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SOCIAL ROLES, HUMAN CAPITAL, AND THE INTRAHOUSEHOLD DIVISION OF LABOR: EVIDENCE FROM PAKISTAN

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ABSTRACT

Using detailed data from rural Pakistan, this paper investigates whether human capital, learning by doing, gender, and one's status within the family affect the division of labor within households. Results suggest the presence of returns to individual specialization in all farm, nonfarm, 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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1. INTRODUCTION

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 laboring. 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. Although most of this literature relates to developed economies, applications to developing countries yield similar conclusions.

Non-economic explanations of the intrahousehold division of labor have also been proposed and can be found in a large body of work written mostly by non-economists. These explanations emphasize the role of customs and social norms and argue that individuals perform the tasks assigned to them by society according to their sex and status. The objective of this paper is to test whether social norms, human capital, and learning by doing can account for the observed division of labor within rural Pakistani households.

In much empirical work, testing the role of social norms has been hindered by the fact that data from developed countries are available nearly exclusively for households with at most one working adult male and female.[1] 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 social norms to fashion what individuals do. These households are also likely to be more organizationally complex. In contrast to small nuclear households where the scope for specialization is limited, large households offer more room for delegation of responsibilities, thereby creating incentive and information problems similar to those encountered in firms.

This paper investigates the extent to which human capital, learning by doing, and socially defined roles affect the division of labor 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 off-farmwork, in line

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

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 off-farm activities, and weakest in household chores where the reallocation of tasks among household members is frequent. Becker (1981) hypothesized that returns to learning by doing lock individuals in the tasks and roles they have learned at early stages of life. Our results indicate 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 off-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 one's status within the family—henceforth family status. In particular, we find overwhelming evidence of a 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 (farming, herding, and other income-generating activities); 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 with socially specified roles partly determined by family status. The observed relationship between financial control and labor effort is consistent with moral hazard considerations: since the head and wife (wives) control household income and are residual claimants, imperfect enforcement and information asymmetries within the household would induce them to work harder and assume more responsibilities. In line with popular perceptions in Pakistan, we find evidence that daughters-in-law work systematically harder than daughters of comparable age, build, and education. In some cases, they work even harder than the head's wife herself. These results are consistent with daughters-in-law either having less bargaining power, or taking a long-term interest in the well-being of the household where they will spend the rest of their life.

Both theoretical and empirical work on time allocation traces its roots to Becker (1965), who first formulated a utility-maximizing model of Z goods that 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. 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 family structure in developing 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, family wealth, and distance to schools, town, or market center. Another issue that 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 that 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.[2] 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

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[2] 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.

associated with different family 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 family

unobservables via conditional logit, they find that daughters-in-law are the least likely to

be employed in productive or market-oriented activities, especially within a family

enterprise. In contrast, men's overall labor force participation is largely unaffected by

their position in the family hierarchy.

In this paper, we propose and test an alternative methodology to investigate

whether human capital, learning by doing, and socially defined roles affect the division of

labor inside the household. Our results largely confirm previous work but considerably

refine our understanding of the factors influencing intrahousehold task allocation. We

begin in Section 2 by sketching our conceptual framework and testing strategy. The data

are presented in Section 3, together with descriptive statistics. Test results are discussed

in Sections 4 and 5. The framework is extended in Section 6 to discuss dynamic effects

and returns to learning by doing. Conclusions are presented at the end.

2. THE CONCEPTUAL FRAMEWORK

Becker (1965) was one of the first economists to argue that, in the presence of

returns to specialization, it is optimal for households to divide tasks among their

members. To the extent that 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)[3] and from easier monitoring (e.g., giving each household member the full responsibility of one or more tasks makes it easier to identify whether each has done their share of total household work). 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

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

with particular tasks becomes arbitrary, although some matching is required to achieve

returns from specialization. This arbitrariness complicates intrahousehold bargaining. To

the extent that bargaining is costly and generates friction, society may seek to 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.[4] If socially defined

roles affect the division of labor among otherwise identical individuals, then labor shares

will be influenced by the role 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, not by an effort to capture gains from specialization. For

instance, it could be that Pakistani women do all the cooking and cleaning simply because

tradition says so. If this were the case, there is no reason why we should observe

individual specialization by task: since working together is presumably more fun than

working alone, women would be expected to cook and clean jointly. A world in which

intrahousehold division of labor is purely due to customs should thus be characterized by

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

team work within each socially defined role. In contrast, a world in which gains from specialization are present (and returns to and preference for teamwork are weak) would display individual division of labor within social roles. Patterns of labor sharing within each social category thus provide evidence of the relative returns to specialization and team work. We use this insight to investigate whether returns to specialization—as opposed to purely arbitrary social roles—are the driving force behind intrahousehold division of labor.

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 exists; home goods must be produced by the household. Household welfare can be written:

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

where V^i is the utility of individual i defined over consumption and leisure and ù ^{i} stands for welfare weights. We treat these weights as exogenously given, which is formally equivalent to assuming a unitary household (e.g., Alderman et al. 1995).[5] Some market

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[5] The model could easily be extended to a collective model by replacing the household's welfare function with a bargaining function. In this case, factors affecting the bargaining power of individual members would enter the labor allocation function. Unfortunately, the data do not provide convincing instruments for intrahousehold bargaining power.

and home goods are consumed individually, in which case $\sum_i C^i_{m_c} = C_{m_c}$ and

$\sum_i C^i_{z_c} = C_{z_c}$; others are household public goods, in 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:

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

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[6]

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

where H_i is a vector of human capital characteristics of individual i and $e_a(.)$ 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:

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[6] 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.

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

where U represents unearned income. Maximizing household welfare (1) subject to equations (2) to (4) plus a series of nonnegativity constraints, $L_a^i \geq 0$, yields a series of reduced-form labor allocation functions:[7]

$$L_a^i = f_a(K_k, U, H_1, ..., H_N, ù_1, ..., ù_N). \tag{5}$$

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 perform. Whether social roles matter can be similarly analyzed by testing whether factors known to shape social roles, such as gender and family status, affect labor allocation.

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[7] 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).

Estimating equation (5) directly is difficult when households differ dramatically in their composition and structure, as is the case in rural Pakistan.[8] 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 $S_a^i \equiv S_a^i L_a$ stands for individual labor shares. Only certain factors affect labor shares S_a^i, such as social roles 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 as

$$L_a = F_a(K_k, U, H_1, ..., H_N, \grave{u}_1, ..., \grave{u}_N) \, . \tag{6}$$

This equation can be econometrically estimated across households of different sizes and composition by replacing individual specific variables H_i and $\grave{u}_i$ 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

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

depends on the role 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 role composition of the household affects total labor use.[9] If social norms were followed very strictly, their efficiency cost could be potentially very large.[10] 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 be negligible.

A convenient parameterization for family composition is obtained by noting that

$$N_1 + \sum_{j=2}^{J} (1 + á_j)N_j \approx Ne^{\sum_{j=2}^{J} á_j N_j / N}, \qquad (7)$$

where J is the number of categories, N_j is the number of household members in category j, N is total household size, and $á_j$ is a parameter that expresses how different category j is from the omitted category, category 1[11]: if household members are equivalent in terms of labor supply and consumption demand, all the $á_j$'s are 0. A $-1 \le á_j < 0$ means that category j counts for less than the omitted category, and vice versa if $á_j > 0$. If $á_j = -1$,

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[9] The validity of this test rests critically on the hypothesis that household composition does not influence labor use for reasons other than social norms. If various household groups have divergent utility rankings, differences in preferences will be reflected in labor choices. To the extent that variations in utility rankings are systematic across groups, they will be captured by household composition variables.

