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value
all jointly	3	265.6	0.00	33.4	0.00	266.6	0.00	12.7	0.01	122.2	0.00	414.8	0.00	49.7	0.00
Gender:															
husband=wife	1	77.7	0.00	33.6	0.00	116.1	0.00	24.2	0.00	13.9	0.00	4.7	0.03	117.5	0.00
son=daughter	1	118.6	0.00	8.3	0.00	33.9	0.00	10.3	0.00	0.0	0.91	3.2	0.07	59.6	0.00
oth.males=oth.fem.	1	39.9	0.00	9.2	0.00	6.6	0.01	7.2	0.01	0.5	0.48	0.2	0.70	18.2	0.00
Family status among females:															
wife=daugther	1	0.1	0.77	0.9	0.35	7.2	0.01	5.2	0.02	36.7	0.00	23.4	0.00	20.7	0.00
wife=daughter-in-law	1	13.6	0.00	1.2	0.28	5.4	0.02	0.7	0.40	0.1	0.73	0.5	0.48	7.5	0.01
wife=other female	1	1.7	0.20	6.6	0.01	2.0	0.16	1.2	0.27	51.6	0.00	27.1	0.00	96.2	0.00
daugher=d-in-law	1	9.9	0.00	0.0	0.89	0.1	0.80	1.6	0.21	18.0	0.00	10.7	0.00	33.5	0.00
all females	3	17.6	0.00	7.0	0.07	10.3	0.02	5.8	0.12	70.8	0.00	42.1	0.00	129.3	0.00
Family status among males:															
husband=son	1	8.6	0.00	2.1	0.15	3.2	0.07	3.4	0.07	13.6	0.00	15.0	0.00	45.7	0.00
husband=other males	1	3.7	0.05	2.9	0.09	28.0	0.00	3.2	0.08	17.9	0.00	19.7	0.00	42.4	0.00
all males	2	11.3	0.00	5.1	0.08	31.6	0.00	5.6	0.06	36.7	0.00	39.2	0.00	94.6	0.00
Gender and family status:															
all coefficients	6	253.0	0.00	184.0	0.00	1947.6	0.00	870.4	0.00	278.2	0.00	221.6	0.00	515.5	0.00
Coefficients (in levels):															
Wife		0.46		1.04		1.09		1.17		0.54		0.76		0.66	
Daugher		0.44		1.16		1.58		2.04		1.18		1.24		0.84	
Dauther in law		0.27		1.18		1.52		1.42		0.57		0.81		0.56	
Other female		0.54		1.45		1.30		1.53		1.34		1.31		1.10	
Son		2.03		0.74		0.41		0.21		1.15		0.99		1.37	
Other male		1.86		0.82		0.82		0.19		1.50		1.24		1.51	
Husband		1.40		0.61		0.29		0.43		0.72		0.66		0.96	

Estimator is Maximum likelihood. Likelihood function presented in the text. One observation per household is omitted. Dependent variable is the share of a particular activity undertaken by individual household member. t-statistics significant at the 10% level or better appear in boldface. (1) Coefficient of husband is implied by the other coefficients. (2) Chi-square test of whether the log of implicit coefficient of husband is different from 0, i.e. whether the implicit coefficient is 1.

