# Household Structure and Child Outcomes: Nuclear vs. Extended Families – Evidence from Bangladesh

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**Abstract**

The nuclear family has long characterized the European family. In Asia, by contrast, the extended family has been the norm. A potentially important difference between these family forms is the allocation of headship: vested in a child's father in the nuclear family, but in the child's grand-father in the extended family. This paper exploits the fact that extended families eventually convert to nuclear families on the death of the grand-father. Treating the death of the patriarch as an exogenous event, we ask if children are better off in nuclear than extended families. A reason this might be the case is that the father is more likely to be around when the child reaches adulthood and therefore better positioned to benefit from investments made in the child's human capital, than the grand-father. On the other hand, extended families may provide better household public goods. We analyze household survey data from Bangladesh collected by the IFPRI in 1996-1997, and focus on education and health outcomes. We find child education, but not height-for-age, to be substantially better in nuclear families. These findings are consistent with children in nuclear families benefitting from privileged provision of private goods, but suffering from lower levels of household public goods, compared to children in extended families. We provide both OLS and 2SLS estimates of the effects.

# 1 Introduction

The nuclear family has long characterized the "European family" (Goody, 1983). In Asia, by contrast, the extended family has been the norm. As the terms suggest, the demographic composition typically differs between these families, but need not. A nuclear family may well contain grand-parents and other family members. Instead, a potentially important, but largely ignored, difference may lie in the allocation of headship: a nuclear family is headed by the child's father, whereas an extended family is headed by the grand-father. While the extended family is commonly viewed as a family form that ensures support of the elderly by their adult children, little is known about its effect on child wellbeing, the focus of this paper.

This is an important question in the context of a developing country, where a great number of children live under the rubric of the extended family for at least a part of their childhood. This paper investigates whether and how household type, headship in particular, matters for children's health and education outcomes in rural Bangladesh using household survey data collected by the International Food Policy Research Institute (IFPRI) in 1996-97.

Why would allocation of headship matter? Edlund and Lagerlöf (2002) argued that since a child's father may expect to live longer than its grand-father, the father may have a greater interest in the human capital of the child than the grand-father. Biologically motivated altruism may be another reason why parents would devote more resources to their children than grand-parents to grand-children. Still, sufficient altruism or capital markets may render headship immaterial. Yet another possibility is that the extended-

family system has evolved precisely because it is conducive to investments in child human capital.

We focus on child education and health. Both are important contributors to child human capital but capture different mechanisms. The former is an example of a private good, while the latter is produced by a combination of private goods (e.g., food intake, medication) and household public goods (e.g., quarters, genetics). Following Edlund and Lagerlöf (2002), we hypothesize that outcomes that are particularly related to private goods allocation towards children, such as education, are better in families where the father (instead of the grand-father) is the head. By contrast, headship may not matter for child outcomes related to household public goods, such as health. If a household public good, individual health outcomes may be determined by household wealth, not by who controls resources. Thus, to the extent that extended families are wealthier, child health may be better in those.

We find that, beyond age 10, children in nuclear families tend to have higher levels of education than their counterparts in extended families, controlling for household composition, wealth and parental education. By contrast, nuclear families are not associated with better health outcomes for children, a result we believe may derive from health being a household public good, as just mentioned. We provide both OLS and 2SLS estimates. Both are motivated by the social norms governing household formation in Bangladesh.

In Bangladesh, there is a strong presumption that adult sons continue to live under the headship of their father until the latter's death, e.g., Amin

(1996), also Foster (1993).[1] Thus, children whose (paternal) grand-father has passed away live under the headship of their father, while children whose grand-father is alive are likely to live under his headship. This motivates the identifying assumption for our OLS estimates: social norms in combination with mortality results in exogenous variation in a child's exposure to extended and nuclear households.

However, we remain mindful of the potential endogeneity of household form. Although prescribed, not all adult sons co-reside with their fathers. Crowding and disagreements may mar the extended family, and the strain is likely to be particularly pronounced if there are several adult sons. In that case, the solution may be a household partition, by which an adult son leaves the extended family to head his own nuclear family, e.g., Foster and Rosenzweig (2002). Therefore, we also present 2SLS estimates where we instrument for household form using information on the father's birth family: father's birth order, number of brothers of father, whether grand-father is alive, whether grand-mother is alive; and their interactions. These instruments are variables that we believe can be assumed to have first order effects on household type in Bangladesh, but not on child health or education outcomes. If the grand-father is alive, then it is more likely that the child will be in extended households. This is particularly likely if the father has few brothers. In the case of a partitioning prior to the death of the grand-father, birth order may influence who remains with the extended household and who branches off.[2]

[1] A phenomenon well-reflected in our data as well.

[2] In the case of health outcomes, we exclude the dummy variables whether or not the grand-parents are alive and the interaction terms involving these dummy variables as

The papers most closely related to ours are Foster (1993) and Joshi and Sinha (2004). In line with our hypothesis, Foster (1993) found that within an extended family, children to the household head did better, education-wise, than grand-children. Joshi and Sinha (2004) found that children in a household that had partitioned did worse than the children who remained in the originating household. If partitioning is more likely on the death of the patriarch (suggested by our data, and Foster (1993)), their findings are consistent with this paper's. That is, children's doing better in the original family may come off headship having passed from the child's grand-father to its father. Both Foster (1993) and Joshi and Sinha (2004) were primarily concerned with household *partitions*. By contrast, this paper focusses on the devolution of headship. While correlated, these are not synonymous events, further elaborated on below.

The prototypical household under the extended-family system goes through a life-cycle (for references see Foster (1993)) that can be illustrated by the following example. A patriarch has two adult sons. The sons marry and form families. These families may continue to co-reside with the patriarch, or form their own households. Typically, at least one son stays with the patriarch, and inherits headship on the patriarch's death. If a son does not inherit headship, but acquires headship by forming his own household (possibly in the same *bari* (compound)), this is a household partition. Hence, a son may head a household as the result of a partition or the passing of his father. The patriarch may also voluntarily cede headship in old-age, although this is rare

longer lived grand-parents (which is an indication of their good health) may have healthy grand-children through sharing common genes.

