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Gender and the Allocation of Adult Time

Evidence from the Peru LSMS Panel Data

Nadeem Ilahi

Analysis of time use data for Peru in 1994 and 1997 shows that women work up to a fifth more than men do and that women in poor households work more than those in rich ones, while there is no difference for men.



Summary findings

Ilahi analyzes the determinants of intra-household time use in Peru in 1994 and 1997. She tests whether sickness, unemployment, the provision of water and energy services, and other factors affect the time use of men and women differently.

The results show that women work up to a fifth more than men do and that women in poor households work more than those in rich ones, while there is no difference for men. Women's work is concentrated in housework and men's in income-generating activities.

Sickness does not affect the work burdens of men or women, but it alters the composition: men work more in income-generating activities, and women tend the sick. Men bear a greater burden from female unemployment than do women from male unemployment. Improvements in the provision of water and energy services affect the time use of both men and women. And finally, demographic and life-cycle variables are as important as gender in explaining differences in time use.

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Gender and the Allocation of Adult Time: Evidence from the Peru LSMS Panel Data

Nadeem Ilahi
LAC-PREM, The World Bank

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I. Introduction

The study of determinants of time allocation in developing countries has received increasing attention in recent years. Not only does such an analysis provide important insights into labor supply behavior, but it also gives useful information about policy changes that require changes in the use of time in the household. Time use studies can show where, among others, education, transport and basic services projects face limitations because they do not properly account for the time allocation of users. For instance, infrastructure projects that provide basic services such as water and energy are more likely to be successful if without them households have to allocate a large amount of time to acquire water and energy.

A number of studies have analyzed the determinants of time use in developing countries.¹ It is widely held that women in developing countries bear a disproportionate share of work, with most of their activities concentrated in the home. Little is known however if women are also more vulnerable (in the sense of their work burden) whenever there is unexpected change in the environment of the household in the form of sickness or unemployment.

This paper attempts to answer these questions by controlling for unobserved heterogeneity so common in cross-section data. It uses the 1994 and 1997 panel data from Peru to answer the following questions:

- Do women undertake a disproportionate burden of work compared to men?
- Do they bear a disproportionate time burden of sickness in the household?
- Do women overcome unexpected changes in employment in the household by changing their own time use more than men do?
- Do poor energy and water supply services affect women's time allocation more than men's? Is women's labor supply to income-generating work affected by poor services?

¹ See among others Alderman and Chishti (1991), Khandker (1988), King and Evenson (1983), Skoufias (1993) and Fafchamps and Quisumbing (1998).

- Does time use inside the household vary by age, ethnicity, demographic variables etc. as much as it does by gender?

There are two competing views about why time use patterns differ by gender in developing countries. On the one hand, it is argued that social roles and norms dictate a segregation of activities by gender. Women are predominantly found doing household chores and men in income-generating activities, because those are largely the roles that society prescribes for them. On the other hand, economists and behavioral scientists have argued that men and women in developing countries respond to economic incentives and constraints to alter their time use. An extreme position in this regard is that work activities are divided along the lines of comparative advantage—men are better at market work and women at housework. However, a more tempered neoclassical view argues that male-female time use responds to economic changes as much as other behavioral factors such as consumption.

While it is relatively straightforward to include economic opportunities and constraints, demographic and regional characteristics, into an empirical analysis of time use, it is quite difficult to pinpoint the exact variables that capture social norms or values that also influence intra-household time use.² However, as far as social norms and values stay unchanged over a relatively short period of time, an analysis of time use using panel data can control for some of these differences in norms by controlling for unobserved differences in time use. This paper takes advantage of the fact that unlike in previous studies in the literature, the availability of panel data from Peru allows us to determine the adequacy of the economic model in describing intra-household time use. If economic variables are found to not influence time use significantly, then it can be argued that the variations could be from differences in other factors such as social norms and roles. This paper estimates the determinants of time allocation of adult men and women.

² Dummies for ethnicity or the status of an individual within the household hierarchy may be incomplete in capturing the effects of social norms.

The findings of this paper are that while economic variables may be somewhat important in determining the intra-household allocation of time, the effect of different social roles for men and women cannot be ruled out. Specifically, the findings are:

- As far as all work activities are concerned, work burdens of men and women are not excessively high. Women work 15% - 20% more than men do and unlike men, women in poorer households work more than those in richer ones.
- However, women's work is concentrated in housework and men's in income generating activities. These differences do not vary substantially by per capita expenditure.
- Sickness in the household does not significantly alter the work burden of men or women. However, there is a substitution of intra-household time between men and women, whenever there is sickness—women tend the sick and men compensate for their lost time by working more in income-generating activities.
- Surprisingly, increases in male unemployment results in a *smaller* increase in female work burden than vice-versa.
- Improvements in the provision of water and energy at the household level affect the time use of both men and women.
- Age, ethnicity, marital status and the presence in the household of women of working age are perhaps as important in explaining differences in time allocation as is gender.

II. Framework and Hypotheses

The neoclassical model of the household can be employed to explore the role of economic opportunities and constraints on time use.³ In this model, home production is taken as an explicit process within the household economy. Household members allocate their time to market activities as well as to home production. The output from home production is consumed within the household along with purchases of market inputs. There are numerous examples that have employed this framework to analyze various impacts on the household economy.⁴

The optimal conditions of the neoclassical model with home production are that time is allocated to various activities until the marginal return from home production is equal to the wage for those who participate in market work. If all members in the household engage in market

³ This model was first proposed by Becker (1965) and further modified by Gronau (1977).

⁴ See among others, Ilahi and Jafarey (1998), Khandker (1988), Pitt and Rosenzweig (1990) and Singh et al (1986).

activities then the model is separable and the determinants of time allocation can be estimated using the standard labor supply formulation—i.e. the determinants would include non-wage income, wages, labor demand etc. If some members do not participate in market activities, as is common in developing countries, then the model is non-separable and household and individual characteristics have to be included on the right hand side of time equations.⁵

This paper is interested in assessing whether sickness and disease and unexpected changes in unemployment alter the time-use patterns of men and women. We are particularly interested in testing whether such changes force women to alter their time use more than they do men. For this purpose, we use *shares of time allocated to various activities as a proportion of total time worked by the individual* as the dependent variables. The use of shares serves the purpose of highlighting time allocated to various work activities by controlling for leisure.⁶ To focus on leisure, we also estimate an equation for the total work burden faced by an individual—the flip side of leisure. So for each individual, the following four equations are estimated:

$$\theta_{it}^g = f(\Omega_{jt}, \Theta_{it}, \mathbf{X}_{it}, \mathbf{Y}_{jt}, \mathbf{Z}_{kt}) + \varepsilon_{it}$$

$$\tau_{it}^g = f(\Omega_{jt}, \Theta_{it}, \mathbf{X}_{it}, \mathbf{Y}_{jt}, \mathbf{Z}_{kt}) + \varepsilon_{it}$$

where τ_{it}^g denotes the total work effort (over the past week) of individual i of gender g at time t .

θ_{it}^g is the ratio of time spent in each of the three activities (housework, self-employment, and

wage work) to total work τ_{it}^g . Ω_{jt} denotes health and sickness variables in household j in which

individual i resides (these are discussed in detail below). Θ_{kt} captures cluster level economic

⁵ Since markets in developing countries are likely to be non-separable, it is more appropriate to include household and individual characteristics on the right hand side and test for separation—i.e. whether such characteristics have no effect on time use.

⁶ The use of shares instead of actual hours as dependent variables also serves to reduce the measurement error problem in hours also. If recall bias is respondent specific and if actual hours allocated to an activity are used as the dependent variable then there is likely to be a bias in the estimation. If recall error is multiplicative—i.e. it affects all the reported hours of an individual in the same proportion—then the share of time allocated to an activity in total work time of the individual would not contain this bias. This is

shocks such as unemployment (also see below for details). X_{it} , Y_{jt} and Z_{kt} are individual (i), household (j) and community (k) level characteristics respectively. Lastly, this paper employs a random effect formulation of the error term ε_{it} . Under this formulation, individual-specific heterogeneity is controlled using a Generalized Least Squares (GLS) method. The alternative approach of fixed effects—which is the same as introducing a dummy variable for each individual in the sample—is not employed here because of the very small number of observations over time (only two).⁷ The error term in the random effect formulation is given by:

$$\varepsilon_{it} = u_i + v_{it}$$

where v_{it} is a classical error term with mean zero and variance equal to σ_v^2 . u_i captures the variance due to individual heterogeneity. The proportion of total variation in ε_{it} due to individual heterogeneity is given by ρ which is the share of σ_u^2 in σ_ε^2 . Estimates of ρ are also reported with the results.