Table 12. ML Estimates of Household Chores Asked Only to Women

		Prepare dung cakes		*Carry meals to workers*		*Cook and wash dishes*		*Knit and sew*		*Prepare ghee*		*Wash and iron clothes*		*Clean the house*	
Human capital:	df	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z
Difference in age		-0.00	-0.48	0.01	**1.76**	-0.00	**-2.29**	-0.01	**-4.07**	0.01	**6.27**	-0.01	**-5.58**	-0.01	**-11.14**
Difference in education		-0.07	**-5.16**	-0.03	-0.78	-0.02	**-2.35**	0.02	1.27	-0.02	-1.25	-0.03	**-3.01**	-0.02	**-2.20**
Difference in height		0.03	**9.34**	0.00	0.59	0.03	**15.01**	0.03	**7.07**	0.02	**4.87**	0.03	**14.78**	0.02	**8.07**
Gender and social roles:		*(coefficients reported in logs)*													
Daugher		-0.06	-0.91	0.06	0.47	0.08	**2.22**	-0.07	-0.96	0.47	**6.37**	-0.09	**-2.00**	-0.11	**-2.40**
Dauther in law		-0.14	**-2.15**	0.35	**3.00**	-0.42	**-9.56**	-0.11	-1.57	-0.01	-0.17	-0.29	**-6.69**	-0.21	**-4.82**
Other female		0.36	**6.35**	0.02	0.15	0.41	**14.03**	0.13	**1.72**	-0.05	-0.49	0.39	**11.58**	0.25	**6.70**
Wife (1)		-0.28		-0.70		-0.29		0.04		-0.76		-0.15		0.01	
Test wife=0 (2)	1	48.98	0.00	54.74	0.00	168.32	0.00	0.64	0.42	130.84	0.00	34.73	0.00	0.03	0.85
Distribution parameters:															
ln(b)		1.14	**19.88**	1.13	**7.45**	1.24	**43.86**	1.06	**15.92**	0.73	**4.69**	1.33	**39.56**	1.25	**35.34**
coef of hh size in p		0.07	**2.71**	-0.01	-0.17	-0.04	**-2.46**	-0.01	-0.34	0.11	**2.18**	0.04	**2.13**	-0.05	**-2.90**
constant in p function		-1.52	**-11.26**	-2.06	**-5.85**	0.45	**5.14**	-1.42	**-8.96**	-3.83	**-12.16**	-0.49	**-5.52**	-0.24	**-2.61**
p at median hh size		0.78		0.89		0.43		0.81		0.97		0.59		0.61	
p at half median size		0.55		0.49		0.51		0.49		0.70		0.51		0.49	
Number of observations		1952		641		3460		1782		1736		3298		3247	
Log-likelihood		-1901		-524		-2956		-1675		-1052		-3159		-3158	
Testing Equal Allocation:															
Human capital:	df	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value
all jointly	3	135.51	0.00	6.15	0.10	240.09	0.00	58.79	0.00	84.11	0.00	225.90	0.00	161.38	0.00
Family status among fem	df														
wife=daugther	1	5.85	0.02	12.18	0.00	53.71	0.00	1.39	0.24	59.22	0.00	1.22	0.27	4.18	0.04
wife=daughter-in-law	1	2.97	0.08	21.84	0.00	7.20	0.01	2.73	0.10	27.05	0.00	7.86	0.01	15.75	0.00
wife=other female	1	47.11	0.00	10.03	0.00	199.02	0.00	0.73	0.39	24.86	0.00	97.68	0.00	19.62	0.00
daugher=d-in-law	1	0.52	0.47	1.73	0.19	62.81	0.00	0.10	0.75	12.90	0.00	8.90	0.00	2.05	0.15
all females	3	60.53	0.00	54.78	0.00	307.59	0.00	4.83	0.18	134.19	0.00	118.43	0.00	46.17	0.00
Coefficients (in levels):															
Daugher		0.94		1.07		1.08		0.93		1.59		0.92		0.90	
Dauther in law		0.87		1.41		0.66		0.90		0.99		0.75		0.81	
Other female		1.44		1.02		1.51		1.13		0.95		1.47		1.28	
Wife		0.75		0.50		0.75		1.04		0.47		0.86		1.01	

Estimator is Maximum likelihood. Likelihood function presented in the text. One observation per household is omitted. Dependent variable is the share of a particular activity undertaken by individual household member. t-statistics significant at the 10% level or better appear in boldface. (1) Coefficient of husband is implied by the other coefficients. (2) Chi-square test of whether the log of implicit coefficient of husband is different from 0, i.e. whether the implicit coefficient is 1.

