Female-Headed Households and Poverty: Evidence from the National Family Health Survey

Ramaprasad Rajaram*

August, 2009

Abstract

This paper estimates whether female-headed households are poorer than their male-headed counterparts, using household data from the National Family Health Survey (NFHS) for the year 2005-06. I use poverty measures that reflect on people's permanent income such as housing condition, wealth index and standard of living index, and argue that these measures could be more informative about the chronic living condition of people than the official measure based on consumption expenditure. Employing probit and logit estimations, the results from the analysis provide evidence that the relationship between female-headed households and poverty depends on the choice of poverty measure. Specifically, poverty measures based on the housing condition and the wealth indices show that female-headed households are less poor than male-headed households. However, based on the standard of living index measure of poverty, female-headed households are marginally poorer than their male-headed counterparts.

JEL classification: D12, I21, I28, I31, I32, J16, O10
Key words: Poverty; Gender inequality; Female Education; Female Labor; Rural India

* Department of Economics, Terry College of Business, The University of Georgia, Athens, GA 30602 USA. Phone +1-706-294-5425. Email: rameco@uga.edu.

1 Introduction

The concept of targeting female-headed households in pursuit of reducing poverty remains contentious and lacks rigorous evidence. Women, who are usually the bread winners in female-headed households, face gender discrimination with respect to education, earnings, rights, and economic opportunities (Barros et al. 1997), making a case for targeting female-headed households to reduce poverty. On the other hand, there are practical issues related to identifying the actual head of the household, and female headship is not always correlated with poverty (Buvivnic and Gupta 1997), which presents a case against focusing exclusively on female-headed households to reduce poverty.

More than a quarter of the world's poor people live in India, and gender-bias against women is deeply ingrained in the society placing female-headed households at potentially a greater risk of poverty.[1] Thus, studying the relationship between female-headed households and poverty in India makes it instructive and important from both an academic and a practical perspective, which is the purpose of this study. While eradicating poverty and eliminating gender-bias are issues central to economic development and are intrinsic goals in themselves, these two issues are even more important and challenging in a socially and economically diverse country like India.

Buvinic and Gupta (1997) maintain that women's lower average earnings compared to men, less access to remunerative jobs, and productive resources such as land and capital contribute to the economic vulnerability of female-headed households. In India, such gender-related economic gaps are largely determined by age-old customs and

[1] Approximately 420 million people in India (41.6% of the population) were living under U.S. $1.25 in 2005 (based on Purchasing Power Parity), World Bank 2008.

traditions (based on social, religious and economic reasons), that have led people to accord lower status to women (Arokiasamy and Pradhan 2006, Das Gupta et al. 2003). For instance, in India, many parents perceive the cost of educating a girl as a burden compared to educating a boy owing to practices such as dowry, besides the opportunity cost of girl's labor in household chores.[2]

Social and cultural motives in India also restrict women's access to work and education, and hence women do not participate in labor market as freely as men do (Dreze and Sen 1995, Dunlop and Velkoff 1999). Moreover, with ideologies entrenched in patriarchy, women's access to family inheritance and productive assets is limited or absent (Agarwal 1999). In addition, several practices and customs are still prevalent in India that symbolize the subordination of women to men, making gender-bias against women an intrinsic social issue as well.[3] Thus, socio-economic gender bias against women in India places female-headed households at a greater risk of poverty, where women are the primary earners. Consequently, many studies in India show that female-headed households are poorer compared to male-headed households (Dreze and Srinivasan 1997, Meenakshi and Ray 2002, and Gangopadhyay and Wadhwa 2003).

Although the question addressed in this study is similar to the ones mentioned above, the current study differs from the literature in important ways. First, while the existing studies use per-capita expenditure to measure poverty, I use different measures of poverty that reflect more upon people's permanent income than transitory income,

[2] In India, when a woman marries, she is supposed to live with her husband's family ever after. Thus, at the time of marriage, the bride's family pays huge amount of money in cash and kind (called dowry) as a compensation to the groom's family to take good care of the bride.

[3] Practices such as Sati, Dowry, Purdah, to name a few. Sati is a Hindu religious practice in which a widow immolates herself on the husband's funeral pyre. Purdah is predominantly an Islamic practice in which a woman conceals her body from head to toe with a 'Purdah' garment. The purpose of such a practice is to keep women separated from men.

such as housing condition, wealth index, and standard of living index. Although these measures do have some limitations, I discuss in detail in section 3 why these dimensions of poverty are more informative on people's living condition than the official poverty measure based on per-capita expenditure. Second, the studies mentioned above use data from National Sample Survey (NSS) for rural India, while I use data from the National Family Health Survey (NFHS) for the year 2005-06.[4] Several studies have criticized the inconsistencies in data collection from the NSS data set (Deaton and Kozel 2005), and moreover, data on poverty measures that reflect upon people's permanent income are readily available only from NFHS.

While headship can be measured in different ways (as explained in detail in section 3), I use the self-reported headship of households enumerated by NFHS. Employing probit and logit estimation techniques the results show that in rural India, whether female-headed households are poorer than male-headed counterparts depends on the measure of poverty used to identify poor households. The difference in poverty status among female and male-headed households is quantitatively very small to warrant urgent policy measures targeting female-headed households to reduce poverty.

2. Poverty in Female-Headed Households: Theory and Evidence

Buvinic and Gupta (1997) identify three channels that are likely to determine why female-headed households are poorer than male-headed counterparts. First, female-headed households in general have more dependents and thus have higher non-workers to workers ratio compared to other households. Second, female heads typically work for

[4] The reason restricting the analysis to rural India is explained in Section-4, under 'data and summary statistics'.

lower wages and have less access to assets and productive resources compared to men owing to gender bias against women. Third, women typically bear the burden of household chores that result in time and mobility constraints compared to male-heads. In other words, female heads must shoulder the burden of economic support and household chores, which leaves them with lesser time for leisure compared to male heads. This link between leisure-work trade-off also leads to intergenerational transmission of poverty in female-headed households. Buvinic and Gupta provide evidence that in Chile, policies targeting female-headed households in pursuit of reducing poverty have been an efficient way of reducing poverty.

Barros et al. (1997) show that female-headed households have worse social, economic and demographic features compared to male-headed counterparts and are thus more likely to be poor. They provide evidence that female-headed households in Brazil tend to have lower household income compared to other households because of lower average earnings of the female head. Senada and Sergio (2007) investigate whether female-headed households are more vulnerable to poverty in Bosnia and Herzegovina. Using yearly per capita consumption expenditure measure of poverty (adjusted for regional differences in prices), they do not find any support for this claim.

Appleton (1996) presents evidence that irrespective of the way poverty is measured (i.e. by income, consumption or social indicators), female-headed households in Uganda are less poorer than male-headed counterparts. Fuwa (2000) shows that in Panama, only certain categories of female-heads such as widows, and female-heads with unmarried partners are particularly disadvantaged in both income and non-income dimensions of poverty compared to male-headed households.

