The Incidence, Determinants and Consequences of Female Headship in Rural Bangladesh*

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Abstract

Using an unusually rich dataset from rural Bangladesh, this paper explores the incidence of female headship, the characteristics of female-headed households and the effects of female headship on children's education. The empirical analysis takes into consideration the heterogeneity in the group of female-headed households, and the possible endogeneity of the female headship variable. The endogeneity of female headship is addressed in two ways. First, female headship is instrumented using widowhood status of mothers in the sample. Next, both female headship and widowhood are treated as endogenous variables and instrumented with information on the marriage market at the time of a woman's first marriage. The results indicate that female headship has a negative effect on children's education. Treating female headship as exogenous however, leads to the spurious result that female headship has a positive effect on children's education.

Since women almost everywhere are disadvantaged relative to men in their access to assets, credit, employment, and education, it is often suspected that female-headed households are more vulnerable to risk, economically less viable, and less able to invest in the health and education of their children (a review of these arguments is in Folbre, 1991; UNDP, 1995; United Nations, 1996; Buvinic and Gupta, 1997; World Bank, 2001).

Surprisingly, robust empirical evidence supporting these claims is scarce. Though a variety of case studies from around the world have documented the disadvantages faced by female-headed households (Mencher and Okongwu, 1993; Kumari, 1989), results from empirical studies have been far from conclusive. For example, Buvinic and Gupta (1997) review 61 studies on headship and poverty and find female-headed households to be disproportionately represented among the poor in 38 cases. Quisumbing, Haddad and Pena (2001) however, find that in their sample of 10 developing countries, the relationship between female headship and poverty is strong in only two countries, namely Ghana and Bangladesh.

The literature on the effects of female-headedness on children's welfare is similarly inconclusive. Several researchers have observed that in the United States children who grow up in female-headed households experience lower educational and occupational attainment, and, for female children, higher risks of teenage pregnancy

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(see McLanahan and Sandefur, 1994 or Seltzer 1994 for a review). Similar results have been found for female-headed households in Latin America (Ilahi, 2002; Barros, Fox and Mendonca, 1995). Yet, a growing literature also suggests that in many developing countries, children from female-headed households may fare better than their counterparts in male-headed households. For example, in their sample of seven African countries, Lloyd and Blanc (1996) find that though female headed households are economically disadvantaged relative to male-headed households, children in these households are more likely to have attended school and completed grade 4 than children in male-headed households.[1] Kennedy and Peters (1992) find that in Kenya and Malawi, though female-headed households are in the lowest income group, the nutrition status of pre-school children in these households was significantly higher than in any other type of household. Similarly, in Malaysia, Pong (1996) finds that children of widowed mothers have similar school participation rates as children of two-parent families.

There are several possible reasons for the impasse in the empirical literature on the effects of female headship. First, there are difficulties in defining female headship: definitions of headship employed in national surveys, the criteria used by survey respondents on the field, and the definitions based on contributions to household income do not always coincide (Rosenhouse, 1989; Kennedy and Peters, 1992; Kennedy and Haddad, 1994; Handa, 1994). Second, most analyses of female headship do not take into account the heterogeneity *within* the group of female household heads (exceptions are Rosenhouse, 1989; Kennedy and Haddad, 1992; Handa, 1994; Handa, 1996; Dreze and Srinivasan, 1998).[2] Finally, even studies that do take the issue of heterogeneity seriously, ignore the issues of selection into different types of households by assuming that female headship and other measures of household structure are exogenously determined. A growing literature illustrates that treating household structure as exogenous is problematic (Foster, 1993; Foster, 1998; Quisumbing, 1998; Foster and Rosenzweig, 2001; Joshi and Sinha, 2003). A woman's choice of heading her own households is affected by her own characteristics (such as age, income, and occupation), the characteristics of the marriage market, socio-economic circumstances of her natal home, and a variety of other factors affecting household formation and dissolution (Alderman, Chiappori, Haddad, Hoddinott and Kanbur, 1994; Schultz, 2001). Many of these factors affect poverty and children's education directly, as well as through female headship.

The goal of this paper is to explore the relationship between female headship, poverty and children's welfare in rural Bangladesh by addressing the issues of (a) heterogeneity in the group of female headed households, and (b) the issue of the endogeneity of certain types of female headship. I use a unique dataset from rural Bangladesh that combines census data from 1974 and 1982 with a rich socio-economic survey in 1996. A descriptive analysis of the data suggests that female-headed households in rural Bangladesh fall into two broad categories: households headed by widows and households headed by married women whose husbands are absent at the time of the survey. A comparison of these two types of households with male-headed households suggests that they have very different circumstances: whereas widow-headed households are the poorest, and spend the least on the health and education of their members, married women who head their own households are often

[1] In Cameroon, for example, 81 percent of children in female-headed households complete fourth grade by age 14, compared to 60 percent of children in male-headed households of like income.

[2] Typically, the group includes widows, divorced women, single women, abandoned women and women whose husbands have migrated away in search of employment. Some women in this group are clearly more vulnerable to falling into poverty than others.

wealthier than than male heads and spend more on the human capital of their children.

The empirical analysis of the effects of female headship on children's educational outcomes proceeds in three stages. First, for the sake of consistency with numerous other empirical studies, female headship is treated as an exogenous variable. In this case, female headship appears to have a positive impact on children's educational outcomes. In a second step, I use widowhood as an instrument for female headship, and show that female headship now appears to have a small negative effect on measures of schooling attainment. In a third and final step, the widowhood variable is also treated as endogenous. I estimate the determinants of widowhood using information on the marriage market at the time of the woman's first marriage, information about her natal home, and information about her marital home. The residuals from this estimation are then used as an instrument for female headship. In this case, I find that female headship has a significant negative effect on not only schooling attainment but also one measure of cognitive development.

This paper makes two contributions to the literature on female-headed households. First, it suggests that even in the context of rural Bangladesh, there is considerable heterogeneity among female-headed households: whereas widow headed households are clearly poorer and less able to invest in the health and education of their children than other types of households, this is not the case for households headed by married women. This is a surprising find because numerous case-studies, international comparisons, and analyses of household surveys have pointed out that female-headed households are among the most vulnerable (Cain, Khanam and Nahar, 1979; Caldwell, Reddy and Caldwell, 1984; Islam, 1993; Amin, 1996; Buvinic and Gupta, 1997; Quisumbing, Haddad and Pena, 2001). Second, the paper demonstrates that treating female headship as an exogenous category can lead to the spurious result that children from female-headed households have higher levels of educational attainment than children from male-headed households. The paper also illustrates that instruments for the endogenous female headship variable must be chosen carefully. Simply using widowhood as an instrument for female headship is unsatisfying when it is clear that the chances of being widowed are also related to the unobservables that directly affect children's schooling.

The remainder of this paper is organized as follows: Section 1 describes the three datasets that are used in the analysis. Section 2 describes the social, cultural and religious factors that affect household formation and dissolution in rural Bangladesh. It also describes the different types of female headed households that are found in rural Bangladesh and the transitions of these households from male to female-headed households (and vice-versa). Section 3 presents a comparison of the income, assets, and expenditures of male-headed households and different types of female-headed households. Section 4 contains an econometric analysis of the effects of female headship on children's educational outcomes. Section 5 concludes.

1 Data

The data used in this paper come from the 1996 Matlab Health and Socio-economic Survey (MHSS) together with census data from the Matlab Demographic Surveillance System (DSS).[3] The Matlab DSS area is located in the Matlab Upazila (subdistrict) if Chandpur district about 40 miles from Dkhaka, the capital of Bangladesh. The area is a low-lying deltaic plain intersected by a network of tidal rivers, and canals. The climate is sub-tropical with three seasons: monsoon, cool-dry and hot-dry. The average rainfall of 2159 mm is concentrated in the monsoon season which extends from June through September. The Tropic of Cancer passes through the area.

The 1974 census consisted of 167,037 individuals in 28,608 households in 233 villages. The 1982 census consisted of 186,695 individuals, in 27,515 households in the same 233 villages as the 1974. The region is thus densely populated: villages in Matlab have an average population of about 1,100 persons, and the average population density exceeds 1500 per square mile (Fauveau, 1993).[4] Eighty-five per cent of the people in the area are Muslims and the remainder are Hindus. Agriculture and fishing are the main economic activities. The per-capita income of the household heads is about US $150 a year (Rahman, Foster, and Menken, 1992).

Both the census datasets contain information on household size and structure, household assets, living arrangements, disability status, and the educational level of each member of the household. These records can be linked for the period of 1974–1982, so that all events occurring to a single individual are available and organized by household residence in 1974. Information on the relationship of the individual to the head of the household in which he or she was residing at the time is also contained in the survey.