Table 13. ML Estimates of General Time Allocation

		January interview:										September interview:									
		Worked on own farm		*Non-farm work*		*Farm and non-farm work*		*Hh tasks and marketing*		*Leisure and rest*		*Worked on own farm*		*Non-farm work*		*Farm and non-farm work*		*Hh tasks and marketing*		*Leisure and rest*	
Human capital:	df	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z
Difference in age		0.01	**3.70**	0.01	**2.28**	0.01	**6.22**	0.00	**2.11**	0.01	**10.97**	0.01	**6.17**	0.00	**1.74**	0.01	**6.98**	0.00	**1.80**	0.01	**8.84**
Difference in education		-0.01	-0.83	0.06	**8.11**	0.04	**8.36**	-0.04	**-2.91**	0.04	**10.64**	0.00	0.34	0.06	**6.91**	0.05	**7.09**	-0.04	**-10.60**	0.04	**8.64**
Difference in height		0.02	**17.45**	0.03	**16.38**	0.02	**21.47**	-0.01	-1.46	-0.01	**-9.09**	0.02	**8.74**	0.03	**16.49**	0.02	**17.38**	-0.01	**-15.27**	-0.01	**-5.05**
Gender and social roles:		*(coefficients reported in logs)*																			
Wife		0.19	**4.04**	0.14	**3.12**	0.14	**4.26**	-0.47	**-31.60**	0.17	**7.07**	-0.02	-0.39	0.02	0.33	-0.00	-0.13	-0.53	(1)	0.09	**2.93**
Daugher		0.40	**6.30**	0.36	**5.61**	0.32	**7.14**	-0.38	(3)	0.26	**7.95**	0.19	**2.77**	0.26	**3.18**	0.23	**4.54**	-0.53	**-16.67**	0.44	**10.99**
Dauther in law		0.44	**7.01**	0.35	**5.53**	0.37	**8.17**	-0.49	**-16.23**	0.56	**16.00**	0.25	**3.76**	0.48	**6.31**	0.35	**7.19**	-0.63	**-23.00**	0.47	**11.37**
Other female		0.43	**6.45**	0.47	**6.66**	0.42	**9.16**	-0.22	**-4.53**	-0.07	**-1.95**	0.24	**3.39**	0.43	**4.96**	0.32	**6.04**	-0.33	**-11.93**	0.08	**1.66**
Son		-1.25	**-9.03**	-1.27	**-8.55**	-1.05	**-14.27**	0.41	(3)	-0.65	**-15.32**	-0.39	**-4.67**	-1.04	**-8.95**	-0.70	**-10.56**	0.50	**21.19**	-0.87	**-13.64**
Other male		-0.72	**-7.32**	-0.56	**-6.28**	-0.52	**-9.42**	0.47	(3)	-0.53	**-12.24**	-0.02	-0.19	-0.50	**-4.84**	-0.21	**-3.55**	0.52	**18.67**	-0.51	**-9.22**
Husband (1)		-0.86		-0.62		-0.55		0.17		-0.30		-0.54		-0.54		-0.44		0.21		-0.41	
Test husband=0 (2)	1	701.47	0.00	334.30	0.00	781.96	0.00	13.10	0.00	302.52	0.00	273.01	0.00	162.60	0.00	356.18	0.00	152.96	0.00	349.54	0.00
Distribution parameters:																					
ln(b)		1.25	**31.72**	1.10	**23.67**	1.52	**51.90**	2.37	**119.80**	1.92	**83.44**	1.21	**24.94**	1.18	**20.79**	1.37	**39.34**	2.42	**109.67**	1.78	**64.69**
coef of hh size in p		-0.01	-1.34	0.00	0.23	-0.00	-0.33	0.02	**2.43**	0.03	**4.18**	-0.02	-1.53	-0.00	-0.16	-0.02	**-2.22**	0.01	1.22	0.06	**7.10**
constant in p function		-0.90	**-9.81**	-1.66	**-16.30**	-0.66	**-9.38**	0.74	**10.61**	-0.22	**-3.42**	-0.76	**-6.73**	-1.56	**-11.91**	-0.47	**-5.48**	0.92	**11.27**	-0.53	**-6.66**
p at median hh size		0.73		0.84		0.66		0.29		0.50		0.71		0.83		0.65		0.27		0.52	