[10] For instance, if men are absolutely prohibited to cook, a household without female members could not feed itself. This example indicates that strict adherence to social norms is likely to influence household formation, an issue that is beyond the scope of this paper.

[11] Equation (12) makes use of the fact that $1 + x \approx e^x$ when x is small. See Fafchamps and Quisumbing (1998) for a similar application.

adding a member of category j does not raise the household total. Household composition effects can thus be tested using $á_j$ 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 nonrival—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.

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 status of the individual relative to the gender and family composition of the household. The first two effects correspond to Becker's idea of comparative advantage; the last effect controls for what the noneconomic literature has described as social roles, that is, 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 family composition. Details of the

estimation method are presented in Section 5.

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.[12] 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

intrahousehold 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 that fully specialize.

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[12] As always, the validity of this test depends on the absence of omitted variable bias: if role variables are correlated with an omitted variable influencing labor use, they will show up as falsely significant. These issues are discussed in detail in latter sections.

3. 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 1,000 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: (1) a recall of total labor, both family and hired, devoted to

crops (by task), livestock, construction, and farm supervision for the *kharif* and *rabi*

seasons on the family farm, as well as wage labor on others' farms[13]; (2) a nonfarm

activity survey recalling each member's primary and secondary nonfarm activities in the

previous week; (3) a one-week recall of up to 15 different household chores; and (4) a

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[13] 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, though less disaggregated, one-week recall on activities performed in the

morning and afternoon, also including leisure. These questions were asked for all

members present in the household other than small children.[14] These data are available

for each household member, together with information on gender, age, schooling, height,

and relation to the household head. Total farm labor recall was asked in all rounds; the

nonfarm activity survey and the 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.

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 percent. Nonfarm earned

income—a mix of wages and self-employment income from crafts, trade, and

services—represents 30 percent of average income; rental income and remittances

amount to another 30 percent. Agricultural wage income is negligible among sample

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[14] Not to antagonize male respondents, questions about domestic chores that are exclusively female were asked only to women. No questions were asked about children aged 6 or less.

households. As already noted by Alderman and Garcia (1993) and by Adams and He

(1995), livestock and nonfarm 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 show 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.

Human capital variables are summarized in Table 2. They include experience

proxied by age and age squared; education measured in years of schooling, and childhood

nutrition measured by height.[15] As a 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.[16] Height proxies

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[15]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.

[16]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.

for health and nutrition aspects of human capital.[17] 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 members of the household have a much lower level of education than males. Forty percent of males have no education versus 86 percent for females. The sample population has a short stature.

We use two variables to capture social roles: (1) gender (male or female) and (2) family status, based on the 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; unlike their elder siblings, they do not work. It is likely that seniority is also associated with a greater importance within the family, 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 in various activities, and the share contributed by males and females, respectively. Household tasks, leisure,

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[17] 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.

and "market" work[18] (an aggregate of work on own farm, work on others' farms, and non-farmwork) are the three main activities that 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 percent 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 male time to non-farmwork and household tasks (around 40 percent each for each category). Wives also account for the bulk of female time in market activity (50 percent) and perform 40 percent of household tasks and marketing. Daughters account for a larger share of market activity (around 25 percent) than daughters-in-law (10 to 13 percent). These figures, however, do not control for household composition and differences in human capital.

The data on household chores show even sharper differences across gender and categories. Females are almost completely responsible for fetching water and making dung cakes; males do most of the firewood collection, marketing, herding, fodder collection, and hunting (Table 3). Females account for almost 60 percent 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 that were asked only of females, so the female

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

share is, by default, 100 percent. Among males, husbands spend the most time fetching

wood and water, milking, hunting, and collecting fodder; sons spend a larger amount of

time herding and making dung cakes—possibly more routine, less desirable activities

(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), 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 2, 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.

4. TOTAL LABOR USE

We begin by examining the total time allocation of surveyed households. Table 5

presents tobit regressions of time allocated to farmwork, non-farmwork, household tasks,

leisure, and two aggregates, farmwork, and market work, in January (*rabi* season) and

September (*kharif* season). 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 are all á$_j$'s 0. In the *rabi* season (January), this is decisively rejected for non-farmwork, 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-farmwork, 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 farmwork, whether on the family farm or others'; households with higher average male education spend more time in non-farmwork (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-farmwork, market work, and leisure. We reject the hypothesis that all females are the same in non-farmwork, 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-farmwork. The coefficient on husbands, sons, and other males, á$_j$, is also

significantly different from -1 in all categories except household tasks in the *rabi* season; these differences are significant only for leisure, farmwork, 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 farmwork) 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.[19]

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 were 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 of 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 nonsignificant. This is particularly true for fetching water, collecting firewood,

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[19] 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.

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.

Next, we test whether household members are equivalent in terms of contribution to household chores; this is rejected for total home time, fetching water, marketing, collecting fodder, and knitting (the test is whether all á$_j$'s are 0). Households with better-educated adult males spend less time in total home chores, fetching wood and water, and herding, but spend more time in marketing. Households where adult females are better educated reduce total time in home production and fodder collection. Controlling for human capital, gender and family status appear to be important in determining the total time the household spends fetching water, marketing, fodder collection, knitting, milking, and making ghee. Coefficients for all females are not significantly different from each other except in marketing, making ghee, knitting, and collecting fodder. Gender differences are significant only in fetching wood, marketing, collecting fodder, and knitting.

Finally, we conduct a similar analysis on time spent on market-oriented activities such as crops, livestock, and various categories of non-farmwork. Results are presented in Table 7.[20] The hypothesis that gender and family status do not matter is rejected for

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

work on one's farm and that of others, and for non-farmwork, 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.[21] 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-
farmwork—particularly government employment and self-employment. They are also
less likely to work as farm or nonfarm 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 off-farm, households with more unearned income work less in
everything, etc.

Taken together, the results indicate that the gender and family status composition of
the household 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. This suggests that something other than human capital
determines who does what and that social roles or hierarchical considerations are binding

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

in the sense that households with a different mix of gender and family status act
differently.

5. 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 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.[22] 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

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[22] Total work is computed as the sum of farm, livestock, and nonfarm work 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.

spent fetching water. The figure indicates that close to two-thirds of individuals do not

fetch water, while a significant 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-farmwork 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: the

higher the proportion, the stronger the gains from specialization. We also compute a

second, more general, measure that 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 multiplying 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.[23] 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

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[23] 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.

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 family composition would fail to yield meaningful results when family structure is extremely varied and complex, as is the case in the data we analyze.[24] 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 $\bar{S}_a^i$, as[25]

$$S_a^{\;i} = \frac{1 + \sum_h \hat{a}_{ah} \ddot{A} H_h^i}{N_r} \; \frac{n_r^{\tilde{a}_a^r}}{\sum_{s \in R} n_s^{\tilde{a}_a^r}} \;. \tag{8}$$

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[24] 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.

[25] In case equation (8) yields a negative number (number greater than 1), ﹀ takes the value 0 (1).

The two parts of equation (8) correspond to human capital and household composition effects, respectively. The human capital term is

$$\frac{1 + \sum_h \hat{a}_{ah} \ddot{A} H_h^i}{N}$$

where $\hat{a}_{ah}$ is a parameter and $\ddot{A} H_h^i$ denotes the difference between the human capital h of member i and that of other household members.[26] If a human capital characteristic h does not affect the allocation of tasks across household members, then $\hat{a}_{ah}$ 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

$$\frac{1}{N_r} \frac{n_r^{\tilde{a}_a^r}}{\sum_{s \subset R} n_s^{\tilde{a}_a^r}}, \tag{9}$$

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 $\tilde{a}_a^r > 0$ 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,

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

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 ã 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 ã'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 ã 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 ã's to sum to S, a value of ã 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 $ã_r^a$ implies that group r provides more than its share of household workforce to the labor required for activity a (Figure 3). Finally, the ã's indicate the order in which tasks are assigned to roles: those with the smallest $ã_a^r$ are the most likely to undertake activity a; if they are absent from the household, those with the next smallest $ã_a^r$ undertake it, etc.