The 1996 MHSS contains information on 4,364 households clustered in 2,687 *baris*.[5] For each of the baris, one household was chosen at random. For the selected households that had more than one household (i.e. 2,067 baris), a second household was also selected.[6]

The MHSS is a very rich dataset, containing information on both householder and non-householder family members, education histories (including the age at which schooling began, the school drop out age, grades attended and grades completed, grade repetition and scores in secondary and higher secondary examinations),

[3]The MHSS is a collaborative effort of RAND, the Harvard School of Public Health, the University of Pennsylvania, the University of Colorado at Boulder, Brown University, Mitra and Associates and the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). It was primarily funded by the National Institute on Aging with some additional support from the National Institute on Child Health and Development. The DSS is organized by the ICDDR,B and has been present in this region since 1966.

[4]This figure is based on the total amount of residential, arable and waste land.

[5]The *bari* is the basic unit of social organization in Matlab (Cain, Khanam and Nahar, 1979; Caldwell, Reddy and Caldwell, 1984; Foster, 1993; Fauveau, 1994). *Bari* literally means "homestead", but commonly refers to a cluster of households in close physical proximity. The households are generally located around a common yard and may share resources such as a tube-well, a cowshed, latrine, and/or several jointly owned trees. Heads of the households on a bari are generally related.

[6]For baris with exactly two households, the second household was automatically chosen as a second pick household. For baris with greater than two households, the second household was selected from the bari in order of preference as follows: (1) The household of the father and/or mother of the head of the first sampled household; (2) A household containing the son of the head of the first sampled household–if there were more than one household in the bari containing a son, one was picked at random; (3) A household containing a brother of the head of the first sampled household–if there was more than one household containing a brother, one was picked at random; (4) If none of the above three categories of households were found a household was selected at random from the bari.

marital histories, household formation, household income and consumption and a variety of other socio-economic variables. A community level survey also contains information on the history of the village as well as the characteristics of the schools, hospitals and local village institutions.

2 Origins and Typologies of Female-headed Households in Rural Bangladesh

To understand how female-headed households in Bangladesh are formed, it is important to understand the social and cultural factors that govern household formation and dissolution in Bangladeshi society.

Bangladesh is a patriarchal society (Cain, Khanam and Nahar, 1979; Caldwell, Reddy and Caldwell, 1984; Amin, 1996; Dyson and Moore, 2003). Decent is patrilineal and residence patrilocal. The practice of "joint-family living" is an important cultural ideal.[7] The head of the household is the eldest male. He is generally the demographic head, main contributor to household income and the main decision-maker.

As is the case in much of Northern India and Pakistan, there is generally a strong male-bias in Bangladeshi households (Dyson and Moore, 1983). This is for several reasons. First, at the time of marriage, a woman migrates from her natal home to live in the home of her husband. Preference for lineage and village exogamy often attenuate her ties with her natal home. As a result, investments in female human capital (such as education, health care, nutrition) and assets are perceived as benefiting "outsiders" rather than kin. Impoverished families may thus consciously favor sons in the intra-household allocation of resources, and may exclude their daughters from entitlements to family assets.

A second factor that leads to the male-bias is the system of dowry. Though Muslim tradition emphasizes the payment of bride-price (*mahr*) at the time of marriage, it appears that in Bangladesh the system has increasingly given way to the Hindu system of dowry, which is basically a husband-price (Cain, Khanam and Nahar, 1979). The pressure to provide a dowry for a daughter can not only intensify the son-preference in a woman's natal home, but also make her status in her in-laws home dependent on the dowry she brings into her marital home. Dowry demands from her in-laws can often continue even after marriage. Her parent's failure to meet these demands can result in violence against women and a severe weakening of her status in her marital home (Rao, 1993).

A third factor contributing to the male bias is the strong preference for early marriage for women. A substantial age gap between a bride and groom can place a woman to be in a subordinate position to her husband from the very onset of marriage, increase the risks of widowhood and reduces the opportunities for schooling or the acquisition of autonomy.

Fourth, throughout their lives, women's roles in the household and society are governed by the norms of *purdah*, or female seclusion.[8] Women are expected to perform tasks within the homestead only, and avoid

[7] Though technical definitions vary, a *joint family* is typically comprised of two or more generations of kin related patrilineally or sometimes matrilineally who live in close proximity, eat from the same hearth and hold property in common (Caldwell, Immerwahr and Ruzicka, 1982 which is adapted from Le Play, 1955). In general, a joint family consists of an elderly couple, their unmarried daughters, sons and possibly daughters-in-law and grandchildren.

[8] The term refers to the broad set of norms that emphasize the seclusion of the sexes, allocate the control of resources to men,

contact with the public realm in terms of employment and exposure to strangers. Men are expected to participate in income-generating activities outside the homestead and represent the household in the public realm. It has often been observed that in rural Bangladesh, poorer women, particularly those from landless families, are forced by economic exigencies to join the labor force and engage in non-traditional activities the clearly demarcated gender divisions of labor do not apply (Feldman, 1983, Kabeer, 1994). Other evidence, however, suggests that in reality women in these circumstances are not free of patriarchal control and face very limited opportunities for gainful employment (Boserup, 1990; Amin, 1997). Moreover, the loss of status experienced by these women and their families as a result of violating the *purdah* can be highly detrimental to their well-being.

In theory the system described above both controls women and provides them with shelter, protection and security. While men have authority over women, they are also normatively obligated to provide them with food, clothing and shelter. These obligations however, are not universally honored. It has been well-documented that women who are widowed, divorced, abandoned, or who unmarried, lose their entitlement of protection and in some sense "fall out" of the social system (Cain, Khanam and Nahar, 1979; Islam, 1993; Amin 1997).

Women who fall out of the social system have been shown to be highly vulnerable to falling into poverty (Islam, 1993). This is mainly driven by the fact that in women's opportunities to participate in the labor force in rural Bangladesh are very limited, even in comparison to most other underdeveloped agrarian societies (Cain, 1979). The market for women's labor is strongly demarcated both physically and functionally. Women work primarily within the homestead, performing housework and simple tasks like picking chillis, cultivating potatoes and other food crops. They may also work on post-harvest processing tasks such as threshing, winnowing, and boiling rice or wheat (Cain, 1979; Abdullah and Zeidenstein, 1982; Amin, 1997). Non-agricultural work consists of mainly domestic help in wealthy homes or government employment. Even when they are employed outside their homes, women's wages are lower than mens and women are more likely to be unemployed or underemployed. They almost never receive payments for their labor in cash.[9] More often than not, the quantity paid in kind works out to be a significantly lower rate than that given to men because the price of produce varies considerably from season to season and is usually lowest at the time of the harvest (Cain, 1979; Amin, 1997).

2.1 Types of Female-headed Households

The incidence of female headship in 1974, 1982 and 1996 is presented in Table 1. Note that the number of female-headed households has been increasing over time: their representation in the total sample of households increased from 11.68% in 1974 to 12.9% in 1982 to 15.2% in 1996.

The estimates in Table 1 are based on self-reported headship measures. Several recent studies have criticized the usage of self-reported headship measures in empirical analyses of survey data (Rosenhouse, 1989; Kennedy

and confer status to women based on their relationships with men (Abdullah and Zeidenstein, 1982; Amin, 1996). The system of *purdah* is sustained by a strong cultural and religious system in which observance of *purdah* is closely related to the family's status and prestige.

[9] In the case of harvesting crops such as chillies and potatoes, women receive a portion of the harvest as payment of their services. For domestic work or post-harvest processing, women are also paid in rice equivalents.

and Peters, 1992; Handa, 1994, Quisumbing, Pena and Haddad, 2001). The main criticism is that such measures are inaccurate in settings where households consist of extended families and social and cultural norms tend to identify the oldest male of the household as the head even when the main contributor to household income is a woman. In this case, households are identified as female headed only when the demographic head (a male) has either deceased or has migrated away. Moreover, it is argued that household headship is a multifaceted concept, and the presence of an adult male is only one dimension. The studies suggest that the question of who heads a household should be examined in the context of the intra-familial relationships of power, the life-cycle of the household, and the impact of social, religious and cultural norms.

While these criticisms are fully valid, it has been shown that in the context of rural Bangladesh, self-reported headship measures are more reliable than they are in many other regions of the world (Foster, 1993). The combination of patriarchal norms, strong preferences for female seclusion and limited opportunities for women's employment generally result in substantial overlap in definitions of demographic heads, ceremonial heads, main income earners, and main decision-makers (Foster, 1993; Joshi, 2003). The problem of misclassification, though important in numerous studies from Latin America (Rosenhouse, 1989) and Africa (Kennedy and Peters, 1992), is likely to be less problematic in Bangladesh. This can be seen by comparing the income of different members of the household in the MHSS dataset.[10] Using measures of both agricultural and non-agricultural income, in primary as well as secondary occupations, it appears that only 43 households of the 4,364 households in the survey were "female supported".[11] We drop these households from the empirical analysis.