p at half median size		0.72		0.84		0.66		0.31		0.53		0.70		0.83		0.63		0.28		0.58	
Number of observations		3631		4156		5509		6139		6004		2171		2629		3580		4753		4156	
Log-likelihood		-2864		-2956		-4189		-701		-3350		-2004		-1964		-3153		-458		-2703	
Testing Equal Allocation:																					
Human capital:	df	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value
all jointly	3	753.8	0.000	692.5	0.000	1133.8	0.000	482.1	0.000	183.2	0.000	190.8	0.000	759.1	0.000	745.8	0.000	1738.2	0.000	108.3	0.000
Gender:																					
husband=wife	1	174.8	0.000	119.0	0.000	225.7	0.000	128.4	0.000	205.3	0.000	62.9	0.000	52.5	0.000	87.5	0.000	1158.6	0.000	136.9	0.000
son=daughter	1	102.2	0.000	102.3	0.000	227.7	0.000	(4)		259.8	0.000	24.6	0.000	81.2	0.000	108.4	0.000	1000.6	0.000	250.6	0.000
oth.males=oth.fem.	1	75.1	0.000	64.2	0.000	136.4	0.000	194.8	0.000	60.0	0.000	4.5	0.035	36.9	0.000	35.0	0.000	475.0	0.000	60.4	0.000
Family status among females:																					
wife=daugther	1	5.5	0.019	6.9	0.009	9.1	0.003	42.1	0.000	3.9	0.050	5.2	0.022	5.5	0.019	12.0	0.001	0.0	0.876	39.1	0.000
wife=daughter-in-law	1	8.1	0.005	6.6	0.010	14.9	0.000	0.3	0.558	64.9	0.000	9.4	0.002	20.6	0.000	29.4	0.000	13.3	0.000	43.2	0.000
wife=other female	1	6.9	0.009	13.9	0.000	22.1	0.000	20.2	0.000	27.3	0.000	8.1	0.005	13.9	0.000	22.0	0.000	49.8	0.000	0.1	0.798
daugher=d-in-law	1	0.2	0.696	0.0	0.933	0.5	0.465	15.3	0.000	29.8	0.000	0.3	0.562	3.0	0.084	2.3	0.132	6.1	0.013	0.2	0.632
all females	3	13.0	0.005	20.7	0.000	32.0	0.000	113.7	0.000	114.7	0.000	15.0	0.002	30.2	0.000	42.9	0.000	67.2	0.000	72.7	0.000
Family status among males:																					
husband=son	1	14.6	0.000	40.3	0.000	89.5	0.000	43.1	0.000	99.0	0.000	3.0	0.085	30.2	0.000	20.4	0.000	78.9	0.000	85.6	0.000
husband=other males	1	1.8	0.180	0.4	0.529	0.4	0.549	69.0	0.000	31.0	0.000	22.8	0.000	0.1	0.706	11.1	0.001	71.9	0.000	3.2	0.074
all males	2	18.3	0.000	41.9	0.000	93.7	0.000	(4)		109.5	0.000	27.4	0.000	34.7	0.000	34.4	0.000	208.1	0.000	85.7	0.000
Gender and family status:																					
all coefficients	6	5617.8	0.000	2762.6	0.000	5551.6	0.000	1832.4	0.000	2952.5	0.000	517.0	0.000	1203.3	0.000	1423.4	0.000	3453.7	0.000	2798.5	0.000
Coefficients (in levels):																					
Wife		1.21		1.15		1.14		0.62		1.19		0.98		1.02		1.00		0.59		1.10	
Daugher		1.49		1.44		1.37		0.69		1.29		1.21		1.30		1.26		0.59		1.55	
Dauther in law		1.56		1.42		1.44		0.61		1.75		1.29		1.61		1.42		0.54		1.60	
Other female		1.54		1.60		1.52		0.80		0.93		1.27		1.53		1.37		0.72		1.08	
Son		0.29		0.28		0.35		1.51		0.52		0.68		0.35		0.50		1.65		0.42	
Other male		0.48		0.57		0.60		1.59		0.59		0.98		0.60		0.81		1.68		0.60	
Husband		0.42		0.54		0.58		1.18		0.74		0.58		0.58		0.64		1.23		0.66	