Expression (9) yields easy tests of household composition effects. Since equal sharing requires that all ã's equal 1, household composition effects can be tested by

examining whether all ã's are jointly equal to 1. By extension, if $\tilde{a}_a^r = \tilde{a}_a^s$ 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 ã 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

$$S_a^i = \bar{S}_a^i + \mathring{a}_a^i \tag{10}$$

and to estimate equation (10) via nonlinear least squares (NLS).[27] Actual shares, however, are bound to remain between 0 and 1. Thus, although NLS estimates might be consistent,[28] 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 (nonlinear) 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 $\mathring{a}_a^i$.[29]

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

[28] By analogy with the linear probability model.

[29] 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)

$$f(S|0<S<1) \;=\; \frac{\tilde{A}(a+b)}{\tilde{A}(a)\tilde{A}(b)}\, S^{a-1}(1-S)^{b-1}\,, \tag{11}$$

where $\tilde{A}(.)$ is the usual Gamma function, parameter $a \;=\; \dfrac{\bar{S}\,b}{1-\bar{S}}$, and b is a variance-like parameter. The likelihood function for parameters p, b, $\tilde{a}$, and $\hat{a}$ 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.[30] Second, 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

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

parameter can be interpreted as an indication of the relative strength of returns to specialization and returns to teamwork 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. This is the pin factory parable of Adam Smith applied to the household: family size must be large enough to allow division of labor.

Results for farm and nonfarm work and for some of the household chores are presented in Table 9. Results for exclusively male and exclusively female activities are shown in Tables 10 and 11, respectively. Table 12 contains results from the one-week total recall interviews. To facilitate interpretation, the $\tilde{a}_a^r$ parameters are normalized to sum to the number of categories r participating in task a.[31] One observation per household is omitted to avoid correlation in the S_a^i's across observations.[32] To minimize numerical difficulties, estimation is organized so that it yields the $\hat{a}$ parameters in levels, and b and the $\tilde{a}$'s in logs. The corresponding $\tilde{a}$'s in level are reported at the bottom of the Tables. The dependence of p on household size is given the form

$$p \ = \ \frac{1}{1 + e^{\acute{a} + \hat{A}N}} \, , \tag{12}$$

_____

[31] Without this normalization, $\tilde{a}$ parameters are only identified by the curvature of the relationship between household composition and specialization. This complication is unnecessary and adds nothing to interpretation.

[32] Since, by construction, shares sum to one over each household.

where N is the number of potential household participants for the task being studied.[33]

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 all the tables, results confirm the extent of full specialization: the

estimated probability of complete specialization p in general oscillates between 50 and 90

percent. 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 only noticeable exception, with a

probability of complete specialization of only 13 percent, 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 4, we find that individuals who are better educated are more likely to be the ones

who work off-farm, particularly as self-employed, and are less likely to tend the livestock,

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[33] 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.

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-farmwork 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.[34] The fact that this is not the case suggests that education is correlated with higher welfare weights. An alternative explanation is that educated household members are more involved in social activities such as information gathering and community building that have returns for the household but are not regarded as work in this predominantly rural environment. This issue deserves more investigation.

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.[35] We find that taller and older individuals are more likely to work on market-related activities such as farm and nonfarm activities. Age is significant in most other regressions as well. Older household members focus on activities that require travel outside the household, such as

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[34] 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.

[35] Their inclusion is justified by the fact that their participation in total work is nonnegligible.

collecting fodder and firewood or 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, since children who

wander around on their own either get into mischief or into trouble. 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 which household chores members specialize in, but it has either no effect (Table

9) or a negative effect (Table 12) 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.

Human capital alone (or at least, the components of human capital that we were

able to measure) 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 such as farming, livestock production, and non-farmwork. They

also are responsible for collecting firewood and visiting the market. 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, nonfarm 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, indicating that social roles vary not only with gender but also with status in the

household. Several strong regularities emerge from the tables. They are most easily seen

by observing the parameter estimates themselves, and are confirmed by formal tests (see

tables). 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-farmwork, 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 traveling 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-farmwork, 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.[36] From the fact that 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 fact that, whenever a husband and a wife are present, the husband is identified to enumerators as the head of household.[37] Husband and wife each have a separate sphere of authority and influence, however. Husbands look after "market-" oriented work such as crops, livestock, and non-farmwork. They occasionally enlist the help of female household members but, whenever male members are present they 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—or "division" of the household firm—exists a hierarchical structure whereby subordinate family 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

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

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

tasks and working harder than all other household members. This is made clear in Table 13 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 (1998) 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 for the work they have done. If enforcement of intrahousehold contracts is imperfect, delegation of tasks is incomplete and work gets concentrated in the hands of residual claimants—the head and wife. It is interesting to note that household members who are likely to exit the household, such as sons and daughters, participate less intensively, especially as they get older. This is because their 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 mothers-in-law. The fact that

daughters-in-law are less likely to undertake market activities and to work outside the

home provides circumstantial evidence supporting the bargaining power interpretation:

their threat point is lower, which may explain why they work harder.[38] Other possibilities

are that daughters are being pampered for the marriage market, or that they are given a

break by their affectionate parents before becoming exploited daughters-in-law in another

household.

6. 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.

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[38] 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.

He goes on to demonstrate that, 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 14 shows the percentage of household members switching in and out of activities from one year to the next.[39] 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 market-oriented (e.g., nonfarm 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 14 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

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

doing. A more detailed analysis is thus called for. To do so, we expand the model

presented in Section 5 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 as

$$E[S_{t-1}] \; = \; \tilde{n}S_{t-1} \; + \; (1-\tilde{n})\bar{S}, \tag{13}$$

where $\bar{S}$ is, as before, given by equation (8) in Section 3. The distribution of S_t around its

conditional expectation is as before. Estimation results for $\tilde{n}$ are presented in the last

column of Table 14.[40] They all test significantly different from both 0 and 1 with very

high levels of confidence. Except for certain nonfarm activities (government and private-

sector employment, plus self-employment), estimated values of $\tilde{n}$ 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 that

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

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[40] 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 $\tilde{n}$ parameter drops dramatically.

as making dung cakes and cleaning the house. Although there may be returns to learning

by doing in certain market-oriented tasks, learning by doing is unlikely to be the reason

for the very high levels of intrahousehold specialization observed in the data. To put it

differently, 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-farmwork, where returns to experience appear

higher and where women are penalized by their low level of schooling (e.g., Sawada

1998).

7. CONCLUSIONS

Using detailed data from rural Pakistan, this paper has investigated whether human

capital, learning by doing, and socially defined roles affect the division of labor within

households. Results concerning human capital confirm what we already knew:

households with better educated members are more involved in non-farmwork (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 traveling 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 (farming, herding, and other income-generating activities); 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 (1985a, 1985b, 1986a, 1986b). 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 socially specified roles partially determined by gender and

family status. The observed correlation between financial control and labor effort is

consistent with moral hazard considerations, long-term commitment to the household,

and internal bargaining power: individuals with more control over household finances

and with a long-term stake in the household work harder. Finally, we found some

evidence of long-lasting returns to learning by doing in nonfarm 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 off-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 its

gender and family structure. 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 mitigate

monitoring and shirking problems. In addition, large households benefit from returns to

scale in household chores and can more easily let some members fully specialize in

off-farmwork. What appears to keep household size in check are problems of shirking

and monitoring, 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 nonfarm occupation join already existing households? Or do larger households let some of their members specialize is less subsistence-oriented activities such as non-farmwork? These issues deserve more research.