It is common in estimation of the determinants of time allocation to find a sizable proportion of the sample at the corner for some activities. For instance, large proportions of women in developing countries do not typically participate in income-generating work. The issue for the analyst is to properly account for the zeros in the dependent variable. Ignoring the zeros in the dependent variable and estimating straight regression can yield biased estimates since there may be a selection process at play which determines whether an individual's time in an activity is zero or positive. The approach taken in this paper is to estimate a probit and a least squares regression on non-zero values of the dependent variable for each set of dependent variables. The probit shows how the decision to participate in a particular activity is determined. The regression shows the determinants of time allocated to the activity, contingent on the individual spending non-zero hours in that activity. Both equations are estimated using the random-effects approach

because the proportional error would cancel in the numerator and denominator. For a detailed review of problems in measuring time use see Juster and Stafford (1991).

so both are free of unobserved heterogeneity which can bias the estimates of standard errors in cross section data.

Sickness and Disease

Within the framework of the neoclassical household model, sickness and disease incur costs on the household. These may be direct costs—primarily the cost of medical inputs purchased from the market. There may also be indirect time costs. First, in order to maintain incomes and to complete household chores, non-sick members have to substitute for the work of sick individuals by reducing their own leisure.⁸ Second, sick members require extra care and attention from non-sick members. For these two reasons, the sickness of adults and children would have different effects on household time use. Sick adults require time input for both the first and second reasons, while sick children who do not do any work would require time of other household members for the second reason only.

This paper focuses on indirect time costs—i.e. how sickness and disease alter the time use of the non-sick household members. From the perspective of gender analysis, the following hypotheses are of particular interest:

- Does the burden of care for the sick and infirm fall disproportionately on women? Or do men and women share equally?
- Does child sickness differ from adult sickness in the affect on time use?
- Does sickness in the household increase the total work burden of women more than that of men?

⁷ Greene (1997) notes that fixed effects may not be consistent if there are too few observations over time.

⁸ Note this would be true even if the infirm adult does not participate in income generating activities and only does housework. The time of remaining household members would have to be re-allocated and their total time increased. Only in the case of children, infants or the elderly who contribute nothing to the household economy—in terms of either income generation or housework—would these costs be zero.

- Do sickness and disease in the household induce a substitution of work patterns whereby women allocate more time to housework and care and less to income-generating work, while men do the opposite?

Sickness and disease are not purely exogenous variables in the household setting.

Household choices affect the health and general well-being of members. One manner in which household choices affect sickness and health is time use. The allocation of time of household members to the production of household public goods (cleanliness, hygiene etc.) can affect the incidence of sickness. Moreover, more time allocated to income-generating activities results in higher income and greater consumption of nutrition and health inputs. Thus it is likely that using observed indicators of health as explanatory variables in time allocation equations would yield biased estimates of time allocation (see Pitt and Rosenzweig 1990). This paper explicitly recognizes the incidence of sickness and disease as an endogenous process. In the econometric estimation instrumental variables are used to control for the endogeneity of health, essentially following the approach taken by Pitt and Rosenzweig (1990).⁹ It is assumed that sickness and disease are household-level effects, i.e. they are generated as household- rather than individual-level processes. The instruments for adult and child sickness are estimated separately. The results of estimation of sickness indicators are discussed in the appendix.

Unemployment

How do layoffs and involuntary quits affect the intra-household allocation of time? The unexpected unemployment of a family member can force a sudden reallocation of resources and time. The interesting question from a gender perspective is whether the effect of job loss on intra-household time use is symmetric across gender. Or put another way, does female layoff

affect male work pattern the same way as male layoff affects female activities? The underlying reason for testing the effects in this manner is that there are reasons to expect there may be asymmetries in the adjustment of time allocation to unemployment shocks. If women have a greater tendency to smooth household consumption than do men, then they would react to the job loss of a male counterpart by increasing their participation in income-generating activities more than men would faced with a female job loss. It remains an open question what happens to the time of children (the subject of a companion paper) and to time allocated to housework (this paper).

How can we conduct this test in a consistent and clean manner? Ideally, we need an indicator for whether a member of the household was laid off from his/her job, or whether they experienced a wage cut. However, even quite sophisticated labor surveys do not make a distinction between voluntary and involuntary job losses. The distinction is extremely important for our purposes because the former will be endogenous and the latter exogenous. In the absence of this distinction in the Peru survey, we calculate unemployment shocks at the cluster level—we calculate separate unemployment rates for men and women. Gender-specific cluster unemployment rates are defined as proportion of men (women) in cluster not employed divided by total number of prime-age men (women) in cluster.^{10,11}

We do not use this analysis for urban Peru for the following reasons. Clusters in the urban sample are a lot more integrated in terms of labor demand than are rural ones. For instance it would be hard to interpret changes in employment in two adjacent clusters in Lima as employment shocks, since individuals in one cluster can work in the next one with little cost.

⁹ However, one difference between the approach in this paper and that study is that in the latter the data are cross-section. Pitt and Rosenzweig (1990) construct a pseudo panel by employing “household” fixed effects, i.e. fixed effects that are common across household members contemporaneously.

¹⁰ Prime age: between 18 and 60 years.

¹¹ Aggregating the unemployment rate to the cluster level does not completely get rid of the voluntary vs. involuntary quits problem. However it does tend to disconnect from the individual level by indicating that general changes in cluster level unemployment rates over time are indicative of changes in labor market situation.

Infrastructure for Basic Services

In developing countries the infrastructure for the provision of water and energy is poor or non-existent. These services thus have to be acquired by household members. In most settings the burden of provision of these services for the household falls largely on the female members.¹²

Since these are “outside chores” that are time intensive, a few obvious questions come up:

- Do “outside” chores constrain women from allocating time to income-generating work more than they do men?
- Or, do they increase the total work burden of women more than men.

The existing literature provides mixed results on this. Kumar and Hotchkiss (1988) find that a deterioration of access to forest wood tends to lower the allocation of women’s labor to on-farm activities in the hills of rural Nepal. However, the Nepal region is a case of a peasant agricultural system with little hired labor. Thus it is not surprising that increased demands on women’s time through a worsening of access to forest energy results in a reduction in their time on the farm. Ilahi and Jafarey (1998) extend this to all of rural Pakistan. Here rural markets for labor exist. Their results indicate that while worsening access to firewood increases the time women have to allocate to collection activities, there is no countervailing drop in time allocated to income-generating work. The case of water collection is somewhat different. Ilahi and Grimard (1998) find that more difficult access to water in rural Pakistan does result in significantly less time allocated to earning activities. This is understandable when one considers the fact that water is quite inelastically demanded (it has little substitutes) whereas firewood has a number of substitutes (coal, kerosene, dung etc.).

¹² There is some evidence that certain activities are also carried out by men. For instance Fafchamps and Quisumbing (1998) who analyze intra-household time use patterns in three rural districts in Pakistan find that water collection is in the domain of women while wood collection for energy are largely male activities.

The analytical approach in the existing literature to assess the impacts of exogenous changes in these outside chores on time allocation is to use a variable that captures the “productivity of collection”.¹³ The data on Peru do not include this level of detail. All that can be constructed are dummy variables that indicate whether the household has access to in-house water or if it uses gas/electricity, firewood, coal or something else for energy. However, the crudeness of these variables is somewhat overcome by the fact that unlike previous work we are dealing with panel data where the results would control for unobserved heterogeneity.¹⁴

Demography and Life cycle

An analysis of the determinants of intra-household allocation of time in developing countries is incomplete without incorporating demographic and life-cycle explanatory variables. Household time burdens are not equally distributed across age (see Ilahi and Grimard, 1998; Ilahi and Jafarey, 1998). It appears that the expectations of work and its composition for an individual change over the life cycle. We include age and its square to capture these effects. Moreover, the age composition of the female members may also be indicative of the possibilities that are open to other members (men and women) for having their work substituted by others. For instance, the presence of adolescent children in the household may allow adults to pursue income-generating work. We include the number of children under 4 and the number of females in the following age groups: 5 through 14, 15 through 60 and above 60. Marital status may also influence time allocation—we include a dummy for if the person was single.

We capture gender and vulnerability indicators by using a dummy for female headship. While the concept of female headship has come under a lot of criticism for not adequately identifying gender vulnerability, it remains the most useful single indicator in the absence of

¹³ This is typically kilograms collected per hour.

¹⁴ This paper does not address the even more complicated issue of correcting for the endogenous placement of basic services. This is due to a lack of data.

anything better.¹⁵ Our objective in including female headship as an indicator of gender vulnerability or female decisionmaking is to see if female and male time allocation in such households is significantly different from their counterparts in male-headed households. Also, whether after controlling for wealth and human capital women in female-headed households devote less time to income-earning activities than do women in male-headed households. We also include a dummy variable for headship itself, i.e. if the individual was a household head or not.

Ethnic origin in Latin America is an important indicator of poverty. Household poverty has been found to be significantly higher among native groups than their non-native counterparts (Psacharopoulos and Patrinos, 1994). An obvious question from this is whether the intra-household composition of time in such households is also different. Do women in such households carry a greater work burden than women in non-native households? Do native males have different labor force behavior than their non-native counterparts?