2.2 Transitions Between Male and Female Headship

Households that are once headed by women do not always remain headed by women. For households in the MHSS that were also present in the 1982 and 1974 census surveys, Figure 1 presents the transitions in and out of female-headed households. Note that of the 379 households that were female-headed households in 1982, 337 households (85.7%) had become male-headed by 1996. Of the 288 female headed households in the 1974 census, 124 became male-headed (43%). These numbers suggest that each year, on average, somewhere between 5 and 6% of female-headed households become male-headed households.

These transitions are generally driven by the change in a woman's status from household head to mother of the head. This pattern is also apparent when we take a closer look at women who have been ever-widowed. 1094 of the 11033 women who were interviewed in the MHSS reported that they had been widowed at least once in their lives. Of these women, 799 were living with their adult children.[12] 549 of these 799 women were also interviewed in the 1982 census. At that time, 517 (94.17%) women were heading their own households. Thus, in the sample considered here, most widow headed households in 1982 had become male headed by 1996.

Almost none of the transitions from male to female-headed households are driven by remarriage. Though

[10]This is not possible for in the census data from 1974 and 1982 since they lack data on household income or employment of household members.

[11]This may however, be misleading. Assets brought into the household as a dowry at the time of her marriage may be an important source of income for households. This however, was difficult to verify due to data limitations.

[12]Of these women, 462 (42.23%) were living with their sons, and 337 (30.8%) were living with their daughters.

Muslim law permits widow remarriage, in reality, a woman who is older or already has children, faces limited options to remarry. For younger widows however, remarriage is common. Of the 1094 women who were ever-widowed, 218 reported that they had remarried (19.2%) after the loss of their first husband. All of these women however, were under the age of 20 at the time of their second marriage. None of them had headed their own households after the death of their husbands. It appears that they returned to their natal homes where their parents arranged a second marriage.[13]

3 Comparisons of Female and Male-Headed Households

In comparing female-headed households to male-headed households (MHH), I make a distinction between households headed by widows (WHH) and households headed by married women whose husbands are absent at the time of the survey (MWHH). Widows are generally *de-jure* heads, i.e. women who are the legal and customary heads of their own households who have full control over household income and expenditures. Married women who head their households in the absence of their husbands on the other hand, are generally *de-facto heads*. In these households, husbands or other male-relatives still play a role in basic decision-making and make varying contributions to household incomes.[14][15]

Table 2 summarizes the composition of households in the 1974, 1982 and 1996 data. Note that female-headed households are substantially smaller: there are fewer men, women, girls and boys in these households. That female-headed households are generally smaller than male-headed households has been found in numerous studies in different parts of the world (Dreze and Srinivasan, 1993; Kennedy and Peters, 1992; Handa, 1994; Lanjouw and Ravallion, 1995; Lloyd and Blanc, 1996).

The income levels, income sources and assets of the three types of households are summarized in Table 3. Notice that MWHH have *highest* levels of total as well as per-capita income. Most of this comes from remittances directly received by household head. WHH on the other hand, have lowest levels of both total income and per-capita income. This pattern is also evident in ownership of assets such as clocks and televisions and indicators of whether the household has a bank account, cash savings, and has ever received an inheritance: MWHH rank the highest, followed by MHH and finally by WHH. This is consistent with numerous other studies. For example, Kennedy and Peters (1992) find that migrant households in Malawi actually have higher per-capita expenditures than any other type of household.

A slightly different pattern is evident for ownership of assets such as land. Note that male-headed households have higher level of land holdings than either type of female-headed households. That widows and other female heads have a poorer resource base than their counterparts in male-headed households has been documented

[13]The average age at the time of second marriage for this group was 13.16, and the standard deviation of the age at second marriage was 3.33.

[14]The distinction between *de-jure* and *de-facto* households has also been made by Rosenhouse (1989), Kennedy and Peters (1992), Handa (1994) and Handa (1996).

[15]There is of course the possibility that married women who are heading their own households are divorced or abandoned, but due to cultural norms still regarding themselves as married. Due to limitations of the data, is difficult to estimate the number of such households.

elsewhere (Kumari, 1989; Agarwal, 1994). The differences are particularly striking with respect to landholdings of the previous generation. The variable *Parent's Land Holdings* indicates that the parents of widowed women who head their own households are likely to be poorer than the parents of other married women in the sample, including the married women who head their own households.[16] This is an interesting finding for it suggests that for women in the sample, parental socio-economic characteristics may affect the probabilities they are widowed or head their own households.

The difference between the asset holdings of male and female-headed households is possibly driven by differences in patterns of inheritance between men and women in rural Bangladesh. Though Islamic law permits women to inherit assets from deceased relatives, in practice, women often forfeit their claims to their inheritances in return for the goodwill of their brothers and other male-relatives. Of all the 665 female heads in the MHSS, only 219 women (32.93%) reported that they had inherited property from deceased relatives. Of the 3699 male heads however, 1557 (42.09%) had inherited property from deceased relatives.

3.1 Expenditure

The differences seen between the income and asset holdings of the three types of household are mostly absent in comparisons of per-capita expenditure. Descriptions of household expenditures in different categories is presented in Table 3. Note that MWHH spend the most in certain categories (non-food expenditure, and indirect educational expenditure).[17] In most cases, they are followed by MHH and finally by WHH. In most cases, the differences in expenditures of the three types of households are not statistically significant.

Why might it be that the differences seen in the incomes of the three types of households are not reflected in the patterns of consumption of these households. One explanation for this is that a greater share of their expenditures are met by other households.[18] A second explanation could be that women from poorer households are likely to engage in more cost-cutting or expenditure-saving activities than their married woman counterparts.[19]

The finding that female-headed households have lower incomes but not lower consumption levels than male-headed households is consistent with numerous other studies. Dreze and Srinivasan (1995) for example, use NSS data from rural India to compare the equivalence-scale adjusted household per-capita expenditures of male and female-headed households. They find that for reasonable choices of equivalence scales, there is no evidence that female-headed households are poorer. Poverty indices however, are sensitive to the level of economies of scale. Even relatively small economies of scale imply that the incidence of poverty among certain types of female-headed household (single widows, widows living with unmarried children, and female household heads)

[16] For the male-headed households, this refers to the landholdings of the parents of the wife of the head, and not the head.

[17] Direct educational expenditure includes school fees and other types of fees that are paid directly to the school. Indirect educational expenditure refers to the costs of uniforms, books, supplies, transportation, and other such expenses.

[18] In an analysis not shown here, I found that the share of non-food expenditure met by other households was the highest for WHH, followed by MWHH and finally by MHH.

[19] Amin (1996) gives several examples of this: whereas landed households busy themselves with processing rice after the harvest, women from poorer households scour the fields after the farmers have left with their rice. Rather than buying vegetables and fish from the local market, poorer women will pick greens these from around the homestead and catch fish in flooded fields. Similarly, they save fuel expenses by foraging through the village for straw, wood and dung, which they then bring home to dry. Rather than threshing rice at a rice mill, they rely on age-old manual tools.

is higher than in the population as a whole. I do not address the issues of equivalence scales here, but in future work, it would be interesting to examine this issue in more detail.

4 The Effects of Female Headship on Children's Education

This goal of this section is to empirically examine the effects of female headship on children's educational outcomes. The main equation that is estimated is as follows:

$$\mathrm{Y}_{ijk} = \beta_0 + \beta_1\, \mathrm{c}_{ijk} + \beta_2\, \mathrm{p}_{ijk} + \beta_3\, \mathrm{h}_{jk} + \beta_4\, \mathrm{v}_k + \beta_5\, \mathrm{FHH}_{jk} + \epsilon_{ijk} \tag{1}$$

where

e_{ijk}: a measure of the educational outcome of child i, in household j, in village k.

c_{ijk}: a vector of characteristics of child i, in household j, in village k.

p_{ijk}: a vector of the characteristics of the parents of child i, in household j, in village k.

h_{jk}: a vector of characteristics of household i, in village k.

v_k: a vector of characteristics of village k.

FHH_{jk}: a dummy variable that takes value 1 if a household i is female-headed and 0 otherwise.

The working sample includes children of the household head who were between the ages of 8 and 18 at the time of the MHSS.[20] This included both young adults living with their parents as well as young adults who had left the household and were living elsewhere.

The reason for setting the lower age limit at 8 is twofold. First, since the average age at which children begin their schooling is 7 (see Table 5), we include all the children who are above the average school starting age. Second, boys and girls between the ages of 8 and 18 are likely to have been significantly affected by the government policies that were aimed at increasing schooling enrollment and schooling attainment (these are described in the following section). Choosing a lower age limit that exceeded the age of 8 would cause us to omit a very interesting and important group of children.