TABLES

Table 1   Sample Summary Statistics

	Number of observations	Sample Mean	Median	Standard deviation
Household composition				
Total household size	2,509	8.7	8	4.3
Adult males (20-65)	2,509	2.0	2	1.2
Adult females (20-65)	2,509	1.8	1	1.1
Young (6-20)	2,509	3.1	3	2.3
Children (0-5)	2,509	1.6	1	1.6
Old (>65)	2,509	0.3	0	0.6
Income (in 1986 rupees)				
Total income[a]	2,202	29,457	20,584	34,635
Net crop income	2,202	7,355	2,138	21,420
Net livestock income	2,202	4,566	3,643	6,176
Wages from agricultural work	2,202	287	0	1,210
Non-farm earned income	2,202	8,823	6,036	10,067
Rental income	2,202	3,876	0	14,879
Remittances and transfers[b]	2,202	4,573	0	17,427
Assets				
Total land owned in acres[c]	2,526	8.4	2.0	18.4
Irrigated land owned in acres	2,526	3.8	0.0	9.7
Rainfed land owned in acres	2,526	2.9	0.0	10.2
Total land owned by father in acres	2,526	11.7	0.5	29.8
Inherited land in acres	2,526	5.1	0.0	15.5
Value of farm tools and equipment in rupees	2,526	9,054	1,011	27,359
Number of cattle	2,526	2.0	1	2.7
Number of buffalos	2,526	1.8	0	2.6
Number of bullocks	2,526	0.3	0	0.8
Number of donkeys	2,526	0.2	0	0.7
Number of sheep and goats	2,526	2.9	2	4.9
Labor in days				
Kharif family labor	2,526	70	27	106
Rabi family labor	2,526	46	20	68
Kharif hired labor	2,526	7	0	38
Rabi hired labor	2,526	7	0	26
Herding labor	2,526	135	36	250
Agricultural wage labor	2,526	0	0	7
Nonfarm labor	2,526	214	141	265

[a] Water tax is deducted from total income.

[b] 96 percent of received tranfers are remittances.

[c] Difference between total land and irrigated and rainfed land is noncultivable land—mostly pastures.

Table 2   Human capital summary statistics

	Number of observations	Sample Mean	Median	Standard deviation
Husband and wife				
Age of head	2,436	48.2	47.0	13.7
Years of education of head	2,436	2.8	0.0	4.1
Height of head	2,395	167.3	168.0	6.5
Age of wife[a]	2,242	41.5	40.0	12.1
Years of education of wife[a]	2,242	0.3	0.0	1.5
Height of wife[a]	2,014	152.4	152.0	6.5
Household averages				
Average age of adult males	2,497	38.0	37.0	8.6
Average years of education of adult males	2,497	3.7	2.5	3.9
Average height of adult males	2,426	167.4	167.5	6.1
Average age of adult females	2,493	37.1	36.0	8.2
Average years of education of adult females	2,493	0.6	0.0	1.6
Average height of adult females	2,322	152.4	152.0	6.2

[a] In polygamous households, average over all wives.

Table 3   Time allocation, by gender

Activity	Number of households reporting activity	Average time spent[a]	Male share of total	Female share of total
			(in percent)	
A. January interview				
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	1,035	0.65	94	6
Farm and nonfarm work	1,434	1.19	93	7
Home tasks/marketing	1,611	2.74	16	84
Leisure	1,548	1.71	81	19
B. September interview				
Work on own farm	634	.035	73	27
Work on others' farm	27	.001	21	79
Work on own or others farm	654	0.36	71	29
Nonfarm work	645	0.42	91	9
Farm and nonfarm work	1,000	0.78	79	21
Home tasks/marketing	1,556	2.38	10	90
Leisure	1,128	1.12	76	24
C. Household chores				
Fetching water	438	5.0	7	93
Firewood collection	468	5.0	76	24
Visiting the market	575	5.9	89	11
Herding	246	11.0	88	12
Milking	513	3.3	43	57
Collecting fodder	539	12.8	60	40
Hunting	12	0.2	92	8
Making dung cakes	387	1.5	1	99
Meal preparation	125	0.9	0	100
Husking	43	0.5	0	100
Cooking	748	24.4	0	100
Knitting and sewing	303	2.6	0	100
Making ghee	320	1.7	0	100
Washing and ironing clothes	741	6.10	0	100
Cleaning the house	726	6.3	0	100

[a] 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.

Table 4a   Social roles and time allocation in general

	Own farm	Other's farm	Own and others	Nonfarm	Farm and nonfarm	Household tasks/ marketing	Leisure
	Share of total time spent on different activities by various family categories						
	(percent)						
Males							
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
Number of observations	871	93	903	1,001	1,422	1,215	1,508
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
Number of observations	521	6	524	614	867	766	960
Females							
January interview							
Wife	59	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
Number of observations	109	32	137	107	232	1,599	721
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
Number of observations	224	22	245	97	324	1,548	475

Table 4b   Social roles and the allocation of tasks

	Share of total time spent on household chores by various family categories						
	Fetching water	Collecting wood	Marketing	Herding	Milking	Collecting fodder	
	(percent)						
Males							
Husband	55	57	72	33	67	58	
Son	33	32	21	45	23	30	
Other males	12	11	7	22	9	12	
Number of observations	43	409	542	221	279	366	
							Making dung cakes
Females							
Wife	41	42	57	41	62	51	49
Daughter	30	33	15	34	12	17	21
Daughter-in-law	19	11	8	10	16	18	20
Other females	11	14	19	14	10	14	10
Number of observations	420	163	125	35	347	284	385

	Carry meals to workers	Husking	Cooking	Knitting	Making ghee	Washing	Cleaning
Wife	52	48	47	39	64	45	37
Daughter	20	12	20	26	10	23	31
Daughter-in-law	14	31	23	23	13	23	20
Other females	14	8	9	12	13	10	12
Number of observations	125	43	746	302	319	739	724

Table 5   Tobit regression on total household time devoted to all 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)

| | January interview | | | | | | | | | | September interview | | | | | | | | | |
| | Work on own farm | | Off-farm work | | Farm and off-farm | | Home activities | | Leisure and rest | | Work on own farm | | Off-farm work | | Farm and off-farm[b] | | Home activities | | Leisure and rest | |
	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic
Household composition																				
1n(household size)[a]	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 daughters-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 income)	–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

(continued)

Table 5 (continued)

	January interview										September interview									
	Work on own farm		Off-farm work		Farm and off-farm		Home activities		Leisure and rest		Work on own farm		Off-farm work		Farm and off-farm[b]		Home activities		Leisure and rest	
	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic
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**
Education 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
Education 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	1,335		1,335		1,335		1,335		1,335		571		1,335		665		1,335		1,335	
of which, censored at 0	564		469		128		3		51		416		785		56		12		374	
Chi-square of regression	773		408		707		1,500		966		210		509		412		1,041		1,127	
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	0.3404		0.1747		0.3738		1.0932		0.5438		0.2835		0.2225		0.4624		0.7213		0.4116	

Testing household composition

		January interview										September interview									
		Work on own farm		Off-farm work		Farm and off-farm		Home activities		Leisure and rest		Work on own farm		Off-farm work		Farm and off-farm		Home activities		Leisure and rest	
	([d])	F statistic	p-value	F statistic	p-value	F statistic	p-value	F statistic	p-value	F statistic	p-value	F statistic	p-value	F statistic	p-value	F statistic	p-value	F statistic	p-value	F statistic	p-value
Daughter = daughter-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
Daughter-in-law = other female[c]	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 females 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	0.606
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

Note: t-statistics significant at the 10 percent level or better appear in boldface.
[a] Omitted category is wife. Other categories are thus compared to wives.
[b] Complete data only available for year 3.
[c] Chi-square test statistic reported instead of F statistic.
[d] Number of tested parameter restrictions, i.e., degrees of freedom of the numerator.