Education captures the human capital of the individual, and it is an indicator of earning opportunities in the labor market. We include education to indicate not only income potential but also to assess whether education alters the work composition of men and women in the household.

Lastly, theoretical time allocation models call for the inclusion of a non-wage income variable on the right hand side. However, in a developing country setting, non-wage income may itself be endogenous for other reasons. Households may receive remittances if they suffer a negative economic shock, thus remittances which are typically included in non-wage income may make that variable endogenous.¹⁶ If we exclude remittances then the new non-wage income

¹⁵ See Rosenhouse (1989) and Mason and Lampietti (1998) for a criticism of the use of this concept in poverty analysis.

¹⁶ See among others, Rosenzweig and Stark (1989).

variable ends up being zero for a large proportion of the sample.¹⁷ In order to overcome this problem we use a stock indicator—household wealth as captured by the real value of household durables. In addition we also use the real value of agricultural assets for rural households and the real value of urban property for urban households.

III. Data and Summary Statistics

The data used in this paper are the LSMS panel of Peru. The 1994 and 1997 subsets were used to construct the panel.¹⁸ This yielded a total of 898 households and 2095 individuals.

The data set contains information on three components of time use—housework, self-employment and wage work. Housework is not disaggregated further into its various components such as child care, cooking, energy or water collection etc. This restricts the manner in which hypotheses can be tested. For instance, the sickness of a child may result in the mother reducing the time she spends on cooking and increasing care for the sick child. If this happens, then the effect of the child's sickness on the mother's housework would be zero. Of course someone else in the household would have to substitute for her time in preparing food. The lack of disaggregation of the housework variable also prevents us from explicitly testing hypotheses regarding energy and water infrastructure on time use (these are discussed in detail below). Note however that this limitation does not prevent us from testing the effect of these variables on time use in income-generating activities.

Reliable community-level data are not available in the Peru LSMS. These variables are constructed from the data itself, aggregating up to the segment level. Note that in aggregating up to the cluster level we do not just use the panel households but the larger sample in each of the

¹⁷ What is left is typically pensions, rents and other small sources of income which are typically zero for a large proportion of the sample.

¹⁸ Earlier years of the Peru LSMS can also be hooked up together in a panel. However, the 1994 and 1991 have not been set up as a panel at the individual level. Regardless, going to an additional year (1991) would either substantially reduce the sample size for a balanced panel, or it would yield an unbalanced

cross sections. The cluster level information then consists of panel individuals and those not in the panel.

Let us look at the pattern of intra-household time use by per capita consumption. We provide histograms for male-female time use split along the lines of consumption deciles in figures 1-4. Figure 1 shows the hours per week allocated to all types of work activities by men and women in the sample. The first striking fact is that the total time worked is not as high as one would expect in a country like Peru. In none of the deciles does work exceed 60 hours per week. However, there are significant differences between urban and rural subsamples, with men and women in the latter working more than those in the former (see table 1 for details). The other striking fact in figure 1 is that women tend to work almost 15-20% more per week than do men. Female work varies by consumption decile. Women in the bottom two deciles work the most, but men in these deciles do not appear to have their work burden any different from men in the rest of the deciles. This seems to indicate that the burden of poverty may be falling on the women in the form of high work needs. Total work patterns tend to mask the disparities that exist between the differing nature of male and female work. Figure 2 graphs the shares of housework in male-female work. Here the contrast between men and women is stark (as expected). Housework accounts for on average 70% of the work effort of women in Peru. It is only 25-35% of the work effort of men. These differences are particularly stark at the bottom end of the consumption distribution (about 73% for women and 23% for men) but less so at the top end (68% for women and 36% for men). The interesting pattern that emerges from this figure is that men's housework seems to vary somewhat across deciles (though not showing any pattern). However, the share of housework in total time of females stays unchanged—there is little difference for instance between this share for women at the bottom and top deciles.

panel. In order to avoid the complications of using an unbalanced panel, the subset used in this paper is restricted to the 1994 and 1997 data sets.

Lastly, figures 3 and 4 graph the shares of self-employment (i.e. farm and non-farm enterprises) and wage work in total work. Here there is a reversal of the pattern observed for the share of housework. The share of self-employment in male time is on average twice as high as that of women. In wage work it is more that twice as high. Wage employment accounts for only about 10% of female time (as opposed to about 30% of male time). There appears to be a pattern across consumption deciles also. The share of wage work in total work for women increases as consumption increases. No such pattern emerges for the share of self-employment in figure 3.

We now discuss briefly the summary statistics in table 1. The sample is split along rural-urban lines and within these categories, along female-male lines. In order to focus on the time use of prime-age adults, the sample has been restricted to those over 15 and under 60 years of age. The most stark difference that emerges from the data is in time use across rural-urban lines. Work burdens are higher in rural (58 hours per week for women and 50 hours per week for men) than in urban (49 hours per week for women and 43 hours per week for men) areas. Women in rural Peru hardly spend any time on wage work (6%) compared to urban women (17%) and rural and urban men (32% and 36% respectively). Rural households are poorer in assets than urban ones. They also have lower access to energy and water services (22% and 53%) compared to urban households (92% and 96%). They also have much fewer hours of public water supply. The incidence of child sickness is higher in rural Peru (24% vs. 13%) while the incidence of adult sickness is somewhat similar (37% vs. 41%).

IV. Empirical Results

The results of econometric estimation of determinants of total work and housework time equations are presented in tables 2a and 2b for the rural and urban samples respectively. Similarly, those for time in income-generating activities--self-employment and wage work—for rural and urban samples are presented in tables 3a and 3b.

Sickness and Time use

First we discuss the estimated coefficients for the effect of health and sickness on adult time use. Recall that sickness is considered endogenous in our estimation. Estimates of determinants of child and adult sickness at the household level are presented in the appendix table. Columns 1 and 2 in table 2a and 2b list the results of the estimation of regressions for total time, i.e. hours per week allocated to all types of work activities (housework, self-employment and wage work) in rural and urban areas respectively. Our original interest was in assessing whether women face a disproportionate increase in time burden as a result of sickness in the household (i.e. if they have to sacrifice their leisure). Our results indicate that sickness does not alter the total adult time in the household—all the estimated coefficients for men and women are not statistically different from zero.

We could also ask, does sickness alter the composition of time of men and women? We test this by estimating regressions for the decision to do housework by women and men respectively (columns 3 and 4 in tables 2a and 2b) and the share of time in housework to total individual time for women and men (columns 5 and 6). Since all women participate in housework, column 3 is left blank. The results show that rural men increase the share of housework in their total time if a child gets sick, with no change in the time of rural women. On the other hand, adult sickness drives rural women to allocate more time away from income-generating work, with no change for male time use. The opposite pattern seems to be at play for urban areas. Urban men increase their time in home activities when there is a sick adult in the household. All other estimated coefficients in the urban regression are not significantly different from zero.

The increase in rural female time in housework as a consequence of adult sickness in the household is countervailed by a decline in their time in self-employment activities (see column 9 in tables 2a and 3a). Thus there appears to be some substitution of women's time between income-generating work and housework as a consequence of sickness but it runs opposite to our

prior expectations. It appears that for women the “care” effect of sickness dominates the “substitution” effect, which would drive them to work more in income-generating activities. All other effects for rural men and women appear to be insignificant. The picture for the effect of sickness on time use in urban areas is somewhat different. Two effects are significant. First the sickness of an adult tends to drive both men and women to allocate a greater share of their time to self-employment activities. This implies that adult sickness possibly has a stronger income-reducing effect in urban areas where the “shock” to the household income of the sickness of an adult may be greater. Secondly, it appears that urban men do reallocate their time in response to sickness in the household—they are more likely to work as wage workers if a child is sick (column 12, table 3b) and less in that activity if an adult is sick. One explanation for this may be that male participation in wage work in response to sickness is opposite in sign to that of women (column 11, table 3b). Thus the sickness of a child drives the women out of the wage market and the men into it, whereas adult sickness has the opposite effect. One has to be cautious in buying this explanation however, since the estimated coefficients of sickness in the female regression (column 11) are not significantly different from zero.