The reason for setting the upper age limit at 18 is fourfold. First, the older the individual, the more likely that the he or she is to make recollection errors about the circumstances in which the schooling decisions were made. Secondly, information on variables such as female headship, income and assets are relevant to the schooling decisions of only those children who are either in school or have recently quit. For older individuals it would be problematic to use current information as a proxy for information at the time that schooling decisions were being made. Third, as in the case of the choice of the lower age limit, I would like to make the present analysis relevant to the current situation in Bangladesh and not an analysis of past situations.

Household histories for these children were constructed using the 1982 Census data, the 1974 census data and where information was unavailable from these sources, the retrospective information on household formation in

[20] Children for whom neither parent was the head were excluded because detailed information about the income and other characteristics of the child's parents was often unavailable. Also, information on how long the child had been living in the household and how long the child would continue to live in the household was unavailable.

the MHSS. Aspects of household history that were most relevant for the purpose of this paper were of course, changes in headship.

The dependent variables in these regressions include measures of children's educational attainment as well as measures of cognitive outcomes. The measures of educational attainment are whether the child has ever attended school (*EverAttd*), and the number of years of schooling (*YearsEd*). The measures of cognitive outcomes include the child's ability to read, write, add and multiply. Among the independent variables, measures of individual characteristics, parental education, household income and assets, household composition, and community level characteristics were included.

Measures of individual characteristics included age (*Age*), age-squared (*AgeSq*) and gender(*Female*).[21] Inclusion of age and age-squared was motivated on the grounds that some older children are likely to drop out of school either because they were old enough for marriage or began participating in income-generating activities.[22]

Among the variables on parental education, variables indicating whether the child's mother had ever attended school (*EverAttdMo*) and the number of years of education of the child's father (*YearsEdFa*). To account for life-cycle effects of the household, the age at which the child's parent became the head (*AgeParHead*) is also included as a dependent variable.[23]

Asset variables included measures of farmland (*Farmland*), and the square of this variable (*FarmlandSq*), a dummy variable indicating whether the child's mother had ever received an inheritance (*RecInherit*) and a dummy variable indicating whether the child's mother owned any jewelry (*OwnJewelry*). Measures of income were excluded on the grounds that the relevant income, mother's income, is likely to be highly endogenous to Equation 1.

Other household characteristics that were included among the dependent variables in this paper included the time taken to fetch drinking water (*TimeDrWater*) and whether the household has a solid rather than dirt floor (*DirtFloor*). The former is intended as a measure of the opportunity costs of schooling while the latter is intended as another measure of household socio-economic status.

Among community level characteristics, information on whether the household was in a Treatment area (*TreatmntArea*), and the time since the establishment of the first primary school (*YrsPrimSch*). The inclusion of the variable *TreatmntArea* was particularly important: The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) has been maintaining a demographic surveillance system in the area since 1966. Half of the surveillance area, the treatment area, consists of villages that have been brought under a program which launched widespread interventions to improve family planning, reduce population growth, and improve overall health. The other half of the area, being served by the government family planning program, was not targeted by such programs.[24]

Summary statistics of all the variables are presented in Table 5. Noticeably absent from the list of dependent

[21]The variable *Female* took value 1 if the child was a girl and 0 if the child was a boy.

[22]The decision to include a dummy for the children's gender instead of carrying out separate regressions for boys and girls was made in light of the substantial increases in enrollment rates of both boys and girls in Bangladesh in recent years (Joshi, 2003).

[23]The relevance of this variable in this context is discussed in Joshi (2003a, 2003b).

[24]More details are available in Razzaque and Streatfield (2001).

variables in this paper are any measures of the returns to education, or the costs of education. Given that the data come from a small part of Bangladesh however, it is likely that they do not vary across the sample and can be omitted from our analysis.

Equation 1 is first estimated using simple Probit and OLS methods. The results are presented in Table 7. Note that the coefficient *FemaleHead* takes a positive coefficient in all six regressions, though it is statistically significant only in the estimation of *YearsEd*.[25]. This suggests that children from a female-headed households are more likely to attend school and more likely to stay in school longer. Though this is consistent with other results in the literature (Lloyd and Blanc, 1996; Handa, 1996), the issue of endogeneity of female headship has been neglected. Rather than discussing the results of this section, we turn now to the second set of results.

4.1 IV Estimation with Widowhood Viewed as Exogenous

A way to consistently estimate Equation 1 with the female headship variable treated as an endogenous variables is to use a two-stage least squares (2SLS) procedure. The instrument is a dummy variable indicating whether or not the child's mother has ever been widowed (*MoEvrWidow*).[26] More formally, the equation being estimated in the first stage is as follows:

$$\mathrm{FHH}_{jk} = \beta_0 + \beta_1\, \mathrm{c}_{ijk} + \beta_2\, \mathrm{p}_{ijk} + \beta_3\, \mathrm{h}_{jk} + \beta_4\, \mathrm{v}_k + \beta_5\, \mathrm{Z}^1_{jk} + \epsilon_{ijk} \tag{2}$$

where Z^1_{jk} is the instrument. For now, this is assumed to be the variable (*MoEvrWidow*). Two assumptions are necessary for consistent estimation: First, widowhood is assumed to be highly correlated with female headship; and second, widowhood is assumed to be uncorrelated with the unobservables that affect children's educational attainment.

Since both the endogenous variable and the instrument are dummy variables, we apply the two stage approach of Blundell and Smith (1986, 1989). In the first stage, a linear probability model is used to obtain predicted residuals. To correct for heteroskedasticity, each of the first stage equations are estimated by OLS, predicted values are obtained, and the estimation is repeated using weighted-least squares with the inverse of predicted values as weights (Maddala, 1983).[27] In the second stage the dummy variables are used along with the residuals obtained from the first stage.

The results from the second stage of the two stage least squares procedure are presented in Table 9. Note that according to the Blundell and Smith (1986) exogeneity test, we can conclude that in the regressions for *EverAttd* and *YearsEd*, tests of exogeneity of *FemaleHead* lead to a rejection of the null hypothesis. Moreover, female headship now appears to have a negative and significant effect on years of schooling. This contrasts sharply with the OLS estimation of years of schooling (Table 7, column (2)).

The main problem with the analysis here is that the exclusion restrictions required for the IV estimation

[25]This was also reported in Joshi (2003a)

[26]Recall that roughly half the female household heads in Matlab are widows. Moreover, more than 60% of most women who are ever widowed end up heading their own households.

[27]Moreover, for negative predicted values, we used a weight of 0.02 (Nerlove and Press, 1973).

are unrealistic. In rural Bangladesh a woman's chance of being widowed are likely to depend on characteristics of the marriage market, the socio-economic circumstances of her natal home, the characteristics of her spouse and variety of other factors that are not included here.[28] Thus widowhood is likely to be highly correlated with the unobservables in Equation 1, leading to spurious results. I address this issue in the following section.

4.2 IV Estimation with Widowhood Viewed as Endogenous

I now examine the possibility that Equation 1 contains unobservables that are correlated with the variable *MoEvrWidow*. Using information on the characteristics of the mother's natal home, marital home and spouse at the item of marriage, I estimate the determinants of widowhood. The residuals from the estimation procedure as an instrument for female headship in estimating Equation 1. It is possible to estimate the determinants of widowhood, due to the availability of detailed information on marital histories in the MHSS, which could in many cases be verified by the panel component of the data.[29]

I estimate the following equation:

$$\text{EverWidow}_{ijk} = \gamma_0 + \gamma_1 \, \text{W}_{ijk} + \gamma_2 \, Z^2_{ijk} + \eta_{ijk} \tag{3}$$

where

EverWidow_{ijk}: a dummy variable taking value 1 if the woman i, belonging to natal home j, marrying into household k, was widowed and zero otherwise.

W_{ijk}: a vector of characteristics of the woman at the time of marriage, her natal home, her husband and her marital home.

Z^2_{ijk}: a vector of variables that appears in neither Equation 1 nor Equation 2.

Characteristics of the woman included here are only her age at marriage (*MoAgeAtMarr*). Characteristics of her natal home regression were as follows: dummy variables indicating whether the woman's mother and father were alive at the time of her marriage, whether any dowry that was paid to the groom's family, and the sex ratio of her siblings (defined as the number of male siblings divided by the number of female siblings). Characteristics of her husband and her in-laws that were included were husband's age, a dummy variable indicating whether the husband's age was missing, husband's education, a dummy variable indicating whether the husband's education information was missing and finally, a dummy variable indicating whether the woman's father was wealthier than her father-in-law. Finally, I also include a measure of the state of the marriage market in the year of the woman's marriage: the fraction of women in a woman's age group from her natal village who paid a dowry in

[28] Recall from the previous section that widowed women had fathers who had the smaller land-holdings than the fathers of women who either resided in male-headed households or who were married and heading their own households.