(as is female headship in the presence of an adult male family member).[3] The nuclear households of the two sons remain nuclear until their sons, in turn, take wives, and the cycle repeats itself. Thus, the extended-family system gives rise to both extended and nuclear families, and, consequently, dependent children may live under the headship of their grand-father or their father.

The remainder of the paper is organized as follows. The next section reviews the related literature. Section 2 presents the empirical analysis, and Section 3 concludes.

## 1.1 Related literature

This paper is in the tradition of the literature on bargaining power and intra-family allocation provoked by the suggestion of the former's irrelevance for the latter by Becker (1974). Bourguignon et al. (1994) proposed an alternative framework that allows for the intra-family income distribution to affect the allocation of consumption, subject to the outcome being efficient; and there is a growing empirical literature that documents the importance of bargaining power for intra-household resource allocation (e.g., Altonji et al. (1992); Lundberg et al. (1997); and Quisumbing and Maluccio (2003)). Note that human capital may be viewed as an investment rather than consumption. Therefore different levels of education may represent not only different points on the utility frontier, but different frontiers.[4]

[3] In Bangladesh, land ownership rests with the oldest male, and inheritance is partible.

[4] Thus, a lower human capital investments achieved under, say, the grand-father's headship can still be Pareto efficient, since he is less likely to be around when the children reach adulthood.

A related strand of literature concerns family form and old age support. In South Asia, the extended family is widely viewed as a vehicle for old age support, e.g., Kochar (2000). However, at least theoretically, support of the elderly need not be premised on the allocation of headship or the living arrangement. For instance, prime-age men may support their fathers (co-residing or not) lest failure to do so would result in their own children refusing to support them in turn, as proposed by Ehrlich and Lui (1991). While the extended family may provide for the elderly, and result in higher provision of public goods (suggested by, e.g., Foster and Rosenzweig (2002)) the consequences for human capital investments in children have received relatively little attention (an exception is Foster (1993)).

# 2 Empirical investigation

We use household survey data collected by the International Food Policy Research Institute (IFPRI) in rural Bangladesh. The survey was conducted every four months from June 1996 to September 1997 (four rounds) in 47 villages from three sites: Saturia, Jessore and Mymensing. The questionnaire was administered to 5,541 individuals in 955 rural households in each round. We restrict our analysis to Muslim households that were male-headed and monogamous (the overwhelming majority) with children 16 years or younger.

Our outcome variables are height-for-age and class completed. Both capture important aspects of a child's current and future well-being and productivity. Height-for-age is a composite measure of the child's nutritional status and morbidity. It is particularly meaningful for children of young age, and

therefore we restrict attention to children aged 0-10 years. An advantage of this measure is that it is robust to transitory spells of disease or seasonality in diet (unlike, e.g., weight-for-height). However, health is likely to partly be a household public good (for instance, from shared quarters or relatedness). Height-for-age was collected in all four rounds, and we have about 3,778 child-round observations.

A, for our purposes, useful feature of education is that it is a private good, and thus reflects resources intentionally directed to the child.[5] We measure education by class completed. This measure is only meaningful for children aged 6-16 years. This variable was collected once for each individual, and we have about 1,297 observations.

We conceptualize the family as potentially consisting of dependent children, their parents and grand-parents. Unless otherwise specified, the terms parent and grand-parent indicate relationship to child, where we define child to be an individual who is no more than 16 years old, is not a parent himself/herself, and still resides with his or her birth family. Grand-parents in our data are paternal. The terms grand-father and patriarch will be used interchangeably, as will the terms household and family.

We classify families according to headship and demographic composition. Nuclear families are headed by the father and extended families are headed by the grand-father. Among, nuclear families, we distinguish between those with and without co-residing grand-parents (chiefly grand-mothers), nuclear$^{w}$ and nuclear$^{w/o}$ respectively.[6] Hence, in terms of demographics, extended and

[5]Schooling is not compulsory in Bangladesh.

[6]If the head is the grand-father of some but the father of other children (in the household), we will classify this as an extended family.

nuclear$^{w}$ families are similar, whereas with respect to headship, the nuclear$^{w/o}$ and nuclear$^{w}$ families are equivalent.

The majority (68 percent) of our households are nuclear$^{w/o}$. Nuclear$^{w}$ and extended families make up 10 and 22 percent, respectively.[7] The distribution of children across family types essentially mirrors the above, see Table (1).

## 2.1 Household type and its correlates

This section examines the data in order to provide a picture of the in-sample evidence of a household life-cycle and/or other factors influencing household formation, in order to gauge the likely direction of any selection or omitted variable bias.

We find that our sample households exhibit characteristics largely consistent with a life-cycle of households dictated by the social norms described earlier. To the extent that household types are systematically different in terms of wealth or parental education, the nuclear families, nuclear$^{w/o}$ families in particular, appear poorer along a number of dimensions, which arguably works against finding support for our hypothesis that child outcomes are better in nuclear families.

**Demographic characteristics by household type** Table (2) presents descriptive statistics (means) of the household heads, adult sons, spouses and parents, by households types. Average age of parents in nuclear$^{w/o}$

[7]The high fraction of nuclear households is consistent with the findings of other studies in South Asia, e.g., Caldwell et al. (1984); Niranjan et al. (1998).

and nuclear$^{w}$ are similar.[8] This suggests that nuclear$^{w/o}$ families do not form solely from the passing of non-head grand-parents (given the substantial spousal age gap, widowers are rare), since this would predict heads in nuclear$^{w/o}$ families to be older. Since presumably a fraction of nuclear$^{w/o}$ families form from nuclear$^{w}$ families, this suggest that either junior sons form their own households at around the same time as the older son inherits headship, or that there is a partition before the patriarch dies.