Swarup and Rajput 1994 show that in India, lack of access to family property and assets, and deficient micro-credit facilities contribute to the poor economic conditions of female-headed households. Several studies have pointed out that intra-household discrimination in education against girls, which results in girls possessing less skill than boys, contributes to fewer economic opportunities for women (Oxaal 1997), resulting in higher poverty rates among female-headed households.

Households with single women as the head can potentially face even a higher risk of poverty because of the cultural and social stigmas attached to their marital status. For instance, a widow or a divorcee does not participate in many social functions and festivals because people perceive her presence as inauspicious.[5] Moreover, if an employer is particularly orthodox in his or her values and beliefs, which is likely to be the case in rural India, then widows and divorcees could have fewer economic opportunities compared to married women, other things equal. Although the data used in this analysis des not have information on whether the female head is single, as per the Indian Census 2001, more than 76% of the female heads are single (widows, divorcees or unmarried women).

Bhan (2001) shows that the mortality rate of widows is 86% higher compared to married women of the same age group. Chen and Dreze (1992), show that widows in rural India get very little economic support from their communities or other family members. They do not find any evidence to show that members in joint families care for widows in the family either. Their study also shows that violation of legal rights of widows in property (mainly in land ownership) contributes much to the poor economic

[5] Even today, many people hold superstitious believes against widows in India. For example, people avoid seeing widows before attending any important occasion, such as attending a marriage or a job interview. In many Hindu and Islamic traditions, there are several restrictions on a single woman's attire and diet as well.

conditions of widows. In rural India, which is predominantly agrarian, possession of arable land is valued both for economic reasons, and for its' symbolic importance – representing social status.

Dreze and Srinivasan (1997), on the other hand, find no evidence that female-headed households or widows in rural India are significantly poorer compared to male-headed households, based on standard head count ratio, which measures the number of people living below the poverty line. However, their results change when accounting for the average households size and child-adult ratio. They use the NSS data for the year 1986-87 and show that the per capita consumption expenditure is significantly lower in households with widows compared to others. Their results however are not sensitive to the choice of poverty line.

Meenakshi and Ray (2002) find that female-headed households face a greater risk of being exposed to poverty in the presence of size economies and child-adult ratio. Size economies refer to the economies of scale that a household can achieve when household size is large. They use the Indian expenditure and employment surveys to demonstrate that the sensitivity of the poverty rate among female-headed households with respect to household size differs across states and regions in the country. Gangopadhyay and Wardhwa (2003) use NSS household data for the years 1987-88, 1993-94, and 1999-00 to demonstrate that female-headed households are poorer than male-headed counterparts. They identify two channels through which gender bias operates in India – work place discrimination and intra-household discrimination. As mentioned earlier, the current analysis differs from the existing studies in the way poverty is measured and the data set used, the rationales for which is explained in sections 3 and 4 respectively.

3. Defining Female-headed Households and Measuring Poverty:

Defining Household Head

Defining head of the household is an ongoing issue both because of the ambiguity in defining the term "head" when left to the judgment of the family members, and the various implicit meanings loaded in that term. Fuwa (2000) categorizes headship based on demographic, economic or self-reported factors. Demographic factors focus on the presence of husbands in the family; economic factors take into account the economic contribution of each family member, and self-reported factors are the survey respondent's perception of who the household head is.[6] NFHS publishes data on headship based on self-reported survey, which I use in this analysis.

Data collected from self-reported surveys could be problematic in certain ways. First, errors could arise when misidentifying the gender of the household head. Although a woman may in principle be the head, the husband or any other male member could have all the decision making power within the household. Buvinic and Gupta (1997) argue that in developing countries, owing to strong patriarchal values, households are more likely to be classified as male-headed when in reality they are female-headed. Such errors would make the number of female-headed households from self-reported survey serve as a lower bound.

Second, as per the definition of NFHS, headship is not necessarily dependent on the earning capacity of the head. Irrespective of whether a female member in the family earns, it is more likely for male members to manage the income and make decisions on behalf of the household, particularly in rural India, where men control women in all

[6] For a detailed discussion and review of measuring headship, see Senada and Sergio 2007.

spheres of life. Thus, information on the earning capacity of the head is not particularly important for the current analysis.

Measuring Poverty

Poverty can be measured in different ways. On the one hand, there are objective indicators such as income level, possession of assets, or total consumption expenditure. On the other, there are indicators that are harder to measure such as social status, self-esteem, or freedom. Sen (1976) postulates that poverty measurement follows two sequential steps: first, identifying the poor, based on specific criteria, and second, aggregating the poor people into an overall indicator of poverty. Consequently, Foster, Greer and Thorbecke (1984) developed a class of poverty measures (FGT measure) that incorporates both the level and depth of poverty for a given population, which satisfy a range of poverty axioms and possess several desirable properties of a poverty measure. One could obtain the head count ratio, poverty gap ratio or the squared gap ratio for specific parametric values of the FGT measure.[7]

The traditional method to identifying poor people is with respect to a dimension-specific poverty line, which reveals whether a person is deprived in that specific dimension (Alkire and Foster 2008). Alternatively, the multi-dimensional poverty indices identify poor people based on whether a person is deprived in more than one dimension.[8] Many economists have insisted the importance of using multi-dimensional measures of poverty, which throws light on the overall level of deprivation, over per-capita income or

[7] Head count ratio is the percentage of population falling under a specific income or expenditure level, poverty gap is the aggregate income required to move people above a specific poverty line and squared poverty is average of the squared normalized income shortfalls below the poverty line.
[8] Identifying and measuring poverty is a separate branch of literature, and for a detailed discussion see Alkire and Foster (2008), Duclos et al. (2006), and Foster and Sen (1997).

consumption expenditure (Bourguignon and Chakravarthy 2003). Deutsch and Silber (2005) argue that information on durable goods and assets are more reliable indicators of the standard of living than income-based measures of poverty. Filmer and Pritchett (2001) construct a wealth index for India using asset ownership indicators to predict children's school enrollment. Duclos et al. (2006), and Bourguignon and Chakravarthy (2003), among many others, have used multidimensional approach to identify poor people in different countries.