[29] Information on the marital histories of more than 11,000 ever married women was available in the MHSS survey. When this sample was restricted to include only mothers of children between the ages of 8 to 18, 6,003 women remained. Of these women, 4.9% reported that they had been ever been a widow. Of course, this will be lower than the percentage of ever-widowed women in the entire population of ever-married women because we are omitting older women, who have a higher probability of being widowed due to life-cycle reasons.

the year of her marriage. A summary of these variables is presented in Table 6. All these variables other than the womans age at marriage and the education of her husband, were excluded from Equation 1 and Equation 2.[30]

The residuals from the estimation of Equation 3 (*MoEverAttdRES*) are then used as an instrument in the two-stage-least squares estimation of 1. To the extent that ϵ_{ijk} includes the exogenous variables in the estimation of Equation 3, the assumption that *MoEverAttdRES* is uncorrelated with ϵ_{ijk} will result in consistent IV estimates.

Consider first the results from the estimation of EquationWidowEqn. The estimation results are presented in Table 10. The coefficients have the expected signs. Women whose parents were alive at the time of their marriages were likely to have a lower probability of being widowed. This is attributed to the fact that marriages in rural Bangladesh are arranged by a bride's parents. In the event that the father dies, the marriage contract would be arranged by male relatives, who do not always have the same incentives to ensure a high quality match.

Assuming that mortality risks increase with age, the age of the groom should be expected to have a positive effect on the chances of a woman being widowhood. It is surprising that though the variable *Husbands age at marriage* takes a positive sign, the coefficient is not statistically significant.[31] The education of the groom however, has the expected negative effects on a woman's probability of being widowed. This could be driven by the fact that more educated men are perhaps wealthier, better able to access health care and less likely to engage in risky occupations or other activities.

Interesting patterns are evident in the dowry variables. A woman's dowry is expected to have a negative effect on widowhood, because it is indicative of the effort made by her parents to ensure her a good quality match. Parents can afford a significant dowry for their daughters at the time of marriage are likely to marry their daughters into families where they have a lower chance of being widowed.

Finally, the sex ratio of the bride's siblings is expected to have a negative effect on her widowhood. A family with a disproportionate number of girls than boys may be forced to compromise on the quality of matches for their daughters due to the pressure of higher levels of dowry outflows than dowry inflows.

The results of the first stage estimation of Equation 1 with the variable *MoEvrAttdRES* as an instrument, are presented in Table 11. The fitted values of *MoEvrWidow*) are included for the purposes of a Hausman exogeneity test.[32] Note that the coefficients for (*MoEverWidowRES*) and (*MoEverWidowHAT*) positive and statistically significant, indicating a rejection of the null hypothesis of the exogeneity of the widowhood variable. Note that the coefficients for the fitted values and the variable are both positive.

The results of the second stage estimation are presented in Table 12. The results indicate that children from

[30]Adding more "exogenous" variables as controls in Equation 1 and Equation 2 does not affect any results presented here. The key exclusion restrictions are: the variable describing the marriage market, the dowry variable and the age of the husband at the time of marriage.

[31]The explanation for this could simply be measurement error. Most women were reporting marriages that occurred more than 20 years ago, a time-frame long enough to weaken the reliability of reported estimates.

[32]Since they are orthogonal to the instrument, the inclusion of these fitted values does not alter any of the estimates in the first stage regression.

female-headed households are considerably less likely to attend school and stay in school than their counterparts in male-headed households. The effects are strong: children from female-headed households are 42% less likely to attend school and are also likely to receive roughly 12.5% less schooling than children from male-headed households. Moreover, the null hypothesis of exogeneity of the female headship variable is rejected for these variables. Unlike in the case of the OLS and previous IV estimation, it now appears that female headship also has an adverse effect on a measure of cognitive development: children's ability to write. Children from female-headed households appear to be 37% less likely to write than children from male-headed households. For this variable too, the null hypothesis of exogeneity of the female headship variable is rejected.

These results stand in sharp contrast to the results from the simple OLS and probit estimates of Equation 1 and the results from the simpler IV procedure where female headship was instrumented with widowhood. A comparison of the coefficients is presented in Table 13. Note that as we move from treating female headship as exogenous to addressing the endogeneity of female headship, the results on the impact of female headship on children's education shift from positive to strongly negative (at least for the variables that were statistically significant).

5 Summary and Conclusion

Understanding the consequences of female headship on poverty and the welfare of children has often been obscured by (a) the tendency to treat female-headed households as a homogeneous group and compare their characteristics to more wealthy, male-headed households; and (b) the tendency to ignore the *causes* of female headship. This paper deals with these issues using a unique dataset from the Matlab area of Bangladesh that combines census data from 1974 and 1982 with a rich socio-economic survey in 1996.

A descriptive analysis of the data suggests that the number of female headed households in Bangladesh has been rising slightly over time. These households fall into two broad categories: households headed by widows and households headed by married women whose husbands are absent at the time of the survey. Widows who head their own households generally do not remarry. In this group, the transition from female-headed households to male-headed households occurs as their status changes from the household head to mother of the head. A comparison of these two types of households with male-headed households suggests that they have very different circumstances: whereas widow-headed households are the poorest, and spend the least on the health and education of their members, married women who head their own households are often wealthier than than male heads and spend more on the human capital of their children.

The empirical analysis of the effects of female headship on children's educational outcomes has been carried out in three stages. First, for the sake of consistency with numerous other empirical studies, female headship is treated as an exogenous variable. In this case, female headship is shown to have a positive impact on children's educational outcomes. In a second step, I use widowhood as an instrument for female headship, and show that female headship now appears to have a small negative effect on children's schooling attainment. In a third and final step, the widowhood variable is decomposed into a predictable and unpredictable components.

The unpredicted components are used as an instrument for female headship. In this case, I find that female headship has a significant negative effect on children's schooling attainment as well as one measure of cognitive development.

The findings of this paper suggest that analyses of the *consequences* of female headship should pay close attention to the *causes* of female headship. Though the data used in this analysis were drawn from a small region of Bangladesh, this general conclusion extends to international comparisons as well. The causes of female headship vary across different countries and even within countries of the world. In the United States and other industrialized countries for example, female-headed households generally include women who are divorced, separated, single unmarried mothers, and widows (McLanahan and Sandefur, 1986; Wojtkiewicz, McLanahan and Garfinkel, 1990; Folbre, 1991). In Africa however, a large number of female-headed households in rural areas are "left-behind" households whose male members have migrated to urban areas in search of employment (Lloyd and Blanc, 1996). In Latin America, it is women who migrate to cities and thus there is an increase in female headship in urban area (Population Council/ICRW, 1989). Focusing on the consequences of female headship without controlling for the causes introduces selectivity and simultaneity problems.

The findings of this paper also have some policy implications. First, the results suggest that since not all female-headed households are overrepresented among the poor, the heterogeneity of female heads should also be taken into consideration in designing policies that aim to improve children's health and education. Second, neglecting the endogeneity of variables pertaining to household structure may result in a failure of poverty-reduction programs that target households or children based on the gender of the household head.

More research is necessary to fully understand the effects of household structure, poverty and children's well-being. Undoubtedly, a clearer understanding of these issues can improve the design of policy, contribute to the reduction of poverty and improvement in children's human capital in the long run.

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Household Type	**No. of households**	**% of Total**
1974 Data		
Female-headed Households	3335	11.68%
Widow Headed Households	2015	7.0%
Total Number of Households	28586	100%
1982 Data		
Female-headed Households	3395	12.90%
Widow Headed Households	2197	8.4%
Total Number of Households	26306	100%
1996 Data		
Female-headed Households	665	15.20%
Widow Headed Households	385	8.80%
Total Number of Households	4364	100%

Table 1: The incidence of female-headed households and widows in the 1974 Census, 1982 Census and 1996 MHSS.

	FHH	MHH	Difference	P-value
1974 Data				
Household Size	3.59	6.17	-2.57***	.000
Number of Adult Men	.350	1.69	-1.33***	.000
Number of Adult Women	1.33	1.53	-.20***	.000
Number of Male Children	1.00	1.36	-.36***	.000
Number of Female Children	1.23	1.83	-.60***	.000
Age of Head	43.12	46.26	-3.13***	.000
1982 Data				
Household Size	3.93	6.48	-2.55***	.000
Number of Adult Men	1.81	3.79	-1.98***	.000
Number of Adult Women	2.79	3.52	-.73***	.000
Number of Male Children	1.17	1.55	-.37***	.000
Number of Female Children	1.46	2.14	-.68***	.000
Age of Head	45.59	48.01	-2.41***	.000
Land Holdings				
1996 Data				
Household Size	3.97	5.81	-1.84***	.000
Number of Adult Men	.82	1.89	-1.07***	.000
Number of Adult Women	1.66	1.78	-.12***	.000
Number of Male Children	1.32	2.67	-1.35***	0.001
Number of Female Children	1.91	2.17	-.26***	.000
Age of Head	46.89	48.97	-2.08***	.000

Table 2: Demographic information for male and female-headed households in the 1974 census, 1982 census and 1996 MHSS.