Consistent with a household life-cycle, we find that both parents and children were significantly younger in extended families. Fathers were on average about nine years younger in extended families, and children three years younger, Tables (1) and (2). Average ages of children in the different family forms are not easily comparable since any additional births after the grand-father's death lowers the average age of children in nuclear families.[9]

Consistent with the existing literature, we find our modal extended family to consist of several adult sons (of head), their wives and children; while the nuclear$^{w/o}$ families were rarely "laterally extended" (not reported). Moreover, less than a quarter of children in nuclear$^{w/o}$ have their grand-father and half have their grand-mother. As expected, these figures are much larger for children in extended families, Table (1).

[8]The survey collected information on marriage and parental characteristics only for the heads and their wives. Thus, we do not have the information on age at marriage for the adult married sons in extended households.

[9]For each of the characteristics, we conduct an $F$-test to see whether two, middle, and extended families are significantly different from each other ($p$-values not reported but available upon request).

**Parental education** We find that parents, fathers in particular, are better educated in nuclear$^{w}$ and in extended families than in nuclear$^{w/o}$ families, Table (2). Thus, it does not seem to be the case that educated males (whose preferences for education may be higher than uneducated men's) are more prone to form nuclear families.

Another concern is that factors liable to be correlated with grand-parental mortality may also cause high investments in child human capital. For instance, if educated men have children later (but their fathers do not live longer), then their children may be both better educated and more likely to grow up in nuclear families, without there being a causal interpretation to the correlation. To check whether more educated men have children later compared to less educated men, we estimate the following equation by OLS:

$$\texttt{child-age}_{ij} = \alpha_0 + \alpha_1 \texttt{father-edu}_j + \alpha_2 \texttt{father-age}_j + \tag{1}$$

$$\beta_1 \texttt{nuclear}_j^{w/o} + \beta_2 \texttt{nuclear}_j^{w} + \epsilon_{ij},$$

where the dependent variable $\texttt{child-age}_{ij}$ is the age (in years) of child $i$ of father $j$. The variable $\texttt{father-edu}_j$ is the education of the father. We also account for the father's age, $\texttt{father-age}_j$, since obviously, fathers and children age at the same rate. $\texttt{nuclear}_j^{w/o}$ and $\texttt{nuclear}_j^{w}$ are dummies for nuclear$^{w/o}$ and nuclear$^{w}$ households respectively, and $\epsilon_{ij}$ is the stochastic error term. The omitted category is the extended households. In the last specification, we interact father's education with the dummies for nuclear$^{w/o}$ and nuclear$^{w}$ households to see whether within each household category, more educated men tend to have children later than less educated men.

Results are in Table (4), panel A. In column (1) we regress child's age on father's education and age only, in column (2) dummies for household types are added, and in column (3) we add interactions between household type and father's education. We find that, controlling for own age, educated men tend to have older, not younger children. $\alpha_1$ is negative in all three specifications, albeit not significant when the interaction terms are added. Children also tend to be older in nuclear families, as would be expected if households form according to the described life-cycle.

A potential caveat is that better educated fathers may have fewer children, in particular, at any give point in time, fewer young children. To check whether the results are driven by this, we estimate the analogue of regression (1) above, for the age of the oldest child. Since we only have information on children under 16 currently in the household, we restrict the sample to fathers aged 45 or less. However, we find no relationship between father's education and age of his oldest child, panel B, Table (4).[10]

In sum, neither do we find any evidence that more educated fathers tend to form their own families, nor do we see that more educated men tend to marry and have children later than less educated men. While any of these mechanisms could lead to endogeneity problems, our data are not suggestive of such mechanisms.

**Household income and wealth** The pattern from land-holdings is somewhat mixed. On the one hand, nuclear$^{w/o}$ families appear substantially poorer than the other family types. Landholdings are lower in nuclear$^{w/o}$

[10]Nor do we find that better educated fathers have fewer children, not reported.

families, as evidenced by both a higher fraction landless and lower average land-holdings, Figure (3) and Table (1).[11] Seemingly, this would suggest that landlessness is a factor in the decision to partition. However, a similar pattern would result from a process in which nuclear$^{w/o}$ families form before the adult male comes into his land inheritance.[12] Thus, it may indicated lower current income but not necessarily lower lifetime wealth.

On the other hand, when head's (and head's wife's) parental land-holdings are considered, nuclear$^{w/o}$ families look considerably better off, Table (2). This measure is instructive since it is likely to contain realized inheritance, and while it may not be indicative of the household's current income, it can shed light on the selection process, i.e., do nuclear$^{w/o}$ families form disproportionately from land poor or rich families. Considering head's father's land-holdings, the extended families are the wealthiest, and there are no significant difference between nuclear$^{w/o}$ and nuclear$^{w}$ families.[13] On the other hand, with respect to head's father-in-law's land-holdings, the three family types are strikingly similar.

In terms of mean monthly expenditure (per capita (adult equivalent)), nuclear families (nuclear$^{w/o}$ and nuclear$^{w}$) spend more than extended families. Finally, the survey also collected data on asset brought at marriage by husband and wife, and there were no statistically significant differences across households (see bottom row of Table (2)).

[11] Also, landlessness falls with the age of household head in nuclear$^{w/o}$ families, not reported.

[12] Female land holding is minor relative to male land-holding.

[13] Although a higher fraction of nuclear$^{w/o}$ families are from poorer families. Figure (3) shows a higher fraction of landless fathers-of-head in nuclear$^{w/o}$ families.