Employment changes and Time use

Unexpected changes in the employment of household members can alter time-use patterns of men and women. One such change is employment. Our interest is to see if these effects are symmetric—i.e. if the layoff of males affects female time use in a manner similar to the layoff of females. If women in the household put a higher premium on the household’s consumption smoothing than do men, then they are more likely to a) sacrifice their leisure, and/or b) increase the share of income-generating work in their total time whenever there is an employment shock to the opposite sex. Our approach in measuring changes in employment is to develop a cluster-level indicator of male and female unemployment rates. As stated above only the rural subsample is used to estimate this effect. The results in tables 2a and 2b show that both men and women

increase their total work burden (lower their leisure) when employment of the opposite sex falls. However, contrary to our priors, the effect for men is larger in magnitude than that for women, and it is statistically significant, while that for women is not. This suggests that men smooth unemployment shocks through their leisure more than do women. How does the composition of work change? Declines in employment at the cluster level result in an increase in the participation of both men and women in self-employment activities. Note that since we have controlled for the share of formal-informal sector employment (the results are not reported in the tables), it is unlikely to be due to a labor-demand effect on adult time use. Both men and women increase their time in self-employment activities, though the effect for men is stronger in magnitude. For men there is also an attendant decline in wage work, which may be partly due to labor-demand effects that are correlated with female overall employment rates. Lastly, there is no effect of changes in employment on housework. While the estimated coefficients for men and women are both negative, they are not statistically different from zero.

Water and Energy Infrastructure and Time-use

It is now quite well known that time-intensive household chores, such as water and wood collection, can alter time-use patterns within the household. Recall that we are hampered in exploring these links by the fact that only dummy variables for sources of water and energy are available in the data, along with the hours of public water supply. On the outcome side we do not have information on housework disaggregated by various components—time in energy collection, water collection, cooking etc. Because of the latter lacunae, we can only test whether energy and water collection requirements (as captured by water and energy dummies) constrain household members from participating in income-generating activities or if they increase the total work time of household members. Further, water and energy collection time costs are large primarily in rural areas where people have to travel long distances. In urban areas these time

costs are not that high. Thus we do not report the results for urban areas here, although energy and water infrastructure variables were also included in the urban subsample regression.

The results in tables 2a and 3a show the weak relationship between household infrastructure dummies and time use. The infrastructure variables do not have an effect on the total time household members spend in housework. Interestingly, women in households using firewood, or without in-house water supply, do not have significantly higher work burdens than women who do not.¹⁹ In terms of the composition of work, tables 2a and 3a indicate that women in rural households with fuelwood or coal as the source of energy tend to devote a smaller share (about 10%) of their time to self-employment activities. They also allocate a greater share to housework compared to their counterparts who use modern fuels. The results with respect to water are somewhat different. Here it seems men are the ones who respond to changes in the provision of these services. In households that do not have in-house water, men have a lower propensity to participate in wage work and they tend to allocate a greater share of their time to self-employment activities, such as agriculture. This suggests that there may be complementarities between farm work and water collection, which men are able to make use of. After controlling for source of water supply, an additional hour of public water supply at home allows men to increase the share of self-employment activities by reducing their time in housework, though the latter effect is below the 10% level of significance. The results for women are all insignificant. Again this suggests that as far as water infrastructure is concerned, men would benefit more from the provision of in-house water supply.

Life cycle and Demography and Time-use

Household characteristics play a big role in time allocation in developing countries. We employ a number of them in our analysis. First, we use a dummy for whether the individual was a

¹⁹ Note we have controlled for the effect of wealth on time use in these regressions through variables such as value of durables and value of agricultural assets.

household head. Tables 2a and 2b show household heads do not work more than non-heads, with the exception of male heads in urban areas who do. However the composition of time of household heads is somewhat different in rural and urban areas. Female heads in rural areas tend to spend a lower proportion of their time in housework and are more likely to participate in self-employment activities. This is consistent with the fact that female-headed households may be poorer also. The same is not true for male heads in rural areas. In urban areas, however, it is the male heads who spend less time in housework and are more likely to work in self-employment. Female heads in urban areas tend to spend more time in wage work than their non-head counterparts in the household.

It is quite common in the literature on poverty to use female headship as an indicator of poverty.²⁰ We employ dummies for female headship to see if there are any systematic differences in time use in such households compared to their counterparts. Our results show that urban men in female-headed households work more than their counterparts in male-headed households. As far as the composition of time is concerned, women in female-headed households allocate less time to housework and more to income-generating work than their counterparts in male-headed household. Thus the overall pattern that emerges from the time-use behavior of heads and members in female-headed households is that while females in female-headed households do more income-generating work and less housework, urban men who are heads also tend to do the same.

Ethnic origin may also play a role in time allocation, partly because social norms regarding work may be different for non-native and native peoples. However, any test on social norms would be clouded by wealth differences also, in that native households are more likely to be poor than their non-native counterparts. We control for differences in wealth and find that individuals in native households do not work more than those in non-native ones and that there

²⁰ See Rosenhouse (1989) and Mason and Lampietti (1998) for a criticism of the use of this concept in poverty analysis.

are few differences along gender lines. However the same cannot be said of the composition of the work. Women in native households tend to allocate less time to housework and more to income-generating work than do women in non-native households. Men in native households have a lower tendency to work in wage work than their counterparts. These results indicate that native women may be facing a greater burden of household poverty than native men.

How does human capital affect time use? We use years of education as an explanatory variable. Education does not affect the total work burden of men or women, except for rural educated men who tend to work less (consume more leisure) than their uneducated counterparts. Does education make one more likely to work in the market and less likely to do housework? The results show that education has little effect on time use in rural areas, predictably because labor markets that reward education do not exist in rural areas. In urban areas however, there is a clear pattern of the effect of education on time use. Educated men and women tend to substitute self-employment work (which largely tends to be in the informal sector) for wage work compared to uneducated men and women respectively.

An analysis of the allocation of adult time is perhaps incomplete without life-cycle variables such as age. Do the differentials in work burdens between men and women vary over the life cycle? We employed a quadratic specification to test whether non-linearities exist in the relationship between age and time use. Our results indicate that the relationship between time use and age is perhaps the most striking in the whole analysis of the paper. Total work for both men and women rises with age but at a decreasing rate, peaks at middle age and then falls. In rural areas, total work for women peaks at about 38 years and for men at 36. In urban areas, total work peaks a little later—44 years for women and 42 for men. The higher urban peak may be a consequence of delayed fertility that moves child care related work burdens to later years. The composition of male and female work also varies in a similar manner over the life cycle. The share of time spent in housework falls (at a decreasing rate) over the life cycle in both urban and

rural areas.²¹ Time allocation to income generating work varies in the opposite manner. In rural areas the propensity to participate in self-employment and the time allocated to it rise with age but at a decreasing rate. In urban areas, the propensity to work in self-employment and wage work increases with age, but conditional on this choice, the time allocated to these activities stays quite fixed.

Another life cycle/demographic variable of interest in time-use analysis is the number of children under 4 years of age and the age composition of the household, particularly that of females. Our results show that the presence of young children in the household does not have that much of an effect on adult time use. One reason this may be so is that older siblings in the household may be taking care of the very young. Thus the effect of the very young would show in the time-use of children (the subject of a companion paper). There appears to be little relationship between the number of females in the 5-14 age and the mother's time in various activities. This is somewhat surprising given the commonly held view that young daughters step in when mothers do market work. The presence of young girls does make it less likely for adult men to do housework in urban areas. The number of adult women in rural households allows other women of working age to substitute self-employment work for housework. There appears to be no effect on men's time allocation. In urban areas, prime age females significantly lower the work burden of other adults (both men and women) in the household. They also reduce the propensity of men to do housework. Lastly, the presence of elderly women appears to have strong effects on the time use of prime age females in the household—suggesting that their share of household activities may not be low. The presence of elderly women allows working age women in the household to increase their time in self-employment activities in rural-urban areas and also make it more likely for urban women to participate in the wage labor market. Their

²¹ Recall that in order to focus on adults, those below the age of 16 are not included in the sub sample used in this paper.

effect on male time use is as follows. They raise the leisure of working age urban males and lower the tendency of rural working age males to do housework.

IV. Policy Implications

The results in this paper provide useful insights for policy. Firstly, the provision of health services, while having a direct beneficial effect on health in household, will not necessarily lead to significant time saving for women, or men. It will however, alter the composition of time whereby women may be able to increase their time in income generating work. However, a reduction in unemployment shocks, through better safety nets will affect male labor supply more than female. A better provision of water and energy supply services at the household level would release the time of both men and women to income generating work, with men benefiting from water related investments and women from energy related ones.

Lastly, if policy makers are interested in studying the effects of projects and policies on time use and vice versa, they should pay as much importance to differences in demographic and life cycle characteristics as to gender. For instance, age seems to be the most important determinant of both total work burden as well as of the types of work men and women do. Total work burden of both men and women rise with age but at a decreasing rate. There are greater disparities in time use along gender lines in native than in non-native households. Lastly, household composition also significantly influences time use of men and women.