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Table 6 Tobit regression on total household time devoted to home activities

Dependent variable is the total time devoted to particular home activities by all household members (measured in days per year)

| | Total home activities | | Fetch water | | Collect firewood | | Visit the market | | Herd livestock | | Milk animals | | Gather and prepare fodder | | Prepare dung cakes | | Carry meals to workers | | Cook and wash dishes | | Knit and stitch | | Prepare ghee | | Wash and iron clothes | | Clean the house | |
	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
Household composition																											
1n(household size)[a]	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	–0.76	**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 daughters-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 income)	–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

(continued)

Table 6 (continued)

| | Activities with male and female participation | | | | | | | | | | | | | | Activities with exclusively female participation | | | | | | | | | | | | | |
| | Total home activities | | Fetch water | | Collect firewood | | Visit the market | | Herd livestock | | Milk animals | | Gather and prepare fodder | | Prepare dung cakes | | Carry meals to workers | | Cook and wash dishes | | Knit and stitch | | Prepare ghee | | Wash and iron clothes | | Clean the house | |
	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
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
Education 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
Education 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		2,003		2,003		2,003		2,003		2,003		2,003		2,003	
of which, censored at 0	3		285		260		170		449		209		201		1,011		1,651		30		1,149		1,129		184		208	
Chi-square of regression	495		569		445		260		286		335		470		1,005		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-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) Daughter-in-law = other female[c]	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 females 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

Note: t-statistics significant at the 10 percent level or better appear in boldface.

[a] Omitted category is wife. Other categories are thus compared to wives.

[b] Complete data only available for year 3.

[c] Chi-square test statistic reported instead of F statistic.

[d] Number of tested parameter restrictions, i.e., degrees of freedom of the numerator.

Table 7 Tobit regression on total household time devoted to "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 | | | | | | | | | | Nonfarm | | | | | | | | | |
| | Work on own crops | | Livestock labor | | Farm supervision | | Construction and field repair | | Farm casual | | Government employment | | Private-sector employment | | Nonfarm self-employed | | Nonfarm casual | | Total nonfarm | |
	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic
Household composition																				
1n(household size)[a]	0.29	1.19	0.20	0.35	0.57	**1.87**	0.36	1.07	−0.18	−0.23	2.34	**1.87**	2.82	**1.87**	3.18	**3.72**	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	−10.74	−1.05	11.93	0.89	−0.75	−0.10	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**	−2.99	−0.53	7.86	1.23	−5.46	−1.38	−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	6.81	1.28	10.44	**1.79**	−2.78	−0.75	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**	−5.19	−0.91	1.75	0.27	−0.95	−0.24	−0.36	−0.07	−2.14	−1.00
Share daughters-in-law	−0.01	−0.01	2.30	1.01	−2.01	−1.59	1.34	0.95	−0.34	−0.11	3.54	0.65	9.43	1.58	−3.02	−0.81	−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	−8.95	**1.78**	4.54	0.77	−4.92	−1.38	−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	−6.04	−1.17	−0.34	−0.06	−5.07	−1.40	−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	−7.24	−1.41	3.31	0.57	−6.62	**1.85**	−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	−4.95	−0.97	4.28	0.74	−5.81	−1.63	−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	0.11	0.89	0.07	0.53	−0.03	−0.38	−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	−1.11	−0.00	−0.63	0.00	0.74	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**	0.69	**8.44**	−0.04	−0.47	0.19	**3.67**	−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	0.09	**2.16**	−0.04	−1.07	−0.07	**2.59**	−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	−0.13	−1.07	0.17	1.18	−0.07	−0.81	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	1.49	−0.00	**1.69**	0.00	0.49	−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	0.31	**2.28**	−0.29	−1.57	−0.39	**3.55**	−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	0.02	0.43	−0.01	−0.25	−0.03	−0.97	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**	1.01	**3.32**	−0.06	−0.17	−0.43	**2.03**	−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**	−1.22	−1.64	0.13	0.16	−0.10	−0.21	−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	−0.51	**3.54**	−0.46	**2.70**	0.63	**6.69**	−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	−0.13	−0.38	−1.45	**3.89**	−1.58	**6.99**	−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	−1.45	**1.73**	0.23	0.25	0.69	1.29	−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**	2.50	1.15	−1.41	−0.62	−0.19	−0.14	−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	1.33	0.54	1.47	0.56	2.39	1.59	−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	0.82	0.99	3.21	**3.59**	1.91	3.51	0.87	1.30	1.33	**4.34**
Unearned income																				
ln(total unearned income)	−0.02	−1.43	−0.02	−0.93	−0.02	−1.42	−0.01	−0.53	−0.11	**2.76**	−0.16	**2.57**	−0.15	**2.11**	−0.15	**3.65**	−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	−0.10	−0.15	1.46	**1.94**	1.51	**3.34**	−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	0.41	0.32	1.56	0.97	1.03	1.11	1.14	1.00	1.00	**1.87**

(continued)

Table 7 (continued)

	Farm										Nonfarm									
	Work on own crops		Livestock labor		Farm supervision		Construction and field repair		Farm casual		Government employment		Private-sector employment		Nonfarm self-employed		Nonfarm casual		Total nonfarm	
	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic
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	–0.30	–1.09	0.24	0.79	–0.79	**4.03**	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	–0.05	–0.17	–0.15	–0.41	0.21	0.89	–0.13	–0.42	–0.23	**1.81**
Education of head's father	–0.07	**1.66**	–0.24	**2.45**	0.03	0.60	–0.11	**1.71**	–0.28	–1.41	0.37	**1.86**	–0.37	–1.32	0.13	0.84	–0.70	**2.41**	0.15	**1.67**
Education of head's mother	0.25	1.14	–0.04	–0.07	0.10	0.36	0.52	**1.73**	–1.22	–0.88	0.99	1.11	2.45	**2.16**	0.15	0.20	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	–0.51	–1.17	–0.45	–0.93	–0.02	–0.08	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	–23.60	**2.05**	–4.78	–0.38	10.79	1.43	7.07	0.76	2.27	0.55
Selection-term	1.61		3.41		1.99		1.86		3.33		5.94		6.90		4.88		5.11		3.19	
Number of observations	2,003		2,003		2,003		2,003		2,003		2,003		2,003		2,003		2,003		2,003	
of which, censored at 0	378		827		496		1,119		1,565		1,606		1,609		1,293		1,515		612	
Chi-square of regression	1,683		701		1,144		1,432		948		567		219		437		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		0.141		0.056		0.073		0.146		0.055	

Testing household composition

	[d]	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 = daughter-in-law	1	0.11	0.745	0.01	0.91	1.90	0.168	1.57	0.211	**8.13**	0.004	**3.95**	0.047	2.52	0.113	0.50	0.480	0.38	0.538	0.45	0.504
Daughter-in-law = other female[c]	2	4.18	0.124	2.08	0.354	2.80	0.247	2.87	0.239	**8.17**	0.017	**8.14**	0.017	2.57	0.277	1.84	0.398	1.70	0.427	**6.16**	0.046
All adult females same	3	1.57	0.195	0.82	0.485	1.86	0.134	0.96	0.411	**3.16**	0.024	**2.99**	0.030	1.30	0.273	1.06	0.364	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	**4.72**	0.003	1.21	0.304	1.20	0.307	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	0.27	**1.85**	0.086	**3.52**	0.002	1.32	0.244	0.86	0.523	0.82	0.557	**6.06**	0.000

Note: t-statistics significant at the 10 percent level or better appear in boldface.