Dreze and Srinivasan (1997), Meenakshi and Ray (2002), Gangopadhyay and Wadhwa (2003) use the Indian official poverty measure, which is based on people's consumption expenditure, to verify whether female-headed households are poorer than male-headed counterparts. The Indian Planning Commission defines a person to be poor if she or he does not have sufficient income to afford 2100 calories of food intake everyday in urban areas and 2400 calories in rural areas. This measure of poverty is both dimension-specific and less informative on the chronic living condition of people. Therefore, I use three different measures of poverty; housing condition (which is dimension-specific but is likely to reflect on people's permanent income), wealth and standard of living index that are both multi-dimensional and informative on people's permanent income.[9]

Information on permanent income is particularly important for people who live near the margin of poverty line. For instance, a person who lives marginally below the poverty line in one year can be above the poverty line (and thus no longer considered poor) in the next year, even if his consumption expenditure increases only by a small fraction. In rural India, agriculture is the primary means of livelihood for most people,

[9] NFHS does not collect data on people's consumption expenditure.

and vagaries of monsoon cause agricultural output to fluctuate from one year to another. Therefore, subsistence farmers, and farmers who can barely manage to sell their produce in the market are likely to move in and out of the government specified poverty line depending on how the agricultural output fluctuates around the long-term trend.

On the other hand, poverty measure based on households possession of assets or the housing condition of people is more likely to reveal the lifetime wealth or income, and thus reflect upon the chronic living standard of people. At least such measures are more consistent over time in indicating the living standards of people than poverty measures based on consumption expenditure.

Moreover, several studies question the methods employed by the National Sample Survey in collecting data on consumption expenditure that the Indian government uses to measure poverty (Deaton and Kozel 2005). The studies particularly criticize the change in the recall period used in different surveys and thus contend that the poverty estimates published by the Indian government are flawed.[10] Such errors can potentially be reduced when estimating poverty based on housing conditions or possession of assets. Ravallion (1998) emphasizes the importance of including the cost of basic needs, besides the food expenditure while defining poverty lines. Thus, I use three different measures of poverty based on housing condition and household's possession of assets.

NFHS assigns categorical values to each of the three poverty measures: housing condition, wealth and standard of living indices. The way I use these values varies with the methods I use to test the hypothesis that female-headed households are poorer than

[10] Recall period refers to a respondent's verbal report of how much money he or she spent on specific food items over some previous period. In some NSS surveys this recall period was 7 days and in some others it was 365 days and in some others it was both.

others. Thus, in section 4 (under 'methods and regression results'), I explain in detail how I assign values to housing condition, wealth index, and standard of living index.

Regarding the housing structure, NFHS classifies houses into three broad categories namely, "pucca", "semi-pucca", and "kutcha", based on roof, floor and wall materials used in houses. Kutcha houses have the least expensive materials used in roofs, floors and walls. Pucca houses use the most expensive of materials for roof, floor and walls, and semi-pucca houses constitute the intermediate category. The materials used in kutcha houses include palm leaves, grass, mud, unburnt brick, to name a few, and this category also include households with either no roofs or no walls or both - implying homeless.[11] In the current sample, roughly 17% of the households live in kutcha houses, 53% live in semi-pucca houses and 30% live in pucca houses in rural India. I classify households living under kutcha houses as poor.

NFHS constructs the wealth index using Principle Component Analysis based on data from household's ownership of various assets. The wealth index also includes dwelling characteristics such as source of drinking water, electricity supply, materials used in houses, whether the household members have a bank account, to name a few. After each item is assigned a weight through PCA, the resulting scores are standardized in relation to a normal distribution and the wealth index is the sum of these scores. The resulting wealth index contains values from one through five, which denotes the five quintiles of the sample, with one representing the poorest, and five representing the

[11] Details of materials used in different housing structures and the list of items used to construct the wealth and the standard of living indices are explained in the Appendix.

wealthiest quintiles. I use the two poorest quintiles to measure poverty, and as a robustness check use only the poorest quintile.[12]

NFHS computes the standard of living index using a more detailed list of household items including whether the household owns a telephone, pressure cooker, mattress etc. The International Institute of Population Sciences (IIPS) research team in India has developed a specific calculation to assign weights for the items in the standard of living index. The weights are based on the relative importance of the assets in a household rather than a more 'formal' analysis (Smith et al. 2003). The resulting household scores are categorized into three levels – "Low standard of living", "medium" and "high". I classify the households falling under the 'low standard of living' as poor.

Limitations of the poverty measures

While housing condition represents a dimension-specific poverty measure, the wealth and the standard of living indices are multi-dimensional poverty measures. The three main approaches to identify poor people on a multi-dimensional setting are the 'unidimensional' approach, the 'union' approach and the 'intersection' approach. Under the unidimensional approach, several indicators of wellbeing are pooled to form a single aggregate variable and if the variable falls below a cut-off for a person, then he or she is identified as poor. Under the union approach, a person is considered poor if he or she is deprived even in one dimension. The intersection approach requires a person to be deprived in all dimensions to be categorized as poor.

[12] NFHS categorizes the five quintiles as 'poorest', 'poor', 'middle', 'richer' and 'richest'. Using the 'poorest' or the two poorest quintiles to measure poverty makes logical sense for this analysis. However, in section 4, I explain how I exploit the information contained in the other three quintiles as well.

The wealth and the standard of living index falls under the unidimensional approach that has an important limitation. This approach considers dimensional deprivations only to the extent that it can affect the aggregate indicator. To illustrate, a person will not be counted as poor if his or her aggregate poverty score falls above a cut-off even though he or she is deprived in 7 out of 10 dimensions. As Alkire and Foster (2008) argue, "there is minimal scope for valuing deprivations per se, which is often viewed as an essential characteristic of a multi-dimensional approach" (pp 1). The housing condition represents a dimension-specific poverty measure that does not even account for deprivations beyond the housing condition of people.

Moreover, ordinal measures of poverty, such as the ones used in this study, in general do not necessarily satisfy two axioms of poverty - monotonicity and distributional sensitivity. Monotonicity implies that if the income of one poor person increases even marginally then total poverty should decrease and distributional sensitivity implies that transferring income from a poor person to a rich person should leave the economy strictly poorer.[13]

4 Model Specifications and methods:

Model

To test whether female-headed households are poorer than others, I estimate the following model, which is standard in this literature:

$$P_i = \alpha_0 + \alpha_1 G_i + \alpha_2 HH_i + \alpha_3 WEduc_i + \varepsilon_i \qquad \text{--- (1)}$$

[13] To satisfy monotonicity, the income raise should be sufficient to move the households from one category to the next higher level.

where, the subscript i refers to the i^{th} household. The dependent variable, P_i includes the three poverty measures namely, the housing condition, the wealth index and the standard of living index. As mentioned earlier, the way P_i is measured depends on the methods employed to estimate to equation (1) and thus discussed in detail under the section on 'methods and regression results'.

G_i, is a binary variable that takes the value one if the household is female-headed and zero otherwise. A positive coefficient on G_i implies that in comparison to male-headed households, female-headed counterparts are poorer. HH_i, measures household variables namely, a) the ratio of children to adults per household (children defined as the population between the age group of 0-5), and b) the average household size in a given household. These variables control for size economies and child-adult ratio in a household, which can potentially change the relationship between poverty and gender of the household head (Dreze and Srinivasan 1997, Ray 2000). Following Dreze and Srinivasan, who find the relationship between household size and poverty to be non-linear, I also include a squared term for the household size.