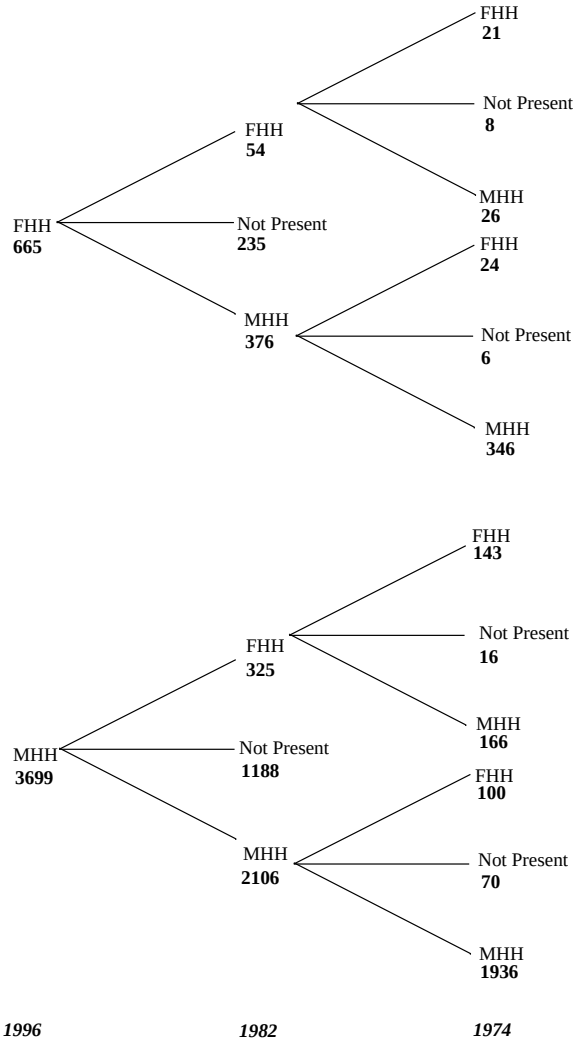

Figure 1: Transitions from female-headed and male-headed households in Matlab. The sample consisted of all individuals who have ever been household heads.

	Descriptions			Comparisons			
	MHH	WHH	MWHH	(WHH versus MHH)		(MWHH versus MHH)	
				Difference	pval	Difference	pval
Income							
Head Inc	22641.49	11323.11	23084.95	-11318.38***	.000	443.46	.885
Head Inc (per cap)	7.631	6.011	13.90	-1.620	.083*	6.269***	.000
Non-head Inc	815.756	28.01	179.67	-787.746	.308	-636.086	.515
Non-head Inc (per cap)	17.663	.849	4.49	-16.814	.278	-13.17	.507
Head's Remittances	950.61	4665.46	11168.96	3148.62***	.000	9817.79***	.000
Non Head's Remittances	1046.55	4921.84	11293.9	3307.46***	.000	9829.49***	.000
Assets							
Farmland	.225	.062	.057	-.162	.154	-.167	.305
Land when became head	.194	.207	.173	.013	.871	-.021	.805
Value of land owned	2.29	1.130	1.721	-1.16	.245	-.569	.690
Value of Jewelry	229.09	113.05	172.19	-116.03	.245	-56.90	.690
Parent's Land Holdings	555.71	132.50	513.11	-423.21**	.055	-42.61	.899
Own TV	.038	.015	.060	-.022*	.018	.022*	.101
Own Radio	.257	.177	.304	-.079	.000*	.047	.128
Own Clock	.453	.285	.529	-.167	.000**	.077*	.026
Total Assets	229090.4	113055.2	172190	-116035.2	.245	-56900.41	.690
Total Assets (per cap)	65754.57	50474.29	63627.43	-15280.28	.609	-2127.139	.960
Expenditure (per cap)							
Total food	29.98	30.02	31.38	1.393	.514	-.031	.984
Food purchased	21.52	20.26	23.38	1.99	.225	-1.35	.225
Total non-food	1338.161	1377.33	1746.33	16.55	.921	403.94*	.083
Direct ed exp	29.79	26.91	47.47	-3.86	.710	17.99	.214
Indirect ed exp	299.75	272.116	622.86	-45.62	.291	326.11***	.000
Non-hhd ed exp	8.91	9.49	19.50	-.002	.998	10.53	.143
Other							
Dirt Floor	.096	.389	.064	.292***	.000	-.032*	.101
Have Cash Savings	.122	.063	.171	-.059***	.000	.049*	.035
Own Bank Account	.111	.067	.152	-.043**	.005	.041**	.061
Received Inheritance	.421	.246	.502	-.175***	.000	.081**	.018

Table 3: Socio-economic information for male and female-headed households in the 1974 census, 1982 census and 1996 MHSS. Notes: (i) MHH, WHH and MWHH stand for "Male-Headed Households", "Widow Headed Households" and "Married Woman Headed Households" respectively; (ii) "Per-cap" stands for per-capita; (iii) The superscripts *, **, and *** on the standard errors indicate that the means are significant at the 10%, 5% and 1% level respectively.

	Descriptions			Comparisons			
	MHH	WHH	MWHH	(WHH versus MHH)		(MWHH versus MHH)	
				Difference	pval	Difference	pval
Ever Enrolled in School	.764	.588	.764	-.18	.000***	.16	.000***
Highest Class Attended	4.02	3.15	4.24	-.88	.000***	.28	.000***
Ability to read	.06	.02	.12	-.03	.001***	.06	.000***
Ability to write	.04	.02	.07	-.02	.011**	.04	.010**
Ability to add	.07	.04	.13	-.03	.006***	.07	.000***
Ability to mult	.05	.02	.09	-.02	.008***	.04	.004**

Table 4: Educational attainment of children residing in male and female-headed households. Notes: (i) MHH, WHH and MWHH stand for "Male-Headed Households", "Widow Headed Households" and "Married Woman Headed Households" respectively. (ii) The superscripts *, **, and *** on the standard errors indicate that the means are significant at the 10%, 5% and 1% level respectively.

	N	Mean	Std. Dev	Min	Max
Age	5865	13.016	3.127	8	18
Agesq	5865	1.792	.818	.64	3.24
Female	5865	.477	.499	0	1
Hindu	5865	.091	.286	0	1
SibSexRatio	5843	1.510	1.194	0	8
AgeParHead	5817	28.334	7.949	1	77
MoAgeAtMarriage	5853	14.873	3.589	0	78
MotherAge	5753	40.132	7.178	20	72.25
MotherAgeSq	5753	1.662	.609	.4	5.22
EdFaMissing	5865	.067	.249	0	1
YearsEdFa	5865	3.912	3.89	0	18
EverAttdMo	5636	.407	.491	0	1
DrWaterMiss	5865	.136	.343	0	1
DrWaterTime	5865	.197	.227	0	3
DirtFloor	5865	.032	.176	0	1
OwnJewelry	5841	.599	.490	0	1
RecInherit	5865	.433	.496	0	1
Farmland	5653	.193	1.656	0	38.4
Farmlandsq	5653	.278	4.723	0	147.456
TreatmntArea	5865	.470	.499	0	1
FemaleHead	5865	.109	.313	0	1

Table 5: Summary statistics of the variables in the schooling regressions.

	N	Mean	Std. Dev	Min	Max
Ever Widowed	2705	.0588	.2353	0	1
Husband age at marriage missing	2705	.3822	.4860	0	1
Husband age at marriage	2506	17.7542	13.9359	0	98
Husband years of education missing	2705	.4329	.4956	0	1
Husband years of education	2685	3.6707	4.0066	0	18
Father alive at time of marriage	2705	.82957	.3761	0	1
Mother alive at time of marriage	2705	.9049	.2933	0	1
Any dowry paid to family of groom	2705	.3024	.4594	0	1
Father richer than father-in-law	2705	.4104	.4919	0	1
Number of brothers	2567	2.4487	1.5211	0	9
Number of sisters	2567	2.1461	1.4227	0	8
Frac of same-age women from natal village paid dowry	2705	.3173	.2633	0	1

Table 6: Summary statistics of variables used to predict widowhood. The sample includes women who have at least one child between the ages of 8 to 18.