In sum, neither do we see that heads of the nuclear$^{w/o}$ families are more educated or wealthier (particularly in terms of land holding – arguably the most valuable asset in agrarian Bangladesh), nor that educated men tend to marry or have children later. The nuclear$^{w}$ families appear similar to extended families in terms of land-holdings and parental education, as would be expected if the main difference between the two were the presence of the grand-father (and his headship). The nuclear$^{w/o}$ families, on the other hand, seem poorer than the other family forms, at least in terms of current land-holdings and, to some extent, (grand-)parental land-holdings. Thus, it appears that for analyzing the effect of the allocation of headship, the closest comparison is that between extended and nuclear$^{w}$ families.

We now turn to the paper's main focus: child outcomes by household type.

## 2.2 Child Outcomes and Household Types

We begin our analysis by estimating an empirical model of the form:

$$(2) \quad y_{ij} = c + a_{ij} + f_{ij} + a_{ij} \times f_{ij} + \gamma_1 \texttt{nuclear}_j + \gamma_2 (a_{ij} \times \texttt{nuclear}_j) + X_j + a_{ij} \times X_j + \epsilon_{ij},$$

where the dependent variable $y_{ij}$ is the outcome of interest of child $i$ in household $j$. $a_{ij}$ is age (in completed years) and $f_{ij}$ is a female dummy. **nuclear** is the dummy that takes on the value 1 if the child is in a nuclear family, and $\epsilon_{ij}$ is an error term that is assumed to be i.i.d. The omitted category is the extended family. We interact all variables with age, as older

children in nuclear households are likely to spent more time not under the headship of their grand-father than younger children. Thus, one would expect the differences in child outcomes between extended and nuclear families to be more pronounced for children of older age groups. This would be particularly relevant for education as completed education and the time a child spend in nuclear family can only increase with age.

Nuclear families may (nuclear$^{w}$ ) or may not (nuclear$^{w/o}$) have co-residing grand-parent(s). We saw earlier that in terms of household structure and household wealth, the closest comparison to the extended family were the nuclear families with a co-residing (non-head) grand-parent. To allow the effects to be different for the nuclear$^{w}$ and nuclear$^{w/o}$ families, we break up the nuclear dummy accordingly and estimate the following equation:

$$
\begin{aligned}
(3) \qquad y_{ij} = c + a_{ij} + f_{ij} + a_{ij} \times f_{ij} + \beta_1 \texttt{nuclear}_j^{w/o} + \beta_2 \texttt{nuclear}_j^{w} + \\
\beta_3 (a_{ij} \times \texttt{nuclear}_j^{w/o}) + \beta_4 (a_{ij} \times \texttt{nuclear}_j^{w}) + \\
X_j + a_{ij} \times X_j + + \epsilon_{ij},
\end{aligned}
$$

where **nuclear**$^{w/o}$ and **nuclear**$^{w}$ are dummies that take on the value 1 if the child is in a nuclear$^{w/o}$ or a nuclear$^{w}$ family, respectively.

The key parameters for our analysis are $\gamma_1$ and $\gamma_2$ in (2) and from $\beta_1$ through $\beta_4$ in equation (3). Under our hypothesis, the effect of household type increases with the child's age; i.e., $\gamma_2, \beta_3$, and $\beta_4 > 0$. And the effect of being in a nuclear household instead of an extended household is positive beyond some age less than 16; i.e., $\gamma_1 + \gamma_2 a_{ij}, \beta_1 + \beta_3 a_{ij}, \beta_2 + \beta_4 a_{ij} > 0$ for some $a_{ij} < 16$. $X_j$ is a vector of household level control variables: adult

equivalent household size, measures of per capita (adult equivalent) income and wealth, and parental education. These are likely to have independent effects on the outcomes at hand. The demographic composition obviously differs between households. To account for the different needs arising from such differences, we compute the adult equivalent household size and per capita (adult equivalent) wealth measures, using the equivalence scale (based on caloric needs by age and sex) for Bangladesh proposed by Ahmed and Shams (1994), see Table (3).[14]

We estimate seven different specifications of equations (2) and (3) in order to assess the sensitivity and robustness of our key parameters of interest in the presence or absence of different household controls. In the basic specification, column (1), we only control for the adult equivalent household size. Then we introduce the controls for log of per capita (adult equivalent) wealth measures in columns (2)-(5): land in column (2), asset in column (3), expenditure in column (4); and all three wealth measures together in column (5). Column (6) presents the specification with parental education but without wealth controls. Finally, parental education and all three wealth controls are in column (7).

We provide both OLS and 2SLS estimates of equations (2) and (3). As described in the introduction, both are motivated by the social norms governing household formation in Bangladesh. For the OLS estimates, our identifying assumption is that nuclear families form on the death of the grand-father, thus mortality results in exogenous variation in a child's exposure to ex-

[14]Our results are not sensitive to this. Per capita or even per household measures yield qualitatively similar results.

tended and nuclear households. As just shown in Section (2.1), to the extent that adult sons form nuclear households for other reasons, the correlates of such "nuclearization" are likely to work against our hypothesis that children benefit from headship with their father. Recognition of the potential endogeneity of household form prompts us to also instrument for household form. For this, we use information on the father's birth family. Specifically, the following variables: father's birth order (fborder), number of brothers of father (fbrother), whether grand-father is alive (gfliv), whether grand-mother is alive (gmliv), as well as these interactions, fborder×fbrother, gfliv×gmliv, fbrother×gfliv, fbrother×gmliv, fborder×gfliv, and fborder×fbrother×gfliv. As argued in the introduction, these are variables that can be assumed to have first order effects on household form but not child education. Since there may be an inherited component to health, we exclude gfliv and gmliv from the set of instruments when analyzing height-for-age, the focus of the next section.