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V. Appendix: The Determinants of Child and Adult Sickness

The incidence of disease is measured by a discrete variable—if an adult (or a child) were sick in the last 30 days.²² Sickness and disease are considered as household level effects, i.e. all individuals within a household are assumed to have the same probability of falling sick. Random effects probit regression were run for the two types to generate instruments. The right hand side variables are: a) cluster proportion of households with infrastructure (namely, sanitation facilities, gas or electricity, electric lighting, running water, hours of public water supply), b) demographic characteristics (namely, median age of household, highest level of education in household, the number of male and female members below 15 and more than 60 years of age), c) physical characteristics of the dwelling (namely, whether it has concrete or tile roofing and the number of rooms per capita) and lastly dummies for rural and native status.

The results are provided in the Appendix table. Only the salient results are summarized here. Household characteristics appear to have a strong influence on household health. Households that are farther along in the life-cycle have a lower probability of child and adult sickness. Bigger households tend to have more illness than smaller ones. Native households are no more likely to have illness than their non-native counterparts. The highest level of education completed by a household member tends to lower the incidence of child disease (though the effect is below significance). Surprisingly, it *increases* the probability of adult sickness. The age/gender composition of the household also matters. The presence of adolescent boys and girls significantly reduces the incidence of sickness and disease in the household. The fact that young children provide health public goods in the household comes out quite starkly in these results. The result for adolescent boys tends to be weaker than that for girls, and their role in influencing

²² The survey also contains information on the number of days an individual in the household was sick and the number of days that individual was bed ridden. The results using these variables were no different than those with discrete indicators of sickness.

adult sickness is insignificant. The presence of the elderly does not appear to influence the sickness and disease in the household, except for the effect of elderly women on adult sickness.