	EverAttd	YearsEd	ChildRead	ChildWrite	ChildAdd	ChildMult
	(1)	(2)	(3)	(4)	(5)	(6)
Age	.4273	1.1652	.8024	.804	.9125	1.1769
	(.1039)***	(.1216)***	(.263)***	(.317)**	(.2391)***	(.2829)***
Agesq	-.1904	-.2733	-.2123	-.1922	-.2646	-.3647
	(.0385)***	(.0478)***	(.117)*	(.1387)*	(.1076)**	(.1253)***
Female	-.016	-.0937	-.1343	-.03	-.1726	-.2957
	(.0799)*	(.086)	(.0787)*	(.0949)	(.0861)**	(.0948)***
Hindu	-.3841	-.1194	-.0307	.0772	.1337	.2629
	(.1293)***	(.1618)	(.1457)	(.1409)	(.1446)	(.1396)*
SibSexRatio	-.0263	-.0194	.0054	.0395	-.0268	-.0571
	(.0325)	(.0389)	(.0387)	(.0443)	(.0379)	(.0401)
AgeParHead	.0096	.0061	.0111	.007	.0081	.0118
	(.0045)**	(.0057)	(.0051)**	(.0057)	(.0052)*	(.0056)**
MoAgeAtMarriage	-.5395	-.3039	-.5042	-.0667	-.1207	-.1726
	(.5174)	(.6435)	(.4964)	(.5212)	(.5946)	(.5261)
MotherAge	-.0942	-.138	-.1137	-.1064	-.0995	-.0506
	(.0467)**	(.0742)*	(.062)*	(.0586)*	(.0606)	(.0662)
MotherAgesq	1.0257	1.5083	1.3114	1.2124	1.1618	.592
	(.5376)*	(.8926)*	(.754)*	(.8271)	(.7359)	(.7985)
EdFaMissing	-.3274	-.2842	.0219	.2008	.2435	.4314
	(.157)**	(.2067)	(.2183)	(.23)	(.1935)	(.2316)*
YearsEdFa	.074	.1225	.0683	.0717	.0662	.075
	(.0139)***	(.0131)***	(.0116)***	(.012)***	(.0115)***	(.0132)***
EverAttdMo	.6565	.9061	.2497	.1842	.3497	.3098
	(.1047)***	(.0911)***	(.0898)***	(.0929)**	(.0883)***	(.0983)***
DrWaterMiss	.2915	.4956	.3635	.2	.288	.3266
	(.1151)**	(.1484)***	(.1206)***	(.1279)	(.1199)**	(.1386)**
DrWaterTime	.0532	-.47	-.1628	-.0614	-.1313	-.0423
	(.1543)	(.2253)**	(.1929)	(.2203)	(.1957)	(.2103)
DirtFloor	-.1349	.8115	.3393	.7354	.5927	.652
	(.2075)	(.2051)***	(.2488)	(.2292)***	(.2424)**	(.2272)***
OwnJewelry	.3119	.4468	.3445	.3738	.187	.2418
	(.0822)***	(.0997)***	(.0871)***	(.0967)***	(.0836)**	(.0975)**
RecInherit	.0051	-.0688	.1958	.1439	.0445	.0394
	(.0812)	(.1012)	(.0851)**	(.0909)	(.0852)	(.0916)
Farmland	.1091	.2001	.2965	.0637	.2701	.354
	(.0623)*	(.0701)***	(.1224)**	(.0935)	(.0861)***	(.1116)***
Farmlandsq	-.0341	-.0698	-.1452	-.0381	-.1057	-.1352
	(.0182)*	(.033)**	(.0725)**	(.0423)	(.0365)***	(.0545)**
TreatmntArea	.0622	.0872	.1233	.2223	-.0548	-.0537
	(.0792)	(.095)	(.0734)*	(.0928)**	(.0813)	(.0905)
FemaleHead	.0103	.2658	.0945	.0406	.1323	.0058
	(.1383)	(.1801)*	(.1155)	(.1366)	(.0797)*	(.1373)
Constant		.5068				
	(1.0511)	(1.4399)***	(1.8061)***	(2.1628)***	(1.6615)***	(1.9795)***
Number of obs	5145	5170	2370	2370	2370	2370
R-squared		.4025				
F-stat		134.0261				

Table 7: OLS regressions for the whole sample. Notes: (i) Standard errors are listed in parentheses below the coefficients, (ii) The superscripts *, **, and *** on the standard errors indicate that coefficients are significant at the 10%, 5% and 1% level respectively.

	FemaleHead
	(1)
Age	.0074
	(.0079)
Agesq	-.0028
	(.0029)
Female	-.0242
	(.0082)***
Hindu	-.0625
	(.0163)***
SibSexRatio	-.036
	(.0069)***
AgeParHead	.0019
	(.0008)*
MoAgeAtMarriage	-.0498
	(.0754)
MotherAge	.005
	(.0058)
MotherAgesq	-.0788
	(.0678)
EdFaMissing	.0427
	(.0434)
YearsEdFa	.0055
	(.0016)***
EverAttdMo	.0071
	(.0142)
DrWaterMiss	-.0132
	(.0169)
DrWaterTime	-.0265
	(.0156)*
DirtFloor	.0287
	(.0358)
OwnJewelry	.0189
	(.0102)*
RecInherit	-.0044
	(.0121)
Farmland	-.0149
	(.0074)**
Farmlandsq	.0036
	(.0023)
TreatmntArea	.0224
	(.0117)*
MoEvrWidow	.6917
	(.0431)***
Constant	-.0591
	(.1264)
No. of obs.	5413
R-squared	.2275
F-stat	23.2978

Table 8: First stage results from IV regressions. Notes: (i) Standard errors are listed in parentheses below the coefficients, (ii) The superscripts *, **, and *** on the standard errors indicate that coefficients are significant at the 10%, 5% and 1% level respectively.

	EverAttd	YearsEd	ChildRead	ChildWrite	ChildAdd	ChildMult
	(1)	(2)	(3)	(4)	(5)	(6)
Age	.41	1.1392	.7861	.7702	.8893	1.1714
	(.1031)***	(.1176)***	(.2609)***	(.3151)**	(.2377)***	(.2831)***
Agesq	-.1851	-.2656	-.2075	-.178	-.2556	-.3634
	(.0382)***	(.0465)***	(.1163)	(.1382)	(.1072)**	(.1254)***
Female	-.0421	-.1343	-.1261	-.0439	-.1632	-.2761
	(.0799)	(.0913)	(.0902)	(.0957)	(.088)	(.097)***
Hindu	-.3584	-.1298	-.0301	.0721	.1214	.2643
	(.1327)***	(.1622)	(.1456)	(.1438)	(.1434)	(.147)
SibSexRatio	-.0531	-.0706	.0009	.0221	-.027	-.0459
	(.0346)	(.0443)	(.0422)	(.0467)	(.0416)	(.0449)
MoAgeAtMarriage	-.0075	-.0044	-.0046	-.0009	-.0005	-.0007
	(.005)	(.0064)	(.0051)	(.0053)	(.0061)	(.0054)
MotherAge	-.001	-.0057	-.0022	-.0025	-.0015	.002
	(.0051)	(.0078)	(.0064)	(.0071)	(.0062)	(.0065)
EdFaMissing	-.2212	-.134	.0133	.253	.2458	.3955
	(.1562)	(.2007)	(.2253)	(.2347)	(.2011)	(.243)
YearsEdFa	.0806	.1302	.0679	.0745	.0659	.075
	(.0142)***	(.0128)***	(.0118)***	(.0123)***	(.0117)***	(.0135)***
EverAttdMo	.6651	.9092	.2645	.1941	.3686	.3299
	(.1041)***	(.0918)***	(.0904)***	(.0936)**	(.0893)***	(.0995)***
DrWaterMiss	.227	.4649	.3613	.2013	.2977	.3298
	(.1138)*	(.15)***	(.1202)***	(.1294)	(.1196)**	(.1372)**
DrWaterTime	-.003	-.5008	-.1762	-.0741	-.1465	-.0528
	(.1527)	(.2189)**	(.1932)	(.2201)	(.1977)	(.2118)
DirtFloor	-.0534	.8937	.3213	.7197	.569	.6286
	(.207)	(.2111)***	(.2362)	(.222)***	(.2339)**	(.2214)***
OwnJewelry	.3153	.448	.3366	.3739	.1863	.2435
	(.0817)***	(.0997)***	(.0869)***	(.0973)***	(.0835)**	(.0971)**
RecInherit	.0409	-.0453	.1991	.1567	.0508	.0487
	(.0799)	(.0999)	(.0846)**	(.0906)	(.0856)	(.092)
Farmland	.1019	.1846	.2778	.0515	.2595	.3444
	(.0639)	(.0696)***	(.1214)**	(.0938)	(.0854)***	(.1069)***
Farmlandsq	-.0323	-.0658	-.135	-.0338	-.1015	-.1298
	(.0187)	(.0327)**	(.0718)	(.0417)	(.0357)***	(.0502)***
TreatmntArea	.0578	.094	.1294	.2241	-.0469	-.0477
	(.0803)	(.0944)	(.0837)	(.0932)**	(.0816)	(.091)
YrsPrimSch	-.0055	-.0041	.0005	-.0008	.0028	.0028
	(.0023)**	(.0027)	(.0026)	(.0026)	(.0025)	(.003)
FemaleHead	-.3242	-.5994	.0872	-.2999	.101	.21
	(.2056)	(.3247)**	(.26)	(.2871)	(.2844)	(.2963)
FemaleHeadRES	.6332	1.162	.0464	.4294	.0675	-.2094
	(.2779)**	(.4395)**	(.2876)	(.322)	(.318)	(.3304)
N	5171	5196	2381	2381	2381	2381
R-squared	.1728	.4035	.2245	.2585	.2137	.2467