### 2.2.1 Height-for-age (ages 0-10)

We use the height-for-age z-score as our measure of health outcome of the children. Low height-for-age indicates chronic malnutrition for which poor diet and spells of disease are key contributors. The z-scores are computed using the height-for-age distribution of American children. On average, children are much shorter than their US comparison group (about 2 standard deviations), see Table (1). The mean z-score is significantly better for children in extended households (-1.99) than their counterparts in nuclear$^{w/o}$ and nuclear$^{w}$ households (with a z-score of -2.14 and -2.16, respectively). While

we hypothesized that fathers, who are heads in nuclear$^{w/o}$ and nuclear$^{w}$ families, would like to invest more in children than the grand-fathers (heads in extended households), it may be that the hypothesized negative effect of grand-fathers is offset by health being a household public good. Extended families are wealthier and hence could afford a higher level of public goods. For instance, plumbing, flooring, ventilation, insulation, and cleanliness of the dwelling, all correlated with household wealth, are likely to affect the living conditions of all household members. Another reason we might expect health outcomes for children to be better in extended households is that to the extent that there is an inherited component to health, the very presence of the grand father may indicate predisposition towards good health. In view of this, as mentioned above, we exclude variables involving grand-parents' mortality from the instrument set and are left with head's birth order, number of brothers, the interaction between birth order and number of brothers, and these three interacted with age, for a total of six instruments.

Tables (5) and (6) provide OLS and 2SLS estimates of equation (2), and Tables (7) and (8) provide OLS and 2SLS estimates of equation (3) using child's height-for-age z-score as the dependent variable. We do not find any significant difference between nuclear (neither nuclear$^{w/o}$ nor nuclear$^{w}$) and extended families in terms of child's health outcomes. We speculate that the failure to find a positive effect of headship with the father may may be due to a counter acting effect of lower household public goods in nuclear households (recall, the extended households are wealthier). Throughout, our set of instruments satisfy the overidentification test of the validity of instruments (see the overidentification test statistic and p-value in Tables

(6) and (8)).

We now turn to children's education, an outcome that to a greater extent measures private goods allocation within the household.

### 2.2.2 Education (ages 6-16)

We restrict the analysis to children aged 6-16.[15] Schooling typically start at age 6 or 7, but is not compulsory. Primary school encompasses grades 1-5, secondary school grades 6-10, and higher secondary school grades 11-12. Higher secondary schooling is not common, and by the age of 16, daughters may already have left their birth family due to marriage. We use class completed as our measure of education. We use data from round two when estimating equation (2).[16]

Tables (9) and (10) present OLS and 2SLS estimates of equation (2). The results are supportive of the hypothesized positive effect of headship with the father (as opposed to the grand-father). For all variables, level effects are negative and age interactions positive, in line with the observation that the class completed can only increase with child's age. The 2SLS estimates are in line with the OLS estimates, albeit substantially larger – suggestive of

[15]In the preliminary analysis we used the age group 6-15 and the results were similar. Also in extended families children of age group 6-16 includes both the grand-children and children of the household head. We included dummy for children in extended families to see whether their outcome is significantly different from the grand-children, but we did not find any significant difference (results are not reported).

[16]The school year in Bangladesh starts in January/February and ends in November/December. Thus round two is the last round for which the recorded completed schooling of new entrants into the survey is comparable to the completed schooling of earlier entrants.

a negative bias in the OLS estimates as hypothesized earlier. In the most comprehensive specification – where we control for adult equivalent household size, per capita (adult equivalent) wealth and income measures and parental education – children nine years or older have higher level of education in nuclear families than children of the corresponding age in extended families, Table (9), column (7). When we instrument household type, the coefficients on the nuclear family dummy and its interaction with age are substantially higher and of the expected sign, and a significance level of 1%. Children 10 years or older now do better in terms of education in nuclear families than their counterpart in extended families, Table (10).

Next, we disaggregate nuclear families into nuclear$^{w/o}$ and nuclear$^{w}$ families, and repeat the above analysis. In the case of the OLS estimation, children eight years or older do significantly better in nuclear$^{w}$ families compared to their counterpart in the extended family, see Table (11), column (7). Both the coefficients on the nuclear$^{w}$ dummy and its interaction with child's age are significant at the 5% and the 1% level respectively in all seven specifications. In the case of the 2SLS estimation, column (7), the estimates imply that children 10 years or older are better off in nuclear$^{w}$ families than in extended families. Again both the nuclear$^{w}$ dummy and its interaction with age is significant at least at 10% level throughout all specifications (and at 5% level or less in most of the cases), Table (12).

Thus it appears that it is nuclear households with co-residing grandmothers that compares most favorably to the extended family. This is interesting considering that it may be the household type most readily comparable to the extended household. A potential caveat when interpreting this result

is that the grand-mother may be matched to the household (among her adult sons) that can best accommodate her, presumably the most affluent. Still, there is no reason to think such a mechanism would confound a comparison between nuclear and extended families. Moreover, the results for nuclear$^w$ are strengthened rather than weakened when household type is instrumented for.

In all the specifications, the instruments satisfy the overidentification test of the validity of instruments (see overidentification test statistic and the corresponding p-values in Tables (10) and (12)).

# 3 Concluding remarks

The organization of the family varies across cultures along a number of dimensions. This paper has been concerned with the difference between the so called extended and nuclear family, the former being more prominent in Asia, and the latter in Europe. A potentially important difference between the two is the allocation of headship – with the father in nuclear families but the grand-father in extended families. While the literature has noted that the extended family provides for the elderly, its consequences for investments in child human capital, the focus of this paper, has received relatively little attention.

We hypothesized that outcomes that are particularly related to private goods allocation towards children, such as education, are better in families headed by the father (instead of the grand-father). By contrast, headship may not matter for outcomes mainly determined by household public goods,

health being a case in point.