Figure 1: Time Allocated to All Types of Work by Gender

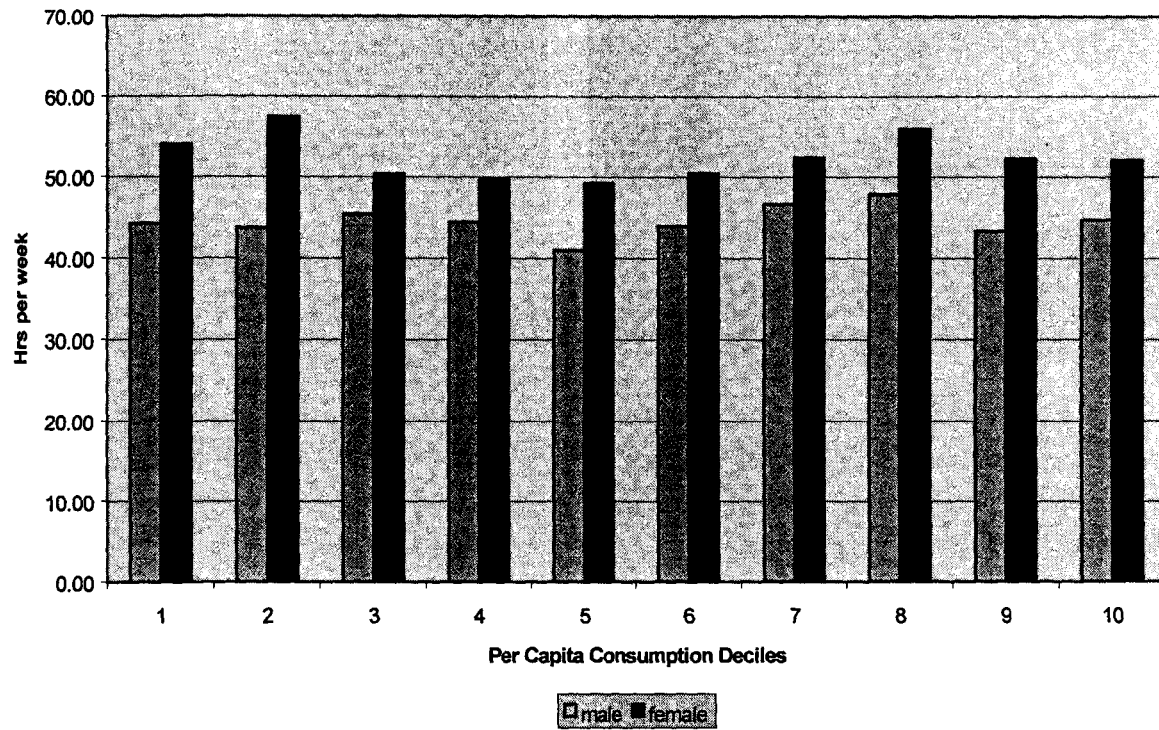


Figure 2: Share of Housework in Individual's Work

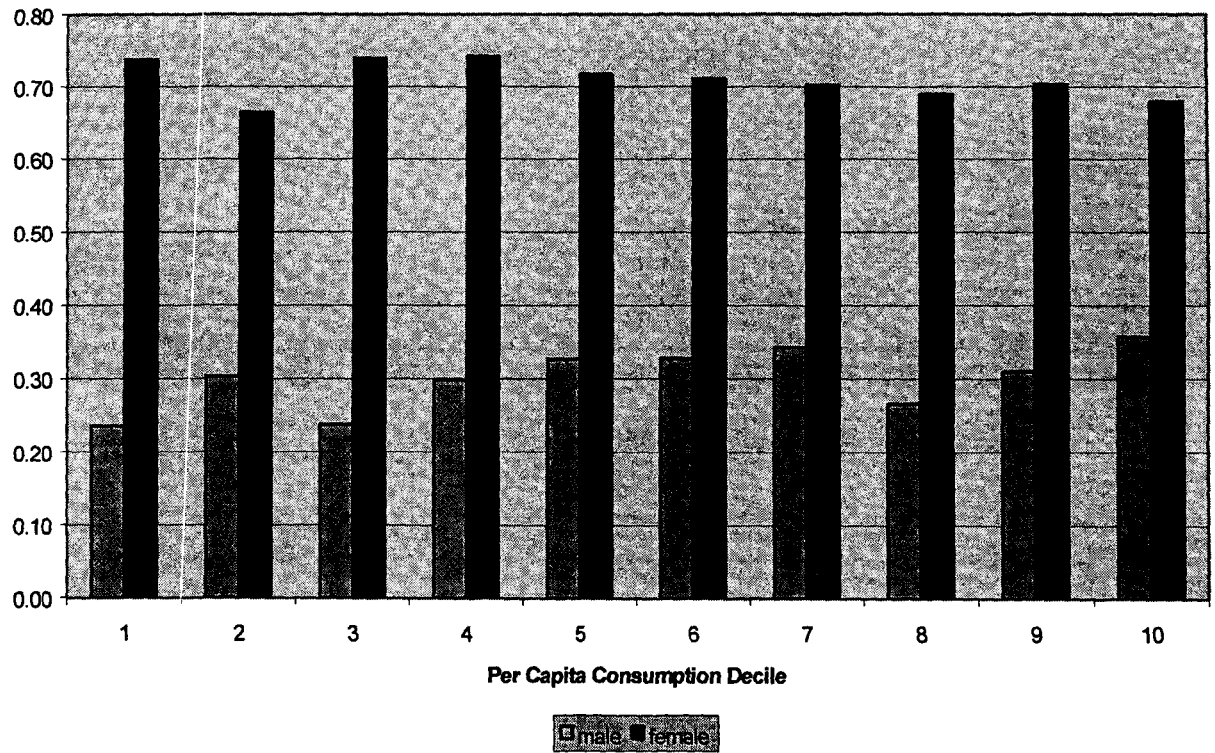


Figure 3: Share of Self-employment in Individual's Work

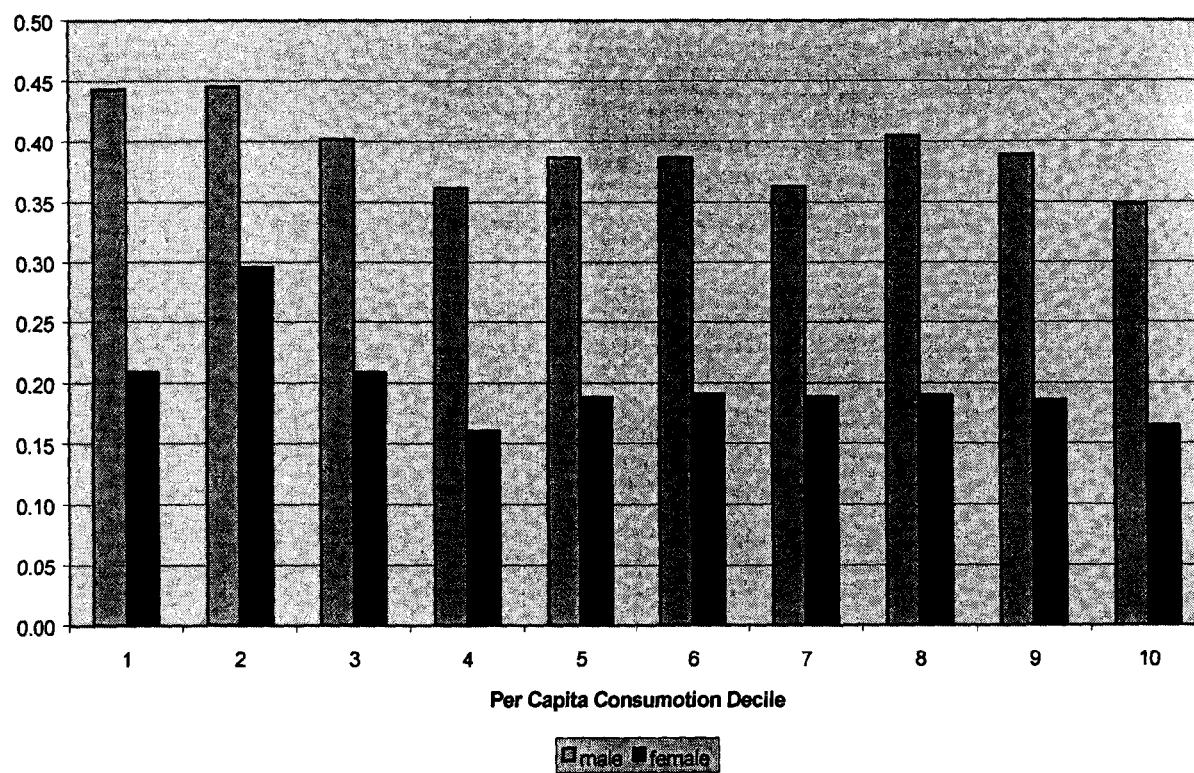


Figure 4: Share of Wage Work in Individual's Work

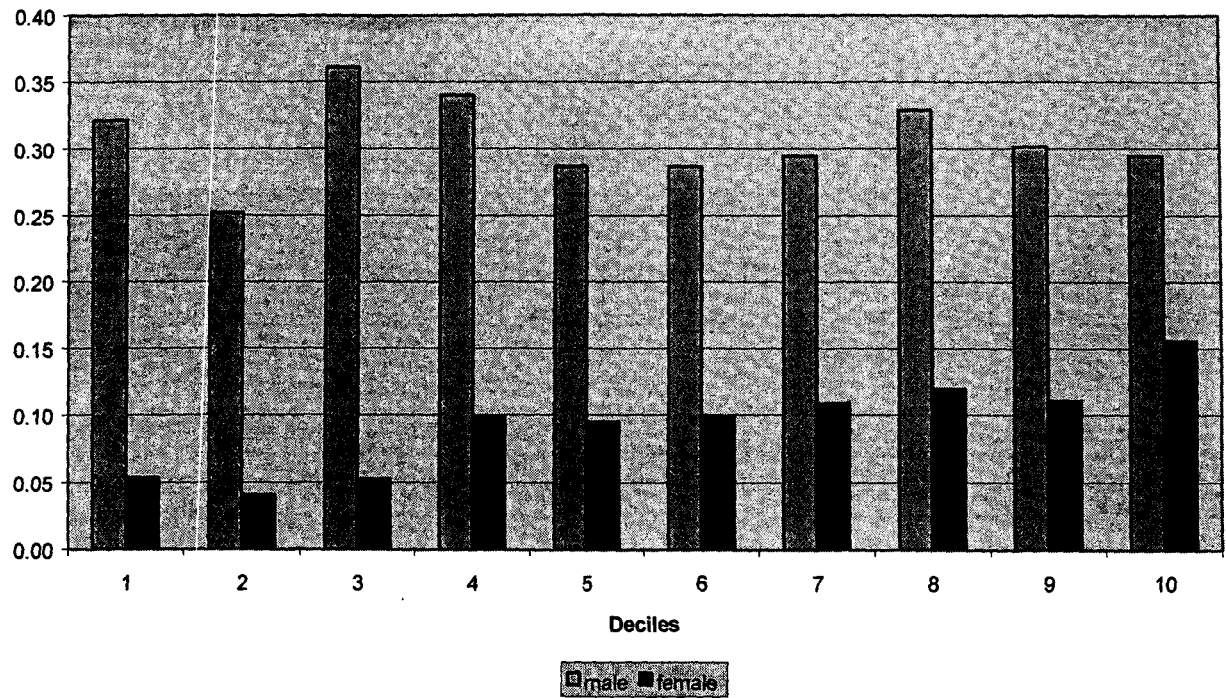


Table 1: Summary Statistics

	Rural				Urban			
	Female		Male		Female		Male	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Share of housework in individual's work ²³	0.679	0.29	0.202	0.251	0.720	0.35	0.353	0.41
=1 if individual does housework	1.000	--	--	--	--	--	--	--
Share of self-employment in individual's work	0.279	0.28	0.561	0.393	0.157	0.28	0.311	0.41
=1 if individual works in self-employment	0.600	--	0.709	--	0.289	--	0.374	--
Share of wage work in individual's work	0.004	--	0.237	--	0.123	--	0.336	--
=1 if individual does wage work	0.075	--	0.317	--	0.172	--	0.356	--
All work (housework, self- & wage-employment) ²⁴	58.12	28.31	48.59	24.34	49.712	28.63	42.889	30.83
=1 if individual is household head	0.091	--	0.702	--	0.132	--	0.589	--
Age in 1994 ²⁵ (in years)	38.946	16.73	38.47	16.12	39.33	17.15	40.088	18.17
=1 if individual is single	0.191	--	0.277	--	0.333	--	0.382	--
=1 if household is of native origin	0.369	--	0.382	--	0.107	--	0.101	--
Education (years)	4.116	3.67	5.853	3.622	8.164	4.17	8.889	3.73
Value of durable assets (real value)	824.41	1654.6	850.91	1862.7	4616.2	9025.5	4450.1	7505.0
Value of agricultural assets (real value)	8649.2	18700	9923.9	23895	--	--	--	--
Value of urban assets (real value)	--	--	--	--	2463.7	16410	1460.7	7934.8
Number of children under 4 years	0.713	0.86	0.693	0.848	0.394	0.661	0.406	0.67
Number of adolescent females between 5 & 14	0.75	0.92	0.699	0.898	0.528	0.79	0.525	0.79
Number of adult females between 15 & 60	1.59	0.94	1.36	0.822	2.102	1.23	1.763	1.09
Number of elderly females, over 60	0.221	0.42	0.162	0.368	0.257	0.45	0.197	0.40
Wages (cluster median)	52.41	29.40	51.47	28.29	94.49	83.00	126.88	89.84
Female unemployment rate ²⁶ (cluster mean)	0.942	0.08	0.944	0.076	--	--	--	--
Male unemployment rate (cluster mean)	0.678	0.20	0.677	0.205	--	--	--	--
=1 if child was sick in household ²⁷	0.242	--	0.242	--	0.130	--	0.134	--
=1 if adult was sick in household ²⁷	0.392	--	0.355	--	0.407	--	0.415	--
=1 if household source of energy is fuelwood/coal	0.780	--	0.779	--	0.079	--	0.084	--
Duration of public water supply (minutes per day)	508.3	641.3	541.92	650.64	741.02	559.13	717.70	562.99
=1 if water source is outside the household.	0.490	--	0.466	--	0.035	--	0.038	--
=1 if department is Lima	0.000	--	0.000	--	0.407	--	0.423	--
=1 if department is Costa	0.229	--	0.211	--	0.251	--	0.218	--
=1 if department is Selva	0.234	--	0.232	--	0.153	--	0.174	--
=1 if department is Sierra	0.537	--	0.557	--	0.189	--	0.185	--

²³ In reference to 7 days before the survey.

²⁴ Hours per week.

²⁵ The sample is restricted to prime age adults (between 15 and 60 years of age).

²⁶ The proportion of those working less than 20 hours per week in all prime age adults of that sex in the cluster.