Studies measuring poverty based on consumption expenditure control for the household composition. In other words, the consumption needs for males, females and children within a household could be very different. The theory of 'equivalence-scale' addresses this issue by assigning different weights to different household members, based on their age and sex. Dreze and Srinivasan (1997) present evidence that the poverty ranking of different types of household, based on per capita expenditure, is not sensitive to equivalence scales, for reasonable and plausible weights given to different members.

NFHS does not provide data on total males and females in a household and thus, I cannot use this variable in my analysis.[14]

Data Source and Summary Statistics

I use the National Family Health Survey (2005-06) data for all the variables used in the study in contrast to most studies that use National Sample Survey data. The NFHS is a division of Demographic Health Survey (DHS) that conducts individual and household level survey for over eighty developing countries mainly to provide data in the areas of health, demographics and nutrition.[15] NFHS has conducted three surveys in India beginning 1992-93 (NFHS-1), and continued with two more in 1998-99 (NFHS-2) and 2005-06 (NFHS-3). The reason I do not employ a panel analysis or compare my results over time is because different households were interviewed in the three surveys, and I do not have the data to control for cost of living adjustment over different years.

The 2005-06 survey used in this study covers households from all the 29 states in India. The rural sample consists of approximately 45,000 households. Datt and Ravallion (1998) argue that focusing on Indian rural poverty is more important than focusing on urban poverty because more than three-quarters of India's poor people live in rural areas. Furthermore, controlling for migration is important as it could potentially affect the relationship between gender of the household head and poverty. Data on net migration are not available in the current data set both for rural and urban areas. Haub and Sharma (2006) maintain that the rate of rural migration is relatively far lesser than that of urban

[14] In any case, controlling for equivalence scale is more relevant while using consumption expenditure as a measure of poverty.
[15] Women between the ages of 15-49 were interviewed in the survey.

migration in India.[16] Yet another limitation of the data set is that, information on the marital status of the household head (whether she is a widow, divorcee or unmarried) is not available. This information could potentially help in identifying whether marital status has a role to play in the relationship between gender of the household head and poverty.

Table 1A gives the preliminary statistics of the variables used in the study. Of the total number of households, women head 13.2% and men head 86.2% in the sample respectively. The poverty statistics for all households taken together vary widely depending on the measure of poverty. When poverty is measured by the housing condition (households living in kutcha houses), 16.8% of the total number of households are poor. 45.2% of the households fall under the poorest two quintiles of the wealth index and 30.2% of the households fall in the poorest quintile based on the standard of living index. 11.5% of households live under poverty based on all the three measures. The average child-adult ratio is 0.43 and the average household size is 5.5.

A simple way to verify whether female-headed households are relatively poorer than male-headed households is to compare the percentage of male and female-headed households that are poor. Table 1B classifies households' poverty status based on the gender of the household head. 15% of the female-headed households and 17% of the male-headed households live in kutcha houses. Similarly, higher percentage of male-headed households (45.7%) fall under the two poorest category of the wealth index

[16] Moreover, most of the items included in constructing both the wealth and standard of living indices are not pertinent for urban analysis. For instance, possession of assets such as household's ownership of tractor, livestock, animal drawn cart, thresher, agricultural land or irrigated land is only relevant in rural India, where agriculture is the mainstay occupation. Thus, using these poverty measures may not exhibit much variation in poverty status among urban households.

quintile compared to female-headed households (43.3%). However, based on the standard of living index, a higher percentage of female-headed households (36.6%) fall under the poorest quintile compared to male-headed counterparts (29%).

Even if a household is categorized as poor only when it lives in a kutcha house, falls under the two poorest wealth index quintile, and falls in the poorest standard of living index quintile, female-heads (11.2%) seem to be marginally better off than male-heads (11.8%). Based on this rudimentary analysis, which does not control for factors that could potentially alter the relationship between gender of the household head and poverty, there is no strong evidence that female-headed households are poorer compared to male-headed households. While the ratios mentioned above seem to be counter-intuitive, these statistics are consistent with Dreze and Srinivasan (1997) who measure poverty by consumption expenditure.[17]

Methods and Regression Results

I employ both probit and logit analyses to estimate equation (1), that controls for factors that can affect the relationship between gender of the household head and poverty. Probit and logit are the most commonly used generalized linear models when the dependent variable is binary in nature.[18] These two models are preferred over OLS because, for certain values of the independent variable the probability value of the dependent variable can be greater than one or less than zero under OLS, which is not very

[17] They show that 57.7% of female-headed households are classified as poor based on head-count ratio compared to 63.8% of male-headed households, 15.8% classified as poor under 'poverty gap' index compared to 17.3% male-headed households, and 6.1% classified as poor under 'squared poverty gap' index compared to 6.4% male headed-households.

[18] Subsequently, I employ the ordered probit and ordered logit models to exploit the categorical data set of the dependent variable, which is explained later.

meaningful. In addition, OLS assumes constant marginal effects on the dependent variable while probit and logit models do not.

Both probit and logit are estimated by Maximum Likelihood Estimation. The main difference between logit and probit estimations is the assumption regarding the probability density function of the error term. While probit assumes a standard normal distribution of the error term, the logit model assumes a logistic distribution and thus, the logistic distribution has flatter tails compared to the probit curves. However, the estimates from both logit and probit models are qualitatively similar.

As mentioned earlier, NFHS provides data on housing condition, wealth index and standard of living index as categorical variables. To estimate equation (1) using probit and logit, I assign binary values for the respective poverty measures: for the housing measure, I assign one to P_i in equation (1) if the household lives under kutcha houses and zero otherwise. Similarly, I assign one to P_i if the household falls under the two poorest quintiles of the wealth index and zero otherwise.[19] For the standard of living index, I assign one to P_i if the household falls under the "low" standard of living and zero otherwise.