[a] Omitted category is wife. Other categories are thus compared to wives.

[b] Complete data only available for year 3.

[c] Chi-square test statistic reported instead of F statistic.

[d] Number of tested parameter restrictions, i.e., degrees of freedom of the numerator.

Table 8 Specialization indices for farm and wage work

	Complete specialization index	Incomplete specialization index	Number of households in which activity is undertaken
	(percent)		
Farmwork			
Work on own crops	21.5	0.482	1,984[a]
Construction and repairs of fields	48.1	0.696	988[a]
Farm supervision	72.2	0.868	1,761[a]
herding own livestock	64.7	0.809	1,463[a]
Casual labor on others' farms	43.3	0.644	514[a]
Nonfarmwork			
Government employment	81.2	0.877	482[a]
Private-sector employment	79.9	0.886	491[a]
Self-employment	71.8	0.836	877[a]
Nonfarm casual labor	65.7	0.799	596[a]
Total nonfarm labor	56.7	0.747	1,709[a]
Household chores			
Fetching water	43.4	0.623	438[b]
Collecting wood	58.2	0.758	467[b]
Marketing	70.4	0.878	575[b]
Herding	73.9	0.882	245[b]
Milking	67.4	0.868	513[b]
Collecting fodder	50.6	0.735	539[b]
Making dung cakes	69.7	0.824	1,226[a]
Taking meals to workers	85.8	0.915	422[a]
Husking	72.5	0.835	171[a]
Cooking	40.6	0.654	2,382[a]
Knitting	75.6	0.860	1,030[a]
Making ghee	95.0	0.972	1,015[a]
Washing	53.7	0.724	2,208[a]
Cleaning	53.1	0.723	2,177[a]
Total household chores	5.9	0.461	767[a]
January interview			
Work on own farm	45.6	0.652	890[c]
Work on others' farm	67.5	0.789	117[c]
Work on own or others' farm	43.5	0.636	926[c]
Nonfarmwork	59.9	0.753	1,035[c]
Farm and nonfarmwork	38.1	0.574	1,434[c]
Home tasks/marketing	7.7	0.298	1,6.11[c]
Leisure	14.1	0.359	1,546[c]
September[c]			
Own farmwork	49.1	0.663	634[c]
Work on others' farm	57.7	0.725	26[c]
All farmwork	49.1	0.662	654[c]
Nonfarmwork	59.6	0.746	644[c]
All market work	39.2	0.589	1,000[c]
Household tasks/marketing	16.3	0.375	1,556[c]
Leisure	24.0	0.457	1,127[c]

[a] Data available for three years.
[b] Data available for year 3 only
[c] Data available for years 2 and 3.

Table 9 ML estimates of male and female time allocation

	Farm				Nonfarm						Household chores												Total home activities
	Work on own crops		Farm casual		Nonfarm self-employed		Nonfarm_laborer		Total nonfarm		Fetch water		Collect firewood		Visit the market		Herd livestock		Milk animals		Gather and prepare fodder		
	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient	z	Coefficient z
Human capital																							
Difference in age	0.01	**8.05**	0.00	**1.85**	0.01	**3.71**	–0.00	–0.31	0.00	**3.11**	–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	0.01	**1.46**	–0.04	**2.86**	0.04	**4.21**	0.02	–1.05	0.05	**12.16**	–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	**35.51**	0.02	**9.03**	0.03	**13.05**	0.04	**11.33**	0.03	**28.29**	-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 (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**	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**
Daughter	0.39	**14.67**	0.08	1.04	–0.05	–0.71	0.29	**3.24**	0.22	**4.96**	0.22	**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**
Daughter-in-law	0.13	**4.39**	0.12	1.53	0.07	1.05	0.40	**4.01**	0.28	**6.23**	–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	0.32	**10.91**	0.26	**3.42**	0.28	**3.85**	0.28	**2.51**	0.41	**8.17**	–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	–0.50	**14.07**	–0.15	**1.99**	–0.24	**3.25**	–0.98	**6.65**	–0.80	**11.88**	0.71	**8.81**	–0.30	**2.65**	–0.90	**–4.91**	0.14	1.49	–0.01	–0.15	0.31	**8.03**	
Other male	–0.20	**5.85**	0.07	0.91	0.15	**2.08**	–0.83	**5.14**	0.32	**5.62**	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 (a) df	–0.65		–0.39		–0.45		–0.61		–0.59		0.33		–0.49		–1.26		–0.84		–0.33		–0.42		–0.04
Test husband =0 (b) 1	2,396	0.00	105	0.00	170	0.00	127	0.00	720	0.00	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)	1.49	**77.71**	1.14	**22.29**	0.76	**14.40**	1.10	**16.17**	1.00	**31.41**	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**
Coefficient of household size in p	–0.04	**7.94**	–0.07	**4.91**	–0.01	–0.95	0.03	**1.71**	0.02	**–2.95**	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	0.36	**6.72**	–0.32	**2.57**	–1.92	**16.54**	–1.97	**12.64**	–1.26	**17.51**	–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 household size	0.50		0.71		0.88		0.85		0.81		0.69		0.79		0.85		0.91		0.83		0.72		0.13
p at half median size	0.52		0.48		0.48		0.56		0.47		0.57		0.47		0.43		0.42		0.47		0.49		0.69
Number of observations	8,214		1,849		3,898		2,098		7,143		1,290		1,367		1,654		785		1,467		1,537		2,086
Log-likelihood	–5,512		–1,666		–2,836		–1,496		–5,344		–1,026		–1,242		–1,179		–505		–1,372		–1,587		–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	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq.	p-value	Chi-sq. p-value
all jointly 3	4,051.0	0.00	141.3	0.00	488.6	0.00	145.1	0.00	2,774.7	0.00	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	698.9	0.00	16.4	0.00	61.8	0.00	77.5	0.00	305.3	0.00	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	342.0	0.00	4.1	0.04	3.3	0.07	56.1	0.00	158.8	0.00	118.6	0.00	8.3	0.00	33.9	0.00	10.3	0.00	0.00	0.91	3.2	0.07	59.6 0.00
other males=other female 1	103.7	0.00	2.3	0.13	1.2	0.27	27.3	0.00	69.9	0.00	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
Roles among females																							
wife=daughter 1	77.4	0.00	4.3	0.04	1.5	0.22	1.0	0.33	1.0	0.31	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	2.9	0.09	5.8	0.02	0.0	0.88	0.0	0.98	3.9	0.05	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	46.4	0.00	14.6	0.00	5.9	0.02	0.8	0.36	15.5	0.00	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
daughter=d-in-law1	35.7	0.00	0.1	0.76	1.3	0.25	0.6	0.44	0.6	0.43	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	102.0	0.00	17.6	0.00	8.7	0.03	1.6	0.66	17.6	0.00	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
Roles 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	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	103.6	0.00	17.4	0.00	31.1	0.00	2.3	0.13	17.5	0.00	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	120.4	0.00	24.3	0.00	37.9	0.00	11.3	0.00	30.8	0.00	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
Roles and gender																							
all coefficients 6	6,536.2	0.00	159.4	0.00	282.3	0.00	1,026.8	0.00	3,045.9	0.00	253.0	0.00	184.0	0.00	1,947.6	0.00	870.4	0.00	278.2	0.00	221.6	0.00	515.5 0.00
Coefficients (in levels)																							
Wife	1.07		0.88		1.06		1.50		1.18		0.46		1.04		1.09		1.17		0.54		0.76		0.66
Daughter	1.47		1.08		0.95		1.33		1.25		0.44		1.16		1.58		2.04		1.18		1.24		0.84
Daughter in law	1.14		1.12		1.07		1.50		1.33		0.27		1.18		1.52		1.42		0.57		0.81		0.56
Other female	1.38		1.30		1.33		1.32		1.51		0.54		1.45		1.30		1.53		1.34		1.31		1.10
Son	0.60		0.86		0.78		0.37		0.45		2.03		0.74		0.41		0.21		1.15		0.99		1.37
Other male	0.82		1.08		1.17		0.44		0.73		1.86		0.82		0.82		0.19		1.50		1.24		1.51
Husband	0.52		0.68		0.64		0.54		0.55		1.40		0.61		0.29		0.43		0.72		0.66		0.96