Estimator is Maximum likelihood. Likelihood function presented in the text. One observation per household is omitted. Dependent variable is the share of a particular activity undertaken by individual household member. t-statistics significant at the 10% level or better appear in boldface. (1) Coefficient of husband is implied by the other coefficients. (2) Chi-square test of whether the log of implicit coefficient of husband is different from 0, i.e. whether the implicit coefficient is 1. (3) Standard error numerically undistinguishable from 0. (4) Test not performed because standard error could not be computed; see (3).

Table 14. Extent of Specialization by Gender and Role

	Days per year (1)		*No. of activities in which member is involved (2)*		*No. of activities for which member is solely responsible (2)*		
	Mean	Median	Mean	Median	Mean	Median	No of obs
Male head	295	257	6.1	6	3.0	2	789
Adult sons	174	103	3.1	2	0.5	0	956
Other adult males	192	77	2.7	2	0.5	0	411
Young males	115	0	1.1	0	0.2	0	940
Wife	237	228	4.3	4	2.1	1	756
Adult daughters	164	132	3.3	3	1.0	0	282
Daughters in law	166	140	3.2	3	0.8	0	549
Other adult females	105	17	2.2	1	0.6	0	375
Young females	74	0	1.7	0	0.3	0	821
Kids	1	0	0.0	0	0.0	0	1705

No of obs refers to people reporting activities and days Data are for year 3. Adult refers to 16 years of age and above; young refers to 7 to 15 years of age; kids are 6 years old and below. (1) We assume people work 6 days a week, 6 hours per day Farm supervision time not included to avoid double counting with farming itself. (2) Farm supervision counted as separate activity.

Table 15. Activity Switching Over Time

1. Market Work	% performing task in year 1	Correlation coefficient	% not doing task in year 2 given done in year 1	% doing task in year 2 given not done in year 1	Nber. of observations pairs	Estimated autocor. coefficient rho (4)
A. Crop work by season						
Kharif land preparation	27.2%	0.59	37.2%	13.7%	4171	0.15
Kharif irrigation labor	30.8%	0.66	36.9%	11.6%	3359	0.26
Kharif harvesting labor	33.4%	0.68	32.5%	14.5%	5038	0.20
Rabi land preparation	28.2%	0.64	30.6%	14.9%	5124	0.16
Rabi irrigation labor	30.4%	0.70	32.7%	8.9%	3147	0.29
Rabi harvesting labor	36.4%	0.61	33.5%	16.0%	5072	0.26
B. Farm work						
Work on own crops	46.6%	0.77	22.9%	17.7%	7886	0.41
Livestock labor (1)	38.0%	0.68	31.5%	13.7%	2701	0.48
Farm supervision (1)	37.6%	0.81	21.1%	14.0%	3419	0.23
Construction and field repairs (1)	54.6%	0.79	17.9%	20.3%	1401	0.37
Casual wage work	35.2%	0.51	34.2%	20.9%	1188	0.26
C. Non-farm work						
Self-employment	19.7%	0.76	25.4%	6.6%	2824	0.53
Government wage work	16.5%	0.92	8.7%	2.4%	1948	0.60
Private sector wage work	19.0%	0.79	21.9%	4.6%	1129	0.58
Casual wage work	24.6%	0.70	31.2%	8.6%	1407	0.48
Total non-farm labor	24.7%	0.78	22.5%	9.4%	6421	0.47
2. Household chores asked to women only (2)						
Prepare dung cakes	43.2%	0.29	41.0%	39.4%	1694	0.10
Carry meals to workers	44.8%	0.48	35.6%	22.7%	232	0.27
Husk grain	50.0%	0.36	40.0%	32.3%	130	(3)
Cook and wash dishes	69.0%	0.57	19.7%	48.3%	3730	0.20
Knit and sew	37.9%	0.29	46.0%	29.1%	1096	0.12
Prepare ghee	33.1%	0.54	28.7%	17.4%	1128	0.33
Wash and iron clothes	55.4%	0.46	28.3%	40.1%	3136	0.18
Clean the house	54.5%	0.39	34.4%	43.0%	3051	0.12