To estimate equation (1) by ordered probit and logit I use the categorical variables as such since I do not have to convert them as binary variables. Thus, the underlying latent variable model that estimates equation (1) by ordered probit and logit is characterized as follows:

$$P_i^* = \alpha_0 + \alpha_1 G_i + \alpha_2 HH_i + \alpha_3 WEduc_i + \varepsilon_i \qquad \text{--- (2)}$$

[19] As a robustness check, I also use the poorest quintile in the wealth index instead of the two poorest quintiles and the results do not change.

where, P_i^*= unobserved poverty level

P_i= actual poverty level

P_i=0 if $P_i^* < 0$ indicating that the household lives in kutcha house

P_i=1 if $0 <= P_i^* < c1$ indicating that the household lives in semi-pucca house

P_i=2 if $c1 <= P_i^* < c2$ indicating that the household lives in pucca house

c1 and c2 are threshold values that determine the poverty level of households (analogously for the other poverty measures as well).[20]

In general, for notational convenience, equation 2 can be written as:

$$y_i^* = X\beta + \varepsilon \qquad \text{--- (3)}$$

where y_i^* represents P_i^*, and X is a vector containing all the independent variables in equation (2). Equation (3) can be expressed in terms of the following conditional probabilities:

for $i = 1\ldots..n$

$P(y=i|X) = P(C_{i-1} < y^* <= C_i \mid X)$

$P(y=i| X) = P(C_{i-1} < X\beta + \varepsilon <= C_i \mid X)$

$P(y=i| X) = P(\varepsilon < C_i - X\beta \mid X) - P(\varepsilon <= C_{i-1} - X\beta \mid X)$

$P(y=i| X) = F(C_i - X\beta) - F(C_{i-1} - X\beta)$

where, C represents the cut-off points.

[20] For the wealth index that has five quintiles, there will be four cut-off points. For a normal probit or logit, there will be only a single cut-off or threshold, such that P_i=0 if $P_i^* < 0$ and P_i=1 if $P_i^* > 0$.

Since the coefficient estimates from the probit or the logit models do not facilitate a straightforward interpretation, I also report the marginal effects that have the same sign as the coefficient estimate, and the p-values of the coefficients in Table 2.[21] Columns (1), (2), and (3) have housing condition, wealth index and standard of living index as the dependent variables, respectively. Column (4) reports the result for households classified as poor under all three measures. Based on the theories explained earlier, one would expect to see a positive sign on the coefficients suggesting that female-headed households are more likely to be poor compared to male-headed households. However, columns (1), (2) and (4) show contrary evidence.

The marginal effect of female-headed households in column (1) indicates that a (discrete) change in the gender of the household head from male to female reduces the probability of the household living under kutcha houses by 2%. This effect is not only very small in magnitude, but also suggests that female-headed households are less likely to be poor. Similarly, Column (2) shows that when poverty is measured by wealth index, female-headed houses are only 3.4% less likely to be poor compared to male-headed counterparts, though the coefficient estimates from both poverty measures are statistically significant at well below the 1% level. These two results are opposed to the findings of many studies that use poverty line based on consumption expenditure of households.

On the other hand, poverty measured by the standard of living index shows that female-headed households are 3.6% more likely to be poor compared to male-headed households (column(3)). Although the coefficient estimate is statistically significant at well below the 1% level, the magnitude of the effect is extremely small to make a

[21] Unlike the slope parameters of a linear regression model, the coefficient estimates from probit or logit do not quantify the marginal effect of the independent variable on the dependent variable.

compelling case for policy interventions specifically targeting female-headed households to reduce poverty. These three results, taken together do not provide strong evidence that female-headed households are particularly worse-off than male-headed counterparts, whichever way poverty is measured.

It is not too surprising to see the results differ between housing condition and the standard of living index because the latter is a composite index in which housing condition is one of the components. However, the items used to construct the standard of living index and the wealth indices largely overlap. Thus, the weights assigned to different items under the alternate indices could possibly cause the results to differ significantly.

Table (2) also shows that households with higher child-adult ratio have a higher probability of being poor under all measures of poverty and the coefficient estimates are statistically significant at less than the 1% level in all the columns. This result is consistent with that of Dreze and Srinivasan (1997), who find that the per capita expenditure is lower in households with higher child-adult ratio compared to other households.

Household size in all the columns is negatively associated with poverty. Households with more number of members are less likely to be poor, and the coefficient estimates are statistically significant at less than the 1% level in columns (2), (3), and (4). This result is again consistent with Dreze and Srinivasan (1997) and Meenakshi and Ray (2002) who argue that households with more household members could achieve economies of scale in household consumption. Dreze and Srinivasan claim that such economies could exist owing to the presence of increasing returns to domestic

technology, role of collective goods in consumption and use of bulk discounts in household purchases. The coefficient estimate of the squared term of household size is positive and statistically significant only in columns (3). The positive sign indicates decreasing returns to economies of scale with respect to household size, which is again consistent with Dreze and Srinivasan (1997).

Column (4) classifies poor household based on all the three measures of poverty: households that a) lives in kutcha houses, b) falls under the two poorest wealth index quintile, and c) falls under the poorest standard of living index quintile. Female-headed households are better off than male-headed counterparts, and the coefficient estimate is not statistically significant. The magnitude of the effect is much smaller for all the other variables as well, when compared to each of the poverty measures individually. Thus, columns (1) through (4) suggest that whether female-headed households are poorer than male-headed households crucially depends on the choice of the poverty measure.

Which of the poverty measures is more useful for policy implication is both subjective and beyond the scope of this study. Hirway (2003) argues that it is not very instructive to compare and match one kind of poverty measure to another, especially when poverty measures are ordinal in nature. As seen in the results above, different measures of poverty yield different results and poverty based on all the three measures differ significantly from individual poverty measures.

However, the results offer an important suggestion to policy makers. While targeting specific sub-group of population to reduce poverty, policies could first identify poor people on more than just one measure of poverty. Targeting priority should subsequently be given to the sub-group that is categorized as poor under most or all the

measures. The reason is that, implementing anti-poverty policies based only on one measure (or the official measure alone) can potentially ignore various other dimensions of deprivation that people may experience, and as seen in Table (2) different measures of poverty yield different results.

Table (3) reports the results for estimating equation (1) employing logit. Qualitatively, the results are very similar to the ones obtained for the probit estimation. Even quantitatively, the logit estimates are usually higher than the probit estimates by a factor of 1.7 approximately, which is the case in table (3). Table (3) also shows the odds-ratio for each coefficient. An odds-ratio higher than one indicates a higher probability for an event to occur in one group compared to the other. Thus, in column (1), an odds ratio of 0.85 indicates that the odds of female-headed households living in kutcha houses are only 0.85 times as much as the odds for male-headed households. Thus, the likelihood of female-headed households living in kutcha houses is lower compared to male-headed counterparts.[22]

Table (4) reports the results for the ordered probit for the alternate measures of poverty. Cut-off 1 in table 4 (A) represent households living under kutcha houses, cut-off 2 represent households living under semi-pucca houses and cut-off 3, households living under pucca houses. Thus, the cut-offs are ordered from the poorest to the richest. Similarly, in Table 4 (B) and 4 (C), the cut-offs are ordered from the poorest to the richest households based on the wealth and the standard of living indices, respectively. The results in table 4 are consistent with the ones obtained in Table 2.

[22] Odds-ratios for continuous variables do not have a nice interpretation as binary variables, as there is no natural baseline group for comparing the odds. However, the odds-ratio for continuous variable still indicates the odds-ratio for a unit change in the variable. This ratio is the same for any pair of adjacent values of the variable.