Notes: 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 percent level or better appear in boldface.
(a) Coefficient of husband is implied by the other coefficients.
(b) 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 male participation in exclusively male activities

	df	Livestock labor		Construction and field repair		Farm supervision	
		coefficient	z	coefficient	z	coefficient	z
Human capital							
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[a]		–0.41		–0.39		–0.99	
Test husband = 0[b]	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**
Coefficient of household 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 household size		0.75		0.48		0.78	
p at half median size		0.64		0.50		0.73	
Number of observations		2,955		1,635		3,130	
Log-likelihood		–2,704		–1,480		–2,481	

Testing equal allocation	df	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value
Human capital							
All jointly	3	100.90	0.0000	72.28	0.0000	168.79	0.0000
Roles 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	1	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	

Notes: Estimator is maximum likelihood. Likelihood function is presented in the text. One observation per household is omitted. dependent variable is the share of a particular activity undertaken by an individual household member. t-statistics are significant at the 10 percent level or better appear in boldface.

[a] Coefficient of husband is implied by the other coefficients.

[b] Chi-square test of whether the log of implicit coefficient of the husband is different from 0, i.e., whether the implicit coefficient is 1.

Table 11 ML estimates of participation in exclusively female household activities (see text for explanation)

	df	Prepare dung cakes Co-efficient	Z-score	Carry meals to workers Co-efficient	Z-score	Cook and wash dishes Co-efficient	Z-score	Knit and stitch Co-efficient	Z-score	Prepare ghee Co-efficient	Z-score	Wash and iron clothes Co-efficient	Z-score	Clean the house Co-efficient	Z-score
Human capital															
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)															
Daughter		−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**
Daughter-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[a]		−0.28		−0.70		−0.29		0.04		−0.76		−0.15		0.01	
Test wife = 0[b]	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**
Coefficient of household 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 household 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		1,952		641		3,460		1,782		1,736		3,298		3,247	
Log-likelihood		1,901		−524		−2,956		−1,675		−1,052		−3,159		3,158	

Testing Equal Allocation

	df	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value
Human capital															
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
Roles among females															
Wife = daughter	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
Daughter = daughter-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)

		Prepare dung cakes		Carry meals to workers		Cook and wash dishes		Knit and stitch		Prepare ghee		Wash and iron clothes		Clean the house	
Daughter		0.94		1.07		1.08		0.93		1.59		0.92		0.90	
Daughter-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	

Notes: Estimator is maximum likelihood. Likelihood function is 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 that are significant at the 10 percent level or better appear in boldface.
[a] Coefficient of husband is implied by the other coefficients.
[b] Chi-square test of whether the log of implicit coefficient of husband is different from 0, i.e., whether the implicit coefficient is 1.

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Table 12 ML estimates of male and female time allocation in general (see text for explanation.)

| | | January interview | | | | | | | | | | September interview | | | | | | | | |
| | | Worked on own farm | | Nonfarm work | | Farm and nonfarm work | | Household tasks | | Leisure and social time | | Worked on own farm | | Nonfarm work | | Farm and nonfarm work | | Household tasks | | Leisure and social time | |
df		Co-efficient	z-statistic	Co-efficient	z-statistic	Co-efficient	z-statistic	Co-efficient	z-statistic	Co-efficient	z-statistic	Co-efficient	z-statistic	Co-efficient	z-statistic	Co-efficient	z-statistic	Co-efficient	z-statistic	Co-efficient	z-statistic
Human capital																					
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**
Daughter		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**
Daughter 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	320.52	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**
Coefficient of household 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 household size		0.73		0.84		0.66		0.29		0.50		0.71		0.83		0.65		0.27		0.52	
p at half medium size		0.72		0.84		0.66		0.31		0.53		0.70		0.83		0.63		0.28		0.58	
Number of observations		3,631		4,156		5,509		6,139		6,004		2,171		2,629		3,580		4,753		4,156	
Log-likelihood		2,864		2,956		4,189		701		3,350		2,004		1,964		3,153		458		2,703	
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	1,133.8	0.000	482.1	0.000	183.2	0.000	190.8	0.000	759.1	0.000	745.8	0.000	1,738.2	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
Roles among females																					
Wife=daughter	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=d-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
Daughter=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
Roles 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
Roles and gender																					
All coefficients		65,617.8	0.000	2,762.6	0.000	5,551.6	0.000	1,832.4	0.000	2,952.5	0.000	517.0	0.000	1203.3	0.000	1423.4	0.000	3,453.7	0.000	2,798.5	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	
Daughter		1.49		1.44		1.37		0.69		1.29		1.21		1.30		1.26		0.59		1.55	
Daughter-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	

Notes: 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 percent 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 13   Extent of specialization by gender and race

	Days per year[a]		Number of activities in which member is involved[b]		Number of activities for which member is solely responsible[b]		Number of observations
	Mean	Median	Mean	Median	Mean	Median	
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	1,705

Notes: Number of observations 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.
[a]   We assume people work 6 days a week, 6 hours per day. Farm supervision time is not included to avoid double counting with farming itself.
[b]   Farm supervision is counted as a separate activity.

Table 14   Activity switching over time

	Percent performing task in year 1	Correlation coefficient	Percent not doing task in year 2 done in year 1	Percent doing task in year 2 not done in year 1	Number of observations pairs	Estimated autocor. coefficient rho[d]
Farm work						
Kharif land preparation	27.2	0.59	37.2	13.7	4,171	0.15
Kharif irrigation labor	30.8	0.66	36.9	11.6	3,359	0.26
Kharif harvesting labor	33.4	0.68	32.5	14.5	5,038	0.20
Rabi land preparation	28.2	0.64	30.6	14.9	5,124	0.16
Rabi irrigation labor	30.4	0.70	32.7	8.9	3,147	0.29
Rabi harvesting labor	36.4	0.61	33.5	16.0	5,072	0.26
Total crop labor	46.6	0.77	22.9	17.7	7,886	0.41
Farm supervision[a]	37.6	0.81	21.1	14.0	3,419	0.23
Construction and field repairs[a]	54.6	0.79	17.9	20.3	1,401	0.37
Livestock labor[a]	38.0	0.68	31.5	13.7	2,701	0.48
Working as hired farm laborer	35.2	0.51	34.2	20.9	1,188	0.26
Nonfarm work						
Government employment	16.5	0.92	8.7	2.4	1,948	0.60
Private-sector employment	19.0	0.79	21.9	4.6	1,129	0.58
Self-employment	19.7	0.76	25.4	6.6	2,824	0.53
Nonfarm casual labor	24.6	0.70	31.2	8.6	1,407	0.48
Total nonfarm labor	24.7	0.78	22.5	9.4	6,421	0.47
Household chores[b]						
Making dung cakes	43.2	0.29	41.0	39.4	1,694	0.10
Taking meals to workers	44.8	0.48	35.6	22.7	232	0.27
Husking	50.0	0.36	40.0	32.3	130	[c]
Cooking	69.0	0.57	19.7	48.3	3,730	0.20
Knitting	37.9	0.29	46.0	29.1	1,096	0.12
Making ghee	33.1	0.54	28.7	17.4	1,128	0.33
Washing and ironing clothes	55.4	0.46	28.3	40.1	3,136	0.18
Cleaning the house	54.5	0.39	34.4	43.0	3,051	0.12

[a] Males only.
[b] Females only.
[c] Not enough observations.
[d] See text for details.