²⁷ In reference to 30 days before the survey

Table 2a: The Determinants of Adult Time Use (Housework and Total Work) in Rural Peru, 1994 and 1997 ^a

	Total Work ^c		Housework			
			Participation ^b		Individual Share ^d	
	Female (1)	Male (2)	Female (3)	Male (4)	Female (5)	Male (6)
Child Sick ^f	-0.168 (-1.30)	-0.052 (-0.30)	--	-0.178 (-0.74)	0.032 (0.68)	0.120** (2.12)
Adult Sick	-0.299 (-1.21)	-0.374 (-1.19)	--	-0.350 (-0.81)	0.217** (2.42)	-0.126** (-1.22)
Female /Male unemployment ^g	0.295 (1.31)	1.168* (1.82)	--	0.732 (0.79)	-0.112 (-1.26)	-0.091 (-0.46)
=1 if individual is household head	0.181 (0.80)	0.197 (0.88)	--	0.357 (1.16)	-0.270** (-3.33)	-0.013 (-0.17)
=1 if household is female headed	-0.130 (-0.68)	0.139 (0.57)	--	-0.146 (-0.44)	0.170** (2.43)	0.029 (0.37)
Age	0.077** (7.06)	0.036** (2.14)	--	-0.034 (-1.40)	-0.015** (-3.70)	-0.013** (-2.50)
Square of age ($\times 10^{-3}$)	-1.02** (-9.04)	-0.498** (-2.80)	--	0.246 (0.98)	0.199** (4.77)	0.159** (2.89)
=1 if household is of native origin	0.108 (1.26)	-0.111 (-1.12)	--	0.132 (0.97)	-0.066** (-2.22)	0.011 (0.37)
Education (years)	-0.001 (-0.01)	-0.029* (-1.93)	--	-0.012 (-0.60)	-0.007 (-1.42)	0.005 (1.08)
# of children under 4 years	0.064 (1.41)	0.022 (0.35)	--	0.090 (1.01)	-0.032* (-1.82)	-0.030 (-1.50)
# of adolescent females between 5 & 14	-0.046 (-0.99)	-0.044 (-0.71)	--	-0.067 (-0.77)	0.014 (0.83)	-0.027 (-1.32)
# of adult females between 15 & 60	-0.048 (-1.06)	-0.008 (-0.13)	--	-0.078 (-0.88)	-0.047** (-2.80)	-0.027 (-1.25)
# of elderly females, over 60	0.058 (0.52)	-0.049 (-0.35)	--	-0.416** (-2.16)	-0.067 (-1.63)	-0.058 (-1.30)
=1 if household energy is fuelwood/coal	-0.024 (-0.30)	-0.015 (-0.15)	--	0.067 (0.45)	0.081** (2.68)	0.053 (1.60)
Duration of public water supply (mins/day)	-0.019 (-0.68)	-0.050 (-1.41)	--	-0.087 (-1.57)	0.010 (0.90)	0.007 (0.65)
=1 if water source is outside the household.	-0.164 (-0.85)	-0.214 (-0.88)	--	-0.131 (-0.34)	0.035 (0.46)	-0.023 (-0.31)
N	615	614		614	600	436
Wald statistic (χ^2 with 24 d.f.)	238.09	86.71		43.10	117.93	56.26
$\rho (= \sigma_u / [\sigma_u + \sigma_\epsilon])$	0.40	0.13		0.00	0.17	0.09
R ² (within)	0.09	0.05			0.07	0.02
R ² (between)	0.41	0.20			0.24	0.17
R ² (overall)	0.33	0.13			0.18	0.12

^a Only the estimation results with respect to selected variables are presented here. The larger regression also included year dummy, cluster wages and proportion of cluster employment in formal sector. Standard errors are given in below coefficient estimates.

^b The decision to participate in the activity. Estimated using a random-effects probit.

^c Individual's time in the activity as a % of the individual's total work time. Random-effects regression. Limit values were excluded.

^d Includes time allocated to housework, self-employment and work for wages. In log of hours per week.

^f Both child and adult sickness are considered endogenous. See the appendix for details.

^g Cluster male (female) unemployment rate in female (male) regression.

Table 2b: The Determinants of Adult Time Use (Housework and Total Work) in Urban Peru, 1994 and 1997 ^a

	Total Work ^c		Housework			
			Participation ^b		Individual Share ^d	
	Female (1)	Male (2)	Female (3)	Male (4)	Female (5)	Male (6)
Child Sick ^f	-0.079	0.007	--	-0.093	0.043	-0.025
	(-0.96)	(0.07)		(-0.63)	(1.37)	(-0.62)
Adult Sick	0.064	-0.184	--	-0.289	-0.088	0.146**
	(0.43)	(-0.92)		(-1.13)	(-1.54)	(2.06)
Female /Male unemployment ^e	--	--	--	--	--	--
=1 if individual is household head	0.027	0.354**	--	0.083	-0.022	-0.123**
	(0.22)	(2.10)		(0.39)	(-0.46)	(-2.13)
=1 if household is female headed	0.096	0.393**	--	0.048	-0.138**	-0.067
	(1.02)	(2.53)		(0.25)	(-3.63)	(-1.26)
Age	0.111**	0.118**	--	-0.025	-0.035**	-0.041**
	(12.55)	(8.54)		(-1.46)	(-9.89)	(-8.35)
Square of age ($\times 10^{-3}$)	-1.268**	-1.399**	--	0.199	0.389**	0.495**
	(-13.47)	(10.28)		(1.17)	(10.27)	(10.29)
=1 if household is of native origin	0.031	-0.105	--	0.191	-0.092**	0.058
	(0.36)	(-0.83)		(1.21)	(-2.70)	(1.32)
Education (years)	-0.001	0.013	--	0.015	-0.001	-0.005
	(-0.07)	(1.14)		(1.05)	(-0.23)	(-1.31)
# of children under 4 years	0.073*	0.110*	--	0.194**	-0.007	-0.037**
	(1.74)	(1.92)		(2.57)	(-0.50)	(-1.89)
# of adolescent females between 5 & 14	-0.007	-0.005	--	-0.150**	0.009	-0.021
	(-0.20)	(-0.10)		(-2.31)	(0.68)	(-1.17)
# of adult females between 15 & 60	-0.082**	-0.107**	--	-0.139**	-0.012	0.008
	(-2.97)	(-2.53)		(-2.58)	(-1.07)	(0.57)
# of elderly females, over 60	-0.033	-0.293**	--	-0.211	-0.050*	0.060*
	(-0.44)	(-2.85)		(-1.59)	(-1.79)	(1.66)
=1 if household energy is fuelwood/coal	--	--	--	--	--	--
Duration of public water supply (mins/day)	--	--	--	--	--	--
=1 if water source is outside the household.	--	--	--	--	--	--
<i>n</i>	1466	1400		1400	1420	943
Wald statistic (χ^2 with 24 d.f.)	427.66	378.52		54.08	205.28	344.55
$\rho (= \sigma_u / [\sigma_u + \sigma_e])$	0.21	0.28		0.15	0.34	0.46
R^2 (within)	0.06	0.05			0.06	0.10
R^2 (between)	0.34	0.33			0.18	0.33
R^2 (overall)	0.25	0.25			0.15	0.31

^a Only the estimation results with respect to selected variables are presented here. The larger regression also included year dummy, cluster wages and proportion of cluster employment in formal sector. Standard errors are given in below coefficient estimates.

^b The decision to participate in the activity. Estimated using a random-effects probit.

^d Individual's time in the activity as a % of the individual's total work time. Random-effects regression. Limit values were excluded.

^c Includes time allocated to housework, self-employment and work for wages. In log of hours per week.

^f Both child and adult sickness are considered endogenous. See the appendix for details.

Table 3a: The Determinants of Adult Time Use (Self-employment and wage work) in Rural Peru, 1994 and 1997 ^a

	Self-employment				Wage work			
	Participation ^b		Individual Share ^d		Participation ^b		Individual Share ^d	
	Female (7)	Male (8)	Female (9)	Male (10)	Female (11)	Male (12)	Female (13)	Male (14)
Child Sick ^f	-0.396 (-1.46)	0.137 (0.44)	0.019 (0.40)	-0.035 (-0.69)	--	-0.176 (-0.50)	--	-0.051 (-0.61)
Adult Sick	-0.379 (-0.76)	-0.254 (-0.46)	-0.143* (-1.70)	-0.045 (-0.47)	--	0.197 (0.31)	--	0.224 (1.48)
Female /Male unemployment ^g	0.806 (1.62)	4.004** (3.54)	0.216** (2.21)	0.366* (1.86)	--	-3.352** (-2.73)	--	-0.324 (-1.14)
=1 if individual is household head	0.860* (1.91)	0.019 (0.05)	0.012 (0.15)	-0.102 (-1.48)	--	0.454 (0.10)	--	-0.125 (-1.19)
=1 if household is female headed	-0.666* (-1.71)	-0.578 (-1.39)	0.010 (0.13)	-0.009 (-0.10)	--	0.167 (0.36)	--	-0.014 (-0.13)
Age	0.081** (3.34)	0.061* (1.95)	0.002 (0.51)	0.011** (1.99)	--	0.019 (0.50)	--	0.006 (0.55)
Square of age ($\times 10^{-3}$)	-1.066** (-3.94)	-0.445 (-1.36)	-0.039 (-0.74)	-0.090* (-1.67)	--	-0.735 (-1.68)*	--	-0.070 (-0.59)
=1 if household is of native origin	0.477** (2.83)	0.128 (0.70)	-0.011 (-0.43)	0.044 (1.58)	--	-0.488** (-2.34)	--	0.123** (2.25)
Education (years)	0.012 (0.46)	0.011 (0.41)	-0.004 (-0.98)	-0.005 (-1.19)	--	-0.011 (-0.35)	--	-0.003 (-0.40)
# of children under 4 years	0.075 (0.76)	0.083 (0.73)	0.002 (0.14)	0.024 (1.27)	--	-0.100 (-0.80)	--	-0.009 (-0.30)
# of adolescent females between 5 & 14	-0.086 (-0.90)	0.060 (0.54)	-0.004 (-0.24)	-0.001 (-0.08)	--	-0.063 (-0.51)	--	0.034 (1.09)
# of adult females between 15 & 60	0.074 (0.78)	-0.110 (-0.96)	0.045** (2.66)	0.015 (0.79)	--	0.047 (0.36)	--	0.043 (1.37)
# of elderly females, over 60	-0.139 (-0.62)	0.149 (0.59)	0.124** (3.10)	0.022 (0.55)	--	0.062 (0.22)	--	0.018 (0.25)
=1 if household energy is fuelwood/coal	-0.030 (-0.17)	-0.249 (-1.31)	-0.106** (-3.54)	-0.027 (-0.84)	--	0.134 (0.64)	--	0.056 (1.07)
Duration of public water supply (mins/day)	-0.059 (-0.92)	-0.070 (-0.99)	-0.011 (-1.01)	0.037** (3.64)	--	-0.108 (-1.59)	--	-0.009 (-0.63)
=1 if water source is outside the household.	-0.338 (-0.77)	-0.308 (-0.63)	-0.081 (-1.10)	0.245** (3.58)	--	-0.803* (-1.76)	--	-0.062 (-0.65)
N	615	614	368	433		614	--	198
Wald statistic (χ^2 with 24 d.f.)	68.36	60.32	56.45	70.64		58.89	--	48.73
$\rho (= \sigma_u / [\sigma_u + \sigma_d])$	0.21	0.284	0.10	0.18		0.25	--	0.22
R ² (within)			0.03	0.07			--	0.06
R ² (between)			0.18	0.19			--	0.28
R ² (overall)			0.15	0.15			--	0.23