Column (1) in Table 4 (A) presents the coefficients of the ordered probit model, and columns (2) through (4) present the marginal effects and the associated p-values.[23] Columns (2), (3), and (4) provide evidence that female heads are concentrated more on pucca houses (the most expensive of the three housing categories) than kutcha or semi-pucca houses. The coefficient estimates on all the three columns are statistically significant at less than the 1% level. Column (1) indicates that compared to male-headed households, female-headed counterparts are 1.8% less likely to be living in kutcha houses. Note that the marginal effects across the cut-offs have to sum up to zero.[24] To illustrate, if the probability of female-heads living in poor houses is less, then their chance of living in rich houses have to be greater by the same amount.

The results in table (4) are also consistent with the results obtained in table (2). When poverty is measured using the wealth index (table 4(B)), female-headed households are less likely to be poor. Compared to male-headed households, female-headed households are 9.7% and 2.8% less likely to be living in the two poorest quintiles respectively. On the other hand, when poverty is measured using the standard of living index (table 4 (C)), female-headed households are 1.6% less likely (than male-headed counterparts) to be living in the richest group. The results for the ordered logit estimations are presented in Table (5) for all three measures of poverty. Both qualitatively and quantitatively the results are comparable to the ones obtained for the ordered probit, and thus follow similar interpretations.

[23] As with a normal probit model, the coefficient in an ordered probit model is not straightforward to interpret. However, a positive sign on the coefficient indicates a higher probability of the variable under that specific cut-off compared to others.

[24] Since I round off the values to three nearest decimals, the marginal effects do not exactly sum to zero for all the variables always.

5 Conclusions

This paper is the first of its' kind to use different measures of poverty to test whether female-headed households are poorer than others in rural India. The measures of poverty I use in this paper, namely housing condition, wealth index and standard of living index reflect more upon people's chronic living standards compared to the official measure based on consumption expenditure, which only reflects on people's transitory income.

The results provide evidence that the choice of poverty measure determines whether female-headed households are poorer than male-headed counterparts. Specifically, only when poverty is measure based on standard of living index, female-headed households are poorer than male-headed counterparts, and not otherwise. These results do offer an important suggestion to policy makers. Policies targeting specific population groups in pursuit of reducing poverty could prioritize the target groups based on the population that is counted as poor under most measures of poverty. This requires policy makers to first identify poor people based on more than just one measure of poverty.

Differences in poverty status among female and male-headed households (based on all the three poverty measures) are not quantitatively significant. Although, female-headed households are poorer than the male-headed counterparts, based on the standard of living index, quantitatively the effects are very small to warrant immediate anti-poverty policies specifically focused on female-headed households. Overall, the results do not provide evidence to support the claim that female-headed households are any poorer than male-headed households and that they require special assistance.

References

Agarwal, B. 1999. "Widows versus Daughters or Widows as Daughters? Property, Land and Economic Security in Rural India", *Modern Asian Studies*, 32(1), 1-48.

Alkire, S., and Foster., J. 2008. "Counting and Multidimensional Poverty Measurement", *Oxford Poverty and Human Development Initiative, Working paper* – 7.

Appleton, S. 1996. "Women-headed Households and Household Welfare: An Empirical Deconstruction for Uganda", *World Development*, Vol. 24 (12) 1811-1827.

Arokiasamy, P., and Pradhan, J. 2006. "Gender Bias Against Female Children in India: Regional Differences and their Implications for MDGs", [Unpublished] Presented at the *2006 Annual Meeting of the Population Association of America, Los Angeles, California*, March 30 - April 1, 2006. 22 p.

Barros, R., Fox, L., and Mendonca, R. 1997. "Female-Headed Households, Poverty, and the Welfare of Children in Urban Brazil", *Economic Development and Cultural Change*, Vol. 45 (2), 231-57.

Bhan, G. 2001. *India Gender Profile*, Report Commissioned by SIDA. Report 62 Brighton IDS.

Burguignon, F., and Chakravarthy, S. R. 2003. "The Measurement of Multidimensional Poverty", *Journal of Economic Inequality*, 1, 25-49.

Buvinic, M., and Gupta, G.R. (1997): "Female-Headed Households and Female-Maintained Families: Are They Worth Targeting to Reduce Poverty in Developing Countries?", *Economic Development and Cultural Change*, Vol. 45 (2), 259-80.

Chen, M. and Dreze, J (1992), "Widows and Well Being in North India", DEP, No.40, STICARD, London School of Economics.

DFID Report, 2000. "Poverty Elimination and the Empowerment of Women"

Das Gupta, M., Zhenghua, J., Zhenming, X., Bohua, L., Chung, W., and Ok. B. 2003. "Why is son preference so persistent in East and South Asia? A cross-country study of China, India and the Republic of Korea," *Journal of Development Studies,* 40(2): 153–87.

Datt, G., and Ravallion, M. 1998. "Why Have Some Indian Done Better than Others at Reducing Rural Poverty?", *Economica*, 65, 17-38.

Deaton, A., and Kozel, V. 2005. "Data and Dogma: The Great Indian Poverty Debate", *World Bank Research Observer*, 20(2), 177-99.

Deutsch, J., and Silber, J. 2005. "Measuring Multi-Dimensional Poverty: An Empirical Comparison of Various Approaches", *The Review of Income and Wealth*, 51 145-174.

Dreze, J., and Sen, A. 1995. "India Economic Development and Social Opportunity," Oxford University Press.

Dreze, J., and Srinivasan, P.V. 1997. "Widowhood and Poverty in Rural India: Some Inferences from Household Survey Data", *Journal of Development Economics*, 217-234.

Duclos J.-Y., D. Sahn, and S. D. Younger , 2006. "Robust Multidimensional Spatial Poverty Comparisons in Ghana, Madagascar, and Uganda", *The World Bank Economic Review* 20, 91-113.

Dunlop, J.E., and Velkoff, V.A. 1999. "Women and the Economy in India", U.S. Census Bureau, Official Statistics December 3.

Filmer, D. and L. Pritchett. 2001. "Estimating wealth effects without expenditure data-or tears: An application to educational enrollments in states of India", *Demography* 38(1):115-132.

Foster, J., Greer, J., and Thorbecke, E. 1984. "A Class of Decomposable Poverty Measures", *Econometrica* 52, 761-766.

Foster, J., and Sen, A. K. 1997. "On Economic Inequality: After a Quarter Century", *On Economic Inequality*, by Amartya Sen, Oxford: Claredon Press.

Fuwa, N. 2000. "The Poverty and Heterogeneity among Female Household Heads Revisited: The Case of Panama ", *World Development*, Vol. 28(8), 1515-1542.

Gangopadhyay, S., and Wadhwa, W. 2003. "Are Indian Female-headed Households more Vulnerable to Poverty", *India Development Foundation*.