FIGURES

Figure 1. Histogram of Individual Shares of Total Work
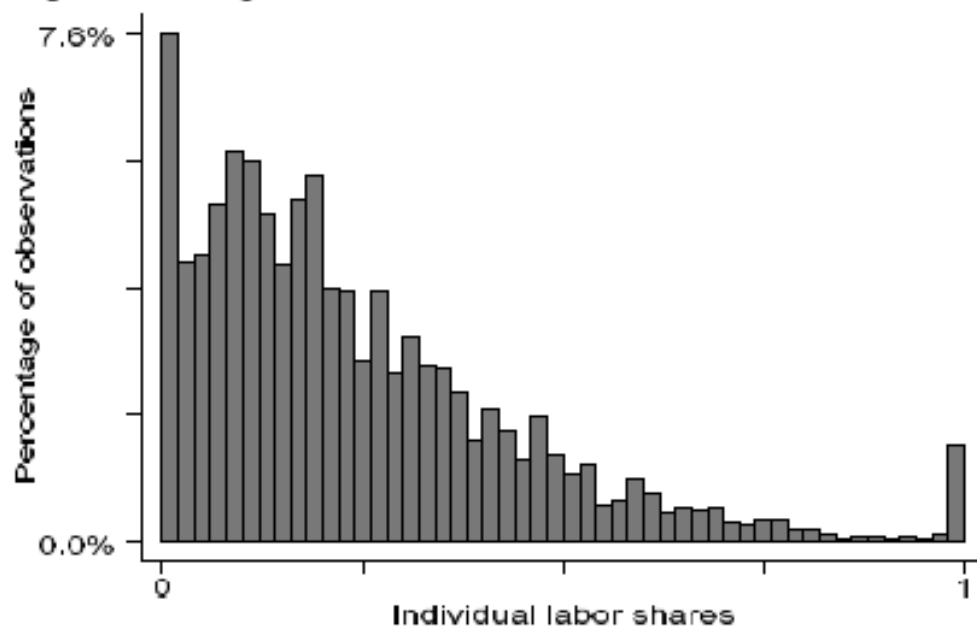
Figure 2. Histogram of Individual Shares of Water Fetching Time
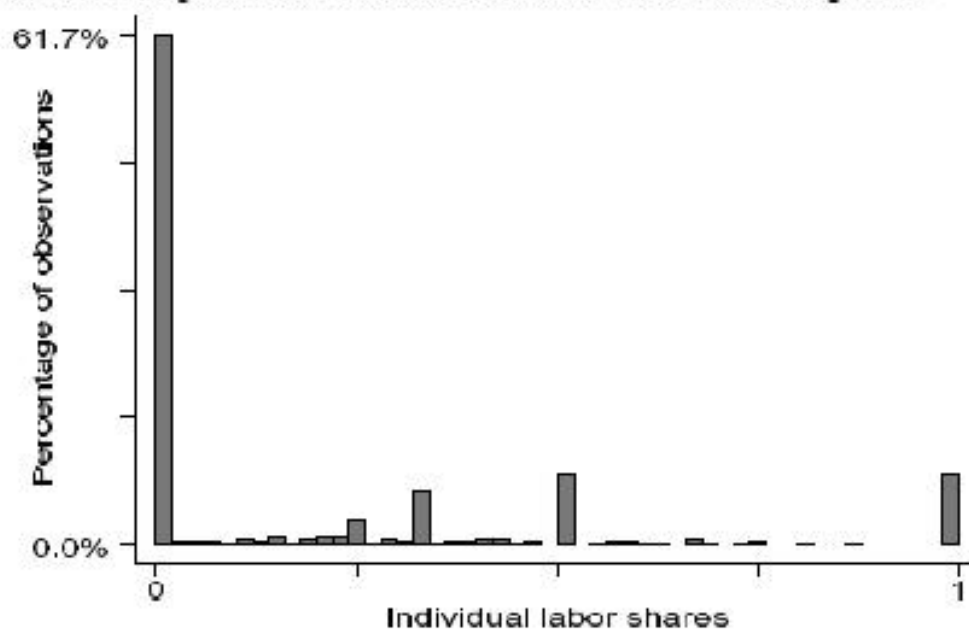
Figure 3. Relationship Between Share of Workforce and Share of Work
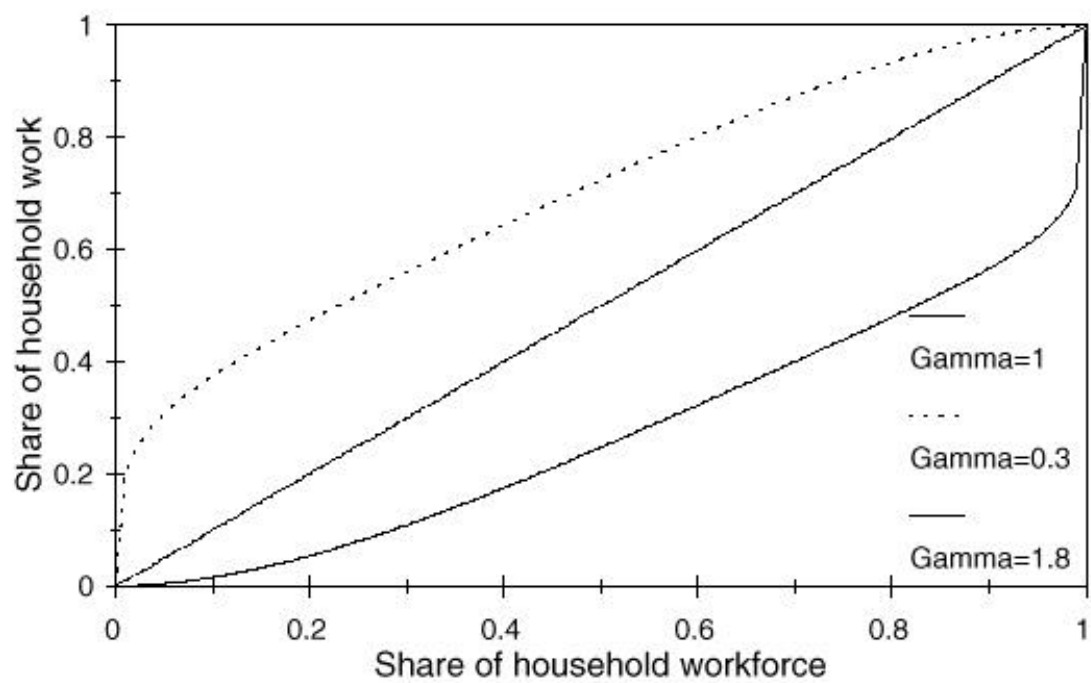
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