^a Only the estimation results with respect to selected variables are presented here. The larger regression also included year dummy, cluster wages and proportion of cluster employment in formal sector. Standard errors are given in below coefficient estimates.

^b The decision to participate in the activity. Estimated using a random-effects probit.

^d Individual's time in the activity as a % of the individual's total work time. Random-effects regression. Limit values were excluded.

^e Includes time allocated to housework, self-employment and work for wages. In log of hours per week.

^f Both child and adult sickness are considered endogenous. See the appendix for details.

^g Cluster male (female) unemployment rate in female (male) regression.

Table 3b: The Determinants of Adult Time Use (Self-employment and wage work) in Urban Peru, 1994 and 1997 ^a

	Self-employment				Wage work			
	Participation ^b		Individual Share ^d		Participation ^b		Individual Share ^d	
	Female (7)	Male (8)	Female (9)	Male (10)	Female (11)	Male (12)	Female (13)	Male (14)
Child Sick ^f	-0.260 (-1.15)	-0.273 (-1.25)	-0.024 (-0.52)	-0.057 (-1.40)	-0.252 (-1.03)	0.401** (1.96)	0.028 (0.55)	0.034 (1.19)
Adult Sick	0.451 (1.12)	-0.190 (-0.50)	0.156* (1.91)	0.132* (1.85)	0.341 (0.77)	-0.699** (-1.96)	-0.106 (-1.10)	0.032 (0.64)
Female /Male unemployment ^e	--	--	--	--	--	--	--	--
=1 if individual is household head	0.401 (1.18)	0.941** (2.77)	0.070 (1.00)	0.032 (0.48)	0.023 (0.07)	-0.210 (-0.72)	0.149** (2.59)	-0.023 (-0.63)
=1 if household is female headed	0.340 (1.25)	0.349 (1.10)	0.015 (0.25)	-0.028 (-0.41)	0.566** (2.33)	0.118 (0.43)	0.016 (0.43)	0.017 (0.45)
Age	0.183** (6.30)	0.151** (5.05)	-0.001 (-0.12)	0.005 (0.86)	0.210** (5.61)	0.146** (4.96)	-0.012 (-1.54)	0.000 (0.06)
Square of age ($\times 10^{-3}$)	-2.190** (-6.74)	-1.629** (-5.47)	0.016 (0.25)	-0.051 (-0.85)	-0.003** (-5.59)	-1.895** (-5.94)	1.073 (1.08)	0.000 (0.17)
=1 if household is of native origin	0.626** (2.71)	0.172 (0.70)	0.059 (1.40)	0.019 (0.43)	0.098 (0.37)	-0.435* (-1.82)	-0.004 (-0.07)	-0.076** (-2.15)
Education (years)	-0.093** (-4.20)	-0.047** (-2.21)	-0.003 (-0.62)	-0.012** (-2.97)	0.110** (4.43)	0.101** (4.87)	-0.008 (-1.56)	-0.003 (-1.03)
# of children under 4 years	0.003 (0.03)	0.206* (1.94)	0.002 (0.08)	0.019 (0.93)	-0.010 (-0.08)	-0.009 (-0.10)	-0.034 (-1.33)	-0.012 (-0.86)
# of adolescent females between 5 & 14	-0.099 (-1.00)	0.065 (0.68)	0.036* (1.86)	0.028 (1.48)	-0.110 (-1.02)	-0.046 (-0.52)	0.017 (0.75)	-0.012 (-1.00)
# of adult females between 15 & 60	-0.064 (-0.82)	-0.026 (-0.32)	0.020 (1.20)	0.018 (1.13)	0.126 (1.58)	-0.022 (-0.29)	0.014 (0.88)	0.014 (1.33)
# of elderly females, over 60	-0.010 (-0.05)	-0.317 (-1.56)	0.081** (2.02)	-0.014 (-0.35)	0.469** (2.26)	-0.188 (-1.00)	0.000 (0.00)	-0.022 (-0.78)
=1 if household energy is fuelwood/coal	--	--	--	--	--	--	--	--
Duration of public water supply (min/day)	--	--	--	--	--	--	--	--
=1 if water source is outside the household.	--	--	--	--	--	--	--	--
<i>n</i>	1466	1400	424	525	1466	1400	262	502
Wald statistic (χ^2 with 24 d.f.)	103.02	87.68	36.39	42.68	86.15	100.60	126.40	34.30
$\rho (= \sigma_u / [\sigma_u + \sigma_\epsilon])$	0.62	0.65	0.57	0.40	0.56	0.58	0.35	0.45
R^2 (within)			0.05	0.06			0.05	0.00
R^2 (between)			0.10	0.09			0.41	0.11
R^2 (overall)			0.09	0.08			0.37	0.07

^a Only the estimation results with respect to selected variables are presented here. The larger regression also included year dummy, cluster wages and proportion of cluster employment in formal sector. Standard errors are given in below coefficient estimates.

^b The decision to participate in the activity. Estimated using a random-effects probit.

^d Individual's time in the activity as a % of the individual's total work time. Random-effects regression. Limit values were excluded.

^e Includes time allocated to housework, self-employment and work for wages. In log of hours per week.

^f Both child and adult sickness are considered endogenous. See the appendix for details.

Appendix Table: The Determinants of Child and Adult Sickness in Peru, 1994 and 1997 ^a

	Child Sickness	Adult Sickness
Median household age	-0.015** (-4.22)	-0.005** (-2.33)
Native	-0.118 (-0.87)	-0.071 (-0.71)
Maximum education in household	-0.017 (-1.27)	0.023** (2.35)
Hours of public water supply in cluster	-0.000 (-0.05)	-0.004 (-0.87)
% of households in cluster with sanitation	-0.252 (-1.28)	0.068 (0.44)
% of households in cluster with gas/electricity	0.233 (1.21)	-0.304** (-2.13)
% of households in cluster with in-house water	0.007 (0.04)	0.385** (2.71)
% of households in cluster with electric lighting	0.142 (0.85)	0.261* (1.95)
Roof: concrete	-0.106 (-0.95)	-0.004 (-0.05)
Roof: wood	-0.115 (-0.48)	-0.351* (-1.91)
Roof: tiles	-0.168 (-1.36)	0.010 (0.10)
Rooms per capita	-0.299** (-2.38)	-0.101* (-1.82)
Household size	0.207** (7.80)	0.069** (3.20)
Number of boys in household (5-14)	-0.027** (-3.52)	-0.010 (-1.56)
Number of girls in household (5-14)	-0.028** (-3.69)	-0.023** (-3.45)
Number of elderly men in household (>60)	-0.021 (-1.02)	-0.001 (-0.08)
Number of elderly women in household (>60)	0.019 (0.87)	-0.031* (-1.76)
Rural	0.245 (1.46)	0.273** (2.11)
Constant	-1.154** (-4.38)	-1.000** (-4.94)
<i>Number of households</i>	898	898
<i>Number of observations per household</i>	2	2
$\chi^2(18)$	156.87	96.19

^a Random-effects probit estimates. Dependent variables are, respectively, child and adult sickness dummies. *t*-ratios are given in parentheses below coefficient estimates.

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