Government of India, Indian Census 2001.

Haub, C., and Sharma, O.P. 2006. "India's Population Reality: Reconciling Change and Tradition", *Population Bulletin* 61: 3-20.

Hirway, I. 2003. "Identification of the Poor: Flaws in Government Surveys", *Economic and Political Weekly*, 38(45), 4803-38.

Meenakshi, J.V. and Ray, R. 2002. "Impact of household size and family composition on poverty in rural India", *Journal of Policy Modeling*.

Morrison, A., Raju, D., and Sinha, N. (2007) "Gender Equality, Poverty and Economic Growth", Policy Research Working Paper 4349, Washington DC: The World Bank

Gender and Development Group, Poverty Reduction and Economic Management Network

Oxaal, Z. 1997. "Education and Poverty: A Gender Analysis", *Bridge Development Gender Report 53,* Institute of Development Studies (Brighton England).

Ravallion, M. 1998. "Poverty Lines in Theory and Practice" *LSMS Working Paper 133, World Bank*, Washington, D.C.

Ray, R. 2000, "Poverty, Household Size and Child Welfare in India", *Economic and Political Weekly*, 35, 3511-3520.

Sen, A. K. 1976. "Poverty: An Ordinal Approach to Measurement", *Econometrica*, 44 219-231.

Senada, S., and Sergio, E. 2007. "Poverty amongst Female-headed Households in Bosnia and Herzegovina: an empirical analysis", *South East European Journal of Economics and Business.* 2(1), 69-88.

Schultz, T. P. 2002. "Why governments should invest more to educate girls", *World Development* 30(2): 207-225.

Smith, D. G., Gordon, D., Kelly, M., Nandy, S., Subramaniam, S. V. 2003. "Inequalities in health in India: the methodological construction of indices and measures", Report submitted to UK Department for International Development., 2003.

Swarup, H., and Rajput, P. 1994. Women and Globalization: reflections, options, and Strategies, Ashok Publications: New Delhi

World Bank. 2001. *Engendering development: Through gender equality in rights, resources, and voice*. New York: Oxford University Press.

World Bank press release 2008. *http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:21882162~pagePK:64165401~piPK:64165026~theSitePK:469382,00.html*, visited August 2008.

Tables

Table: 1A Number and percentage of variables used in the study

	Number of households (in percentage)
Female-headed households	5,940 (13.2)
Male-headed households	39,044 (86.8)
Households living in Poverty based on housing condition	7,559 (16.8)
Households living in Poverty based on wealth index	20,417 (45.4)
Households living in Poverty based on standard of living index	13,601 (30.2)
Households living in poverty under all three measures of poverty	5,084 (11.5)
Average child-adult ratio in each household	0.43
Average household size (number of members in each household)	5.5
All India Rural Total Households	44,984 (100)

Table 1B: Poverty status by household type

	Female-headed households (in percentage)	Male-headed households (in percentage)
Total households	**5,940 (100)**	**39,044 (100)**
Households living in kutcha houses	913 (15.4)	6,646 (17.0)
Households living in two poorest wealth index quintiles	2,577 (43.4)	17,840 (45.6)
Households living in the poorest standard of living index quintiles	2,175 (36.6)	11,426 (29.2)
Households living under poverty based on all three measures of poverty	704 (11.8)	4,380 (11.2)

Table 2: Probit Estimation: Dependent Variable: Different measures of poverty in rural India for 44984 households in 2005-06 (Marginal effects are in bold and italicized, and P-values in parenthesis)

	(1)	(2)	(3)	(4)
Dependent Variable	Housing Condition	Wealth Index	Standard of Living Index	All three measures
Female-headed households*	-0.087 (0.000) ***-0.020***	-0.086 (0.000) ***-0.034***	0.103 (0.000) ***0.036***	-0.020 (0.391) ***-0.004***
Child-adult ratio	0.186 (0.000) ***0.046***	0.294 (0.000) ***0.116***	0.321 (0.000) ***0.111***	0.229 (0.000) ***0.042***
Household size	-0.013 (0.136) ***-0.003***	-0.028 (0.000) ***-0.011***	-0.123 (0.000) ***-0.042***	-0.048 (0.000) ***-0.009***
Household size Square	-0.001 (0.219) ***-0.0001***	-0.0003 (0.383) ***-0.0001***	0.002 (0.000) ***0.0008***	-0.0003 (0.715) ***0.000***
Constant	-0.936 (0.000)	0.064 (0.000)	-0.091 (0.001)	1.045 (0.000)
Pseudo- Rsquare	0.01	0.02	0.03	0.02

**The marginal effect is for discrete change of the dummy variable from 0 to 1*

Table 3: Logit Estimation: Dependent Variable: Different measures of poverty in rural India for 44984 households in 2005-06 (p-values in parenthesis, marginal effects in bold and italicized, odds ratio in squared bracket)

	(1)	(2)	(3)	(4)
Dependent Variable	Housing Condition	Wealth Index	Standard of Living Index	All three measures
Female-headed households*	-0.156 (0.000) ***-0.020*** **[0.855]**	-0.138 (0.000) ***-0.034*** **[0.870]**	0.170 (0.000) ***0.036*** **[1.186]**	-0.038 (0.393) ***-0.003*** **[0.962]**
Child-adult ratio	0.324 (0.000) ***0.045*** **[1.383]**	0.474 (0.000) ***0.117*** **[1.607]**	0.526 (0.000) ***0.109*** **[1.692]**	0.421 (0.000) ***0.041*** **[1.524]**
Household size	-0.023 (0.164) ***-0.003*** **[0.977]**	-0.043 (0.000) ***-0.010*** **[0.958]**	-0.204 (0.000) ***-0.042*** **[0.815]**	-0.089 (0.000) ***-0.008*** [**0.915**]
Household size Square	-0.001 (0.220) ***-0.0001*** **[0.998]**	-0.001 (0.337) ***-0.0001*** **[0.999]**	0.003 (0.000) ***0.0008*** **[1.004]**	-0.001 (0.579) ***0.000*** **[0.999]**
Constant	-1.555 (0.000)	-0.107 (0.010)	-0.128 (0.006)	-1.750 (0.000)
Pseudo- Rsquare	0.01	0.02	0.03	0.02

**The marginal effect is for discrete change of the dummy variable from 0 to 1*

Table 4: Marginal Effects in Ordered Probit: Dependent Variable: Different Measures of Poverty in Rural India in 2005-06 (p-values in parenthesis)

A) Housing Condition (Cut-off Y=1 represent the poorest and Y=3 the least poor group) for **44628 households**[@]