(1) Males only. (2) Multiple years only for questions asked to women only. (3) Not enough observations. (4) See text for details.

Figure 1. Histogram of Individual Shares of Total Work

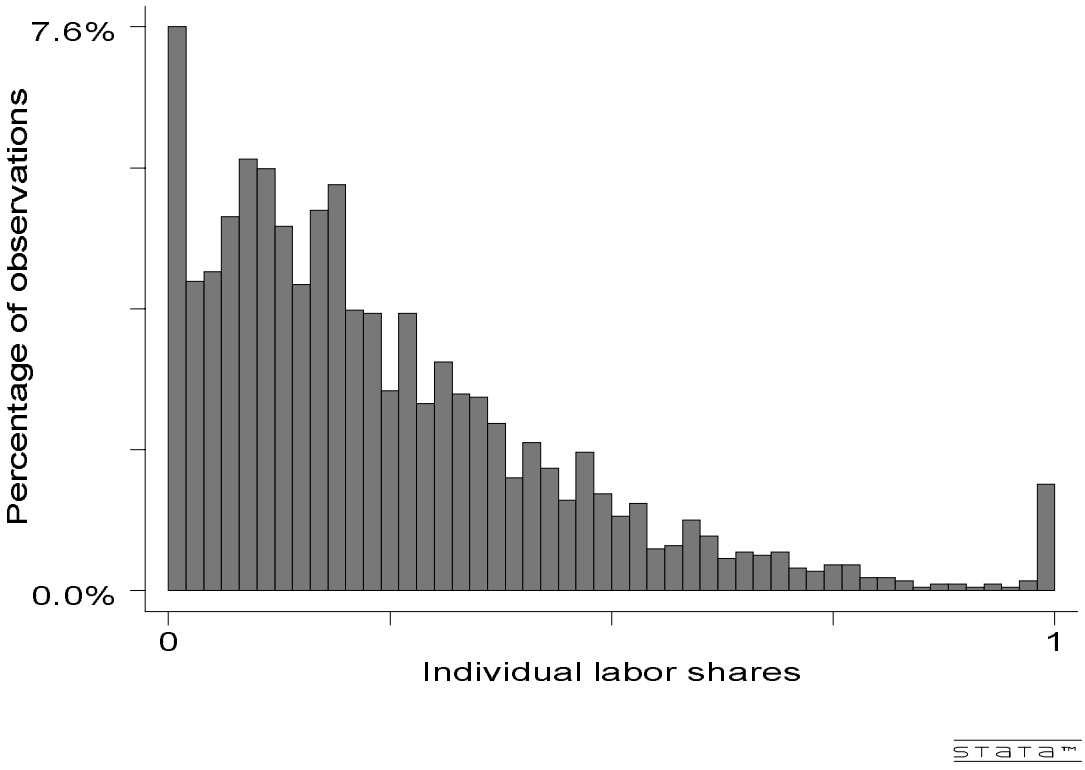

Figure 2. Histogram of Individual Shares of Water Fetching Time

Figure 3. Relationship Between Share of Workforce and Share of Work