Analyzing Bangladeshi household survey data collected by the IFPRI in 1996-1997, we found child education to be better in families headed by the child's father, but found no significant difference between household types in terms of child health (measured by height-for-age). We interpreted these findings to be consistent with children in nuclear families benefitting from privileged provision of private goods, but suffering from lower levels of household public goods, compared to children in extended families. We provided both OLS and 2SLS estimates, where number of brothers, birth order and parental mortality of the child's father served as instruments for household type.

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Figure 1: Land holdings, by household type. Clock-wise from top left: nuclear$^{w/o}$, nuclear$^{w}$, and extended.

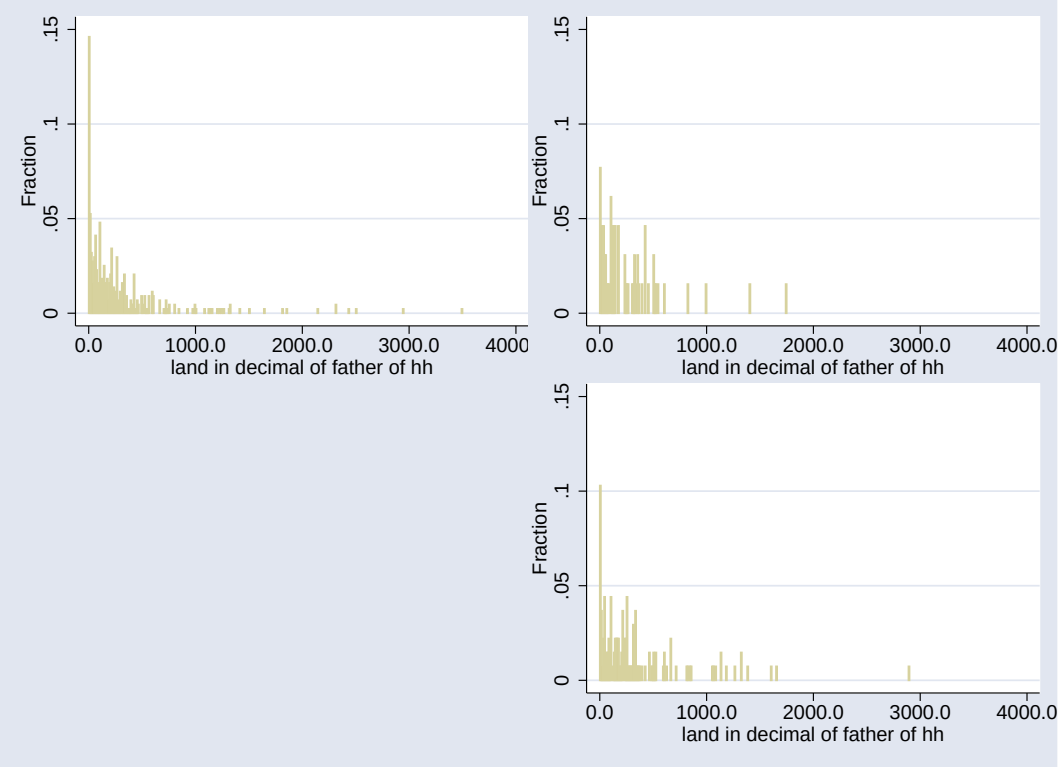

Table 1: Household Characteristics and Child Outcomes (means)

| | Household type | | |
|---|---|---|---|
| | Nuclear$^{w/o}$ | Nuclear$^{w}$ | Extended |
| *Height-for-age* (ages 0-10) | | | |
| z-score | -2.14 | -2.16 | -1.99 |
| $N^a$ | 2601 | 422 | 755 |
| | | | |
| *Education* (ages 6-16) | | | |
| class completed | 2.36 | 2.96 | 2.10 |
| $N^b$ | 809 | 134 | 354 |
| class completed | 1.67 | 2.12 | 1.88 |
| | | | |
| *Household Characteristics* | | | |
| Household Size | 5.30 | 6.76 | 9.03 |
| Adult equivalent | 4.23 | 5.23 | 6.62 |
| Age of children | 8.45 | 8.58 | 5.46 |
| Land (1/100 acre) | 88.70 | 170.07 | 232.35 |
| Assets (Takka) | 8880.18 | 13372.05 | 17069.33 |
| Expenditures (monthly, per capita adult equivalent) | 767.74 | 746.27 | 682.27 |
| $N^c$ | 464 | 70 | 152 |
| | | | |
| *Percentage of children whose grand-parents are not alive* (ages 0-16) | | | |
| Grand-father not alive | 77.18 | 79.51 | 42.20 |
| Grand-mother not alive | 50.23 | 10.98 | 40.27 |
| $N^d$ | 1065 | 173 | 372 |

[a] Number of children in four rounds. [b] Number of children in second round. [c] Number of households. [d] Number of children in first round.
Age of children refers to children under 16 years of age in survey round 1.

Table 2: Summary Characteristics of Adult by Household Types

| | Household Type | | | |
|---|---|---|---|---|
| | Nuclear$^{w/o}$ | Nuclear$^{w}$ | Extended | |
| | | | Head | Child's parent |
| Head | | | | |
| Age | 42.42 | 41.72 | 57.79 | 33.26 |
| Education | 3.15 | 5.00 | 2.47 | 4.48 |
| Birth-order | 3.26 | 3.12 | 3.05 | 3.59 |
| No. of Brothers | 2.50 | 1.91 | 2.25 | 3.45 |
| Wife | | | | |
| Age | 33.76 | 33.23 | 48.98 | 26.79 |
| Education | 2.74 | 2.21 | 1.09 | 2.86 |
| *Parental Characteristics (pre-wedding)* | | | | |
| Head | | | | |
| father's land holding | 275.14 | 259.87 | 344.62 | |
| mother's land holding | 14.78 | 22.52 | 39.87 | |
| father's education | 2.03 | 2.38 | 1.82 | |
| mother's education | 0.29 | 0.37 | 0.25 | |
| Wife | | | | |
| father's land holding | 360.79 | 327.22 | 358.14 | |
| mother's land holding | 23.43 | 31.91 | 30.68 | |
| father's education | 2.67 | 2.91 | 1.98 | |
| mother's education | 0.76 | 0.80 | 0.49 | |
| *Assets brought at Marriage (Takka)* | | | | |
| Head | 25209 | 30664 | 37495 | |
| Wife | 2665 | 1885 | 3454 | |

Education is class completed. Landholdings are in 1/100 acre, and assets are in Takka.