	(1)	(2)	(3)	(4)
	Coefficient	Marginal effects and p-values		
Cut-offs		Y=1	Y=2	Y=3
Female-headed Households*	0.073 (0.000)	***-0.018*** (0.000)	***-0.008*** (0.000)	***0.026*** (0.000)
Child-adult ratio	-0.162 (0.000)	***0.053*** (0.000)	***0.021*** (0.000)	***-0.073*** (0.000)
Household size	-0.010 (0.012)	***0.002*** (0.120)	***0.001*** (0.120)	***-0.003*** (0.012)
Household size Square	0.001 (0.001)	***-0.0003*** (0.000)	***-0.0001*** (0.001)	***0.0004*** (0.001)
Pseudo- Rsquare	0.01			

[@] Housing condition cut-off data were not available for 356 households

** The marginal effect is for discrete change of the dummy variable from 0 to 1*

B) Wealth Index (Cut-off Y=1 represent the poorest and Y=5 the least poor group) for 44984 households

	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Marginal Effects and p-values				
Cut-offs		Y=1	Y=2	Y=3	Y=4	Y=5
Female-headed Households*	0.097 (0.000)	-0.028 (0.000)	-0.011 (0.000)	0.004 (0.000)	0.015 (0.000)	0.018 (0.000)
Child-adult ratio	-0.287 (0.000)	0.084 (0.000)	0.029 (0.000)	-0.047 (0.000)	-0.047 (0.000)	-0.052 (0.000)
Household size	0.023 (0.000)	-0.007 (0.000)	-0.002 (0.000)	0.001 (0.000)	0.004 (0.000)	0.004 (0.000)
Household size Square	0.0005 (0.015)	-0.0001 (0.015)	-0.0001 (0.015)	0.000 (0.015)	0.0001 (0.015)	0.0001 (0.015)
Pseudo-Rsquare	0.01					

** The marginal effect is for discrete change of the dummy variable from 0 to 1*

C) Standard of Living Index (Cut-off Y=1 represent the poorest and Y=3 the least poor group) for 44010 households[@]

	(1)	(2)	(3)	(4)
	Coefficient	Marginal Effects and p-values		
Cut-offs		Y=1	Y=2	Y=3
Female-headed Households*	-0.05 (0.005)	0.020 (0.006)	0.0003 (0.258)	-0.016 (0.005)
Child-adult ratio	-0.330 (0.000)	0.115 (0.000)	0.0003 (0.584)	-0.116 (0.000)
Household size	0.099 (0.000)	-0.035 (0.000)	-0.0001 (0.584)	0.035 (0.000)
Household size Square	-0.001 (0.000)	0.001 (0.000)	0.000 (0.587)	-0.001 (0.000)
Pseudo Rsquare	0.02			

[@] Standard of living cut-off data were not available for 974 households

** The marginal effect is for discrete change of the dummy variable from 0 to 1*

Table 5: Marginal Effects in Ordered Logit: Dependent Variable: Different Measures of Poverty in rural India in 2005-06 (p-values in parenthesis)

A) Housing Condition (Cut-off Y=1 represent the poorest and Y=3 the least poor group) for 44628 households

	(1)	(2)	(3)	(4)
Cut-offs		Y=1	Y=2	Y=3
	Coefficient	Marginal Effects and p-values		
Female-headed Households*	0.123 (0.001)	-0.017 (0.000)	-0.010 (0.000)	0.026 (0.001)
Child-adult ratio	-0.362 (0.000)	0.050 (0.000)	0.026 (0.000)	-0.077 (0.000)
Household size	-0.017 (0.082)	0.003 (0.082)	0.001 (0.082)	-0.004 (0.082)
Household size Square	0.002 (0.001)	-0.0003 (0.001)	-0.0002 (0.001)	0.0004 (0.001)
Pseudo Rsquare	0.01			

** The marginal effect is for discrete change of the dummy variable from 0 to 1*

B) Wealth Index (Cut-off Y=1 represent the poorest and Y=5 the least poor group) for 44984 households

	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Marginal Effects and p-values				
Cut-offs		Y=1	Y=2	Y=3	Y=4	Y=5
Female-headed Households*	0.159 (0.000)	-0.026 (0.000)	-0.013 (0.000)	0.005 (0.000)	0.018 (0.000)	0.016 (0.000)
Child-adult ratio	-0.483 (0.000)	0.081 (0.000)	0.038 (0.000)	-0.019 (0.000)	-0.054 (0.000)	-0.045 (0.000)
Household size	0.038 (0.000)	-0.006 (0.000)	-0.003 (0.000)	0.002 (0.000)	0.004 (0.000)	0.003 (0.000)
Household size Square	0.001 (0.134)	-0.0001 (0.134)	-0.0001 (0.134)	0.000 (0.134)	0.0001 (0.134)	0.0001 (0.134)
Pseudo Rsquare	0.01					

** The marginal effect is for discrete change of the dummy variable from 0 to 1*

C) Standard of Living Index (Cut-off 1 represent the poorest and 3 the least poor group) for 44010 households

	(1)	(2)	(3)	(4)
	Coefficient	Marginal effects and p-values		
Cut-offs		Y=1	Y=2	Y=3
Female-headed Households*	-0.080 (0.003)	0.017 (0.003)	0.0004 (0.193)	-0.017 (0.002)
Child-adult ratio	-0.545 (0.000)	0.115 (0.000)	0.0002 (0.808)	-0.115 (0.000)
Household size	0.166 (0.000)	-0.035 (0.000)	-0.0001 (0.808)	0.035 (0.000)
Household size Square	-0.002 (0.000)	0.001 (0.000)	0.000 (0.809)	-0.001 (0.000)
Pseudo Rsquare	0.02			

** The marginal effect is for discrete change of the dummy variable from 0 to 1*

Appendix:

a) Materials used in kutcha houses

Flooring materials: Mud, clay, earth, sand, dung, raw wood planks, palm, bamboo and other rudimentary materials.

Wall materials: cane, palm, trunks, mud, grass, reeds, thatch, bamboo and stone with mud, plywood, cardboard, unburnt bricks, raw or reused wood or other rudimentary materials, including houses with no walls.

Roof materials: thatch, bamboo, mud, palm leaves, grass, plastic, polythene sheets, raw wood planks, timber, unburnt bricks and loosely packed stones, including houses with no roofs.

b) Wealth Index

The list of items used to construct the wealth index include the source of drinking and non-drinking water, toilet and electricity facilities, type of cooking fuel, floor, roof and wall materials used in houses, type of windows, household possession of items, number of *de jure* members sleeping per room, house ownership, and whether the household has a bank or post office savings account.

c) Standard of living index

List of items used to construct the standard of living index: Housing structure, cooking fuel, drinking water source, separate room for cooking, ownership of house, land, irrigated land, livestock, tractor, car, motorcycle, telephone, refrigerator, TV, bicycle, electric fan, radio, sewing machine, water pump, animal-drawn cart, thresher, mattress, pressure cooker, chairs, cot, table, clock.