Table 9: IV regressions for the whole sample. Notes: (i) Standard errors are listed in parentheses below the coefficients, (ii) The superscripts *, **, and *** on the standard errors indicate that coefficients are significant at the 10%, 5% and 1% level respectively. (iii) The variable *Female Head (resid)* is the residual from the regression in Table 8.

	EvrWidow
	(1)
Huband's age at marriage	.1694
	(.026)***
Husbands age at marriage missing	.0016
	(.0009)
Age at marriage	.0025
	(.0009)***
Husband's years of education missing	-.0214
	(.0179)
Husband's years of education	-.0042
	(.0023)
Ever attended school	-.0346
	(.0108)***
Father alive at the time of marriage	-.0023
	(.0172)
Mother alive at the time of marriage	-.0004
	(.0205)
Any dowry paid to family of groom	-.0581
	(.0103)***
Father richer than father-in-law	-.0166
	(.0099)
Number of brothers	-.0099
	(.0034)***
Number of sisters	-.0015
	(.0036)
Frac of same-age women from natal village paid dowry	.0289
	(.0244)
Constant	.0228
	(.0369)
N	2261
R-squared	.1046
F-statistic	6.5241
F-statistic for exogenous variables	9.30

Table 10: OLS results on who becomes a widow. Sample includes ever married women. Notes: (i) Standard errors are listed in parentheses below the coefficients, (ii) The superscripts *, **, and *** on the standard errors indicate that coefficients are significant at the 10%, 5% and 1% level respectively.

	FemaleHead
	(1)
Age	.0079
	(.0079)
Agesq	-.003
	(.0029)
Female	-.0228
	(.0064)***
Hindu	-.0647
	(.0138)***
SibSexRatio	-.0368
	(.0054)***
MoAgeAtMarriage	-.0004
	(.0008)
MotherAge	-.001
	(.0006)*
EdFaMissing	-.1572
	(.1412)
YearsEdFa	.0065
	(.0015)***
EverAttdMo	.0138
	(.013)
DrWaterMiss	-.0104
	(.0166)
DrWaterTime	-.0303
	(.0153)**
DirtFloor	.0372
	(.0338)
OwnJewelry	.0212
	(.0103)**
RecInherit	.0114
	(.0117)
Farmland	-.0117
	(.0045)***
Farmlandsq	.0026
	(.0014)*
TreatmntArea	.0184
	(.0114)*
YrsPrimSch	2.00e-06
	(.0003)
EvrWidowHAT	.9102
	(.0769)***
EvrWidowRES	.7034
	(.048)***
Constant	.0819
	(.0566)
N	4995
R-squared	.23
F-statistic	22.204

Table 11: First stage results from IV regressions. Notes: (i) Standard errors are listed in parentheses below the coefficients, (ii) The superscripts *, **, and *** on the standard errors indicate that coefficients are significant at the 10%, 5% and 1% level respectively.

	EverAttd	YearsEd	ChildRead	ChildWrite	ChildAdd	ChildMult
	(1)	(2)	(3)	(4)	(5)	(6)
Age	.3702	1.0903	.912	.9277	.9504	1.2703
	(.111)***	(.1213)***	(.2659)***	(.3085)***	(.2469)***	(.2906)***
Agesq	-.1725	-.2479	-.2621	-.2439	-.2833	-.4061
	(.0412)***	(.048)***	(.1191)**	(.1367)*	(.1114)**	(.1288)***
Female	-.0172	-.1022	-.0552	.005	-.1018	-.2106
	(.083)	(.0944)	(.0931)	(.0991)	(.0913)	(.1012)**
Hindu	-.3465	-.1195	-.0547	.1068	.1351	.2662
	(.1388)**	(.1716)	(.1412)	(.1529)	(.1435)	(.142)*
SibSexRatio	-.0448	-.056	.033	.0439	-.0061	-.0216
	(.035)	(.0459)	(.0443)	(.0486)	(.0433)	(.0475)
MoAgeAtMarriage	-.0051	-.0034	-.0052	-.0011	-.0012	-.0015
	(.0052)	(.0065)	(.0053)	(.0054)	(.0062)	(.0055)
MotherAge	.0007	-.0019	-.0042	-.005	-.0026	.0024
	(.0053)	(.0081)	(.0067)	(.0074)	(.0066)	(.0068)
EdFaMissing	-.3504	-.3748	.024	.2641	.3569	.438
	(.1661)**	(.198)*	(.2492)	(.2529)	(.204)*	(.2657)
YearsEdFa	.0784	.1323	.0647	.0745	.0632	.0702
	(.0147)***	(.0133)***	(.012)***	(.013)***	(.0119)***	(.0138)***
EverAttdMo	.6959	.9119	.2726	.1954	.4002	.3425
	(.1085)***	(.0973)***	(.0946)***	(.0986)**	(.0934)***	(.1043)***
DrWaterMiss	.2074	.461	.4004	.1663	.3244	.3606
	(.1176)*	(.1576)***	(.1263)***	(.1381)	(.1255)***	(.1427)**
DrWaterTime	.0532	-.372	-.1004	-.0105	-.1044	-.0011
	(.1618)	(.2213)*	(.1947)	(.2237)	(.2023)	(.2131)
DirtFloor	-.0573	.8979	.2966	.7403	.5493	.6067
	(.2099)	(.2159)***	(.2465)	(.2387)***	(.2391)**	(.2238)***
OwnJewelry	.3511	.4911	.3703	.4228	.2115	.2383
	(.0854)***	(.1029)***	(.0922)***	(.1041)***	(.0881)**	(.1022)**
RecInherit	.0727	.0134	.2235	.1911	.0607	.0744
	(.0845)	(.104)	(.0879)**	(.0948)**	(.0884)	(.0957)
Farmland	.131	.1768	.1443	.2837	.1805	.2613
	(.0916)	(.0801)**	(.081)*	(.1975)	(.0882)**	(.0982)***
Farmlandsq	-.0404	-.0626	-.0689	-.1541	-.0714	-.0961
	(.0246)*	(.0353)*	(.039)*	(.1197)	(.0343)**	(.0396)**
TreatmntArea	.0585	.0815	.1121	.1627	-.0855	-.09
	(.084)	(.0984)	(.0881)	(.0974)*	(.0852)	(.0949)
YrsPrimSch	-.0062	-.005	-.0006	-.0022	.0017	.0021
	(.0024)***	(.0028)	(.0027)	(.0028)	(.0026)	(.0031)
FemaleHead	-.4205	-.6364	.1393	-.3757	.0191	.2391
	(.2271)*	(.3359)*	(.3019)	(.2381)*	(.2779)	(.3383)
FemaleHeadRES	.7991	1.2494	.0386	.5855	.2174	-.2009
	(.3033)***	(.4639)***	(.33)	(.3241)*	(.3177)	(.3694)
N	4765	4785	2210	2210	2210	2210
R-squared	.1731	.4066	.2246	.2587	.2139	.2468
e(F)		128.1696				

Table 12: IV regressions for the whole sample. Notes: (i) Standard errors are listed in parentheses below the coefficients, (ii) The superscripts *, **, and *** on the standard errors indicate that coefficients are significant at the 10%, 5% and 1% level respectively. (iii) The variable *EverWidowed (resid)* is the residual from the regression in Table 10.

Variable	OLS/Probit Estimates	IV with Widowhood Exogenous	IV with Widowhood Endogenous
Ever Attended School	.0103	-.3242	-.4205*
Years of Schooling	.2658*	-.5994**	-.6364*
Reading	.0945	.0872	.1393
Writing	.0406	-.2999	-.3797*
Addition	.1323*	.101	.0191
Multiplication	.0058	.210	.2391

Table 13: A comparison of the coefficients for the variable *FemaleHead* from Tables 7, 9, 12.