Table 3: Adult Equivalence Weights by Age and Sex

| Ages (years) | | | |
|---|---|---|---|
| From | To | Females | Males |
| 0 | 1 | 0.25 | 0.25 |
| 1 | 2 | 0.36 | 0.37 |
| 2 | 3 | 0.4 | 0.42 |
| 3 | 4 | 0.43 | 0.46 |
| 4 | 5 | 0.46 | 0.49 |
| 5 | 6 | 0.48 | 0.53 |
| 6 | 7 | 0.49 | 0.56 |
| 7 | 8 | 0.49 | 0.58 |
| 8 | 9 | 0.49 | 0.58 |
| 9 | 10 | 0.49 | 0.58 |
| 10 | 11 | 0.64 | 0.70 |
| 11 | 12 | 0.64 | 0.71 |
| 12 | 13 | 0.66 | 0.73 |
| 13 | 14 | 0.68 | 0.77 |
| 14 | 15 | 0.7 | 0.81 |
| 15 | 16 | 0.7 | 0.85 |
| 16 | 17 | 0.72 | 0.89 |
| 17 | 18 | 0.75 | 0.92 |
| 18 | 30 | 0.82 | 1.03 |
| 30 | 60 | 0.83 | 1.03 |
| 60 | – | 0.61 | 0.68 |

Source: Ahmed and Shams (1994).

Table 4: Father's Education, Age and Number of Children

| | (1) | (2) | (3) |
|---|---|---|---|
| | Dependent variable: | | |
| Panel A. | Child's age | | |
| Father's education | 0.050** | 0.048** | 0.017 |
| | [0.023] | [0.024] | [0.053] |
| Father's age | 0.271*** | 0.275*** | 0.274*** |
| | [0.011] | [0.011] | [0.011] |
| Nuclear$^{w/o}$ | | 0.648** | 0.488 |
| | | [0.255] | [0.329] |
| Nuclear$^{w}$ | | 0.844** | 0.881 |
| | | [0.370] | [0.551] |
| Father's education | | | 0.046 |
| $\times$ Nuclear$^{w/o}$ | | | [0.061] |
| Father's education | | | 0.001 |
| $\times$ Nuclear$^{w}$ | | | [0.083] |
| Observations | 1634 | 1634 | 1634 |
| Adjusted $R^2$ | 0.29 | 0.29 | 0.29 |
| | | | |
| Panel B. | Age of oldest child[a] | | |
| Father's education | -0.011 | 0.008 | -0.12 |
| | [0.037] | [0.038] | [0.081] |
| Father's age | 0.703*** | 0.684*** | 0.681*** |
| | [0.027] | [0.029] | [0.029] |
| Nuclear$^{w/o}$ | | 0.809** | 0.141 |
| | | [0.382] | [0.537] |
| Nuclear$^{w}$ | | 0.579 | -0.185 |
| | | [0.562] | [0.823] |
| Father's education | | | 0.162* |
| $\times$ Nuclear$^{w/o}$ | | | [0.093] |
| Father's education | | | 0.169 |
| $\times$ Nuclear$^{w}$ | | | [0.130] |
| Observations | 413 | 413 | 413 |
| Adjusted $R^2$ | 0.62 | 0.62 | 0.62 |

[a] The age of the oldest child under 16 in the household is likely to be a poor measure of the age of oldest child for older men, therefore we restricted the sample to fathers 45 years or younger.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Child's Height-for-Age z-score, Nuclear vs Extended Families – OLS

| | Dependent Variable: Child's height-for-age z-score (0-10 years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nuclear | -0.373 | -0.33 | -0.351 | -0.378 | -0.355 | -0.179 | -0.181 |
| | [0.256] | [0.264] | [0.262] | [0.251] | [0.261] | [0.262] | [0.262] |
| Nuclear×age | 0.03 | 0.029 | 0.029 | 0.032 | 0.03 | 0.003 | 0.005 |
| | [0.035] | [0.035] | [0.035] | [0.034] | [0.035] | [0.038] | [0.038] |
| log (adult equivalent | -0.136 | -0.224 | -0.173 | -0.145 | -0.182 | -0.071 | -0.079 |
| household size) | [0.272] | [0.271] | [0.266] | [0.265] | [0.268] | [0.280] | [0.277] |
| log (adult equivalent | 0.012 | 0.017 | 0.01 | 0.015 | 0.015 | -0.007 | -0.004 |
| household size)×age | [0.039] | [0.039] | [0.039] | [0.039] | [0.039] | [0.042] | [0.042] |
| log(land, per | | 0.095 | | | 0.021 | | -0.01 |
| capita adult equivalent) | | [0.061] | | | [0.069] | | [0.070] |
| log(land, per capita | | -0.002 | | | 0 | | 0.004 |
| adult equivalent)×age | | [0.009] | | | [0.010] | | [0.010] |
| log(asset, per capita | | | 0.109 | | 0.055 | | 0.089 |
| adult equivalent) | | | [0.074] | | [0.086] | | [0.080] |
| log(asset, per capita | | | -0.001 | | -0.003 | | -0.01 |
| adult equivalent)×age | | | [0.010] | | [0.012] | | [0.011] |
| log(expenditure, per capita | | | | 0.344** | 0.264* | | 0.253* |
| adult equivalent) | | | | [0.142] | [0.144] | | [0.146] |
| log(expenditure, per capita | | | | 0.005 | 0.008 | | 0.006 |
| adult equivalent)×age | | | | [0.021] | [0.021] | | [0.022] |
| father's education | | | | | | 0.040* | 0.023 |
| (class completed) | | | | | | [0.024] | [0.024] |
| father's education | | | | | | -0.004 | -0.003 |
| (class completed)×age | | | | | | [0.004] | [0.004] |
| mother's education | | | | | | 0.001 | -0.01 |
| (class completed) | | | | | | [0.037] | [0.036] |
| mother's education | | | | | | 0.006 | 0.005 |
| (class completed)×age | | | | | | [0.005] | [0.005] |
| Adjusted R-squared | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.04 | 0.05 |
| Observations | 3778 | 3778 | 3778 | 3778 | 3778 | 3590 | 3590 |

Heteroskedasticity consistent standard errors clustered at the household level are in parentheses. The omitted household category is the extended family. All regressions include child's age (completed in years) dummies for female, site, round and their interaction with child's age. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: Child's Height-for-Age z-score, Nuclear vs Extended Families – 2SLS

| | Dependent Variable: Child's height-for-age z-score (0-10 years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nuclear | -0.28 | 0.017 | 0.25 | -0.339 | 0.057 | -1.675 | -0.86 |
| | [3.384] | [3.679] | [3.726] | [3.328] | [4.018] | [4.687] | [5.345] |
| Nuclear×age | 0.117 | 0.038 | 0.051 | 0.088 | 0.02 | 0.089 | -0.007 |
| | [0.404] | [0.444] | [0.447] | [0.409] | [0.495] | [0.569] | [0.665] |
| log (adult equivalent | -0.068 | -0.022 | 0.248 | -0.125 | 0.062 | -1.104 | -0.551 |
| household size) | [2.470] | [2.585] | [2.678] | [2.433] | [2.780] | [3.287] | [3.579] |
| log (adult equivalent | 0.07 | 0.026 | 0.023 | 0.056 | 0.015 | 0.054 | -0.007 |
| household size)×age | [0.288] | [0.305] | [0.314] | [0.292] | [0.333] | [0.393] | [0.439] |
| log(land, per | | 0.121 | | | 0.053 | | -0.013 |
| capita adult equivalent) | | [0.097] | | | [0.122] | | [0.150] |
| log(land, per capita | | -0.003 | | | -0.002 | | 0.005 |
| adult equivalent)×age | | [0.013] | | | [0.016] | | [0.018] |
| log(asset, per capita | | | 0.118 | | 0.046 | | 0.08 |
| adult equivalent) | | | [0.091] | | [0.100] | | [0.095] |
| log(asset, per capita | | | -0.002 | | -0.004 | | -0.013 |
| adult equivalent)×age | | | [0.012] | | [0.014] | | [0.014] |
| log(expenditure, per capita | | | | 0.386** | 0.264 | | 0.32 |
| adult equivalent) | | | | [0.164] | [0.291] | | [0.407] |
| log(expenditure, per capita | | | | 0.002 | 0.01 | | -0.001 |
| adult equivalent)×age | | | | [0.025] | [0.042] | | [0.059] |
| father's education | | | | | | 0.062 | 0.033 |
| (class completed) | | | | | | [0.070] | [0.085] |
| father's education | | | | | | -0.005 | -0.002 |
| (class completed)×age | | | | | | [0.009] | [0.011] |
| mother's education | | | | | | -0.052 | -0.038 |
| (class completed) | | | | | | [0.152] | [0.171] |
| mother's education | | | | | | 0.011 | 0.008 |
| (class completed)×age | | | | | | [0.019] | [0.022] |
| Overid test statistic | 0.52 | 0.18 | 0.3 | 0.11 | 0.1 | 0.68 | 0.31 |
| p-value | 0.97 | 0.99 | 0.99 | 0.99 | 0.99 | 0.95 | 0.99 |
| Observations | 3622 | 3622 | 3622 | 3622 | 3622 | 3453 | 3453 |

Heteroskedasticity consistent standard errors clustered at the household level are in parentheses. The omitted household category is the extended family. All regressions include child's age (completed in years) dummies for female, site, round and their interaction with child's age. Number of child's father's brothers(hbro), child's father's birthorder (hbor), their interaction (hbro × hbor), and each of these variables interaction with child's age are used as instruments. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Child's Height-for-Age z-score by Family Type – OLS

| | Dependent Variable: Child's Height-for-age z-score (0-10 years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nuclear$^{w/o}$ | -0.44 | -0.38 | -0.402 | -0.417 | -0.387 | -0.231 | -0.214 |
| | [0.273] | [0.283] | [0.283] | [0.269] | [0.282] | [0.285] | [0.284] |
| Nuclear$^{w/o}$×age | 0.041 | 0.039 | 0.039 | 0.039 | 0.038 | 0.013 | 0.013 |
| | [0.037] | [0.038] | [0.038] | [0.036] | [0.038] | [0.041] | [0.041] |
| Nuclear$^{w}$ | -0.209 | -0.203 | -0.223 | -0.273 | -0.264 | -0.053 | -0.093 |
| | [0.289] | [0.289] | [0.288] | [0.282] | [0.286] | [0.281] | [0.282] |
| Nuclear$^{w}$×age | 0.001 | 0.002 | 0.003 | 0.008 | 0.008 | -0.023 | -0.017 |
| | [0.041] | [0.041] | [0.041] | [0.041] | [0.041] | [0.042] | [0.042] |
| log (adult equivalent | -0.193 | -0.263 | -0.214 | -0.177 | -0.208 | -0.114 | -0.106 |
| household size) | [0.282] | [0.280] | [0.278] | [0.277] | [0.279] | [0.290] | [0.288] |
| log (adult equivalent | 0.021 | 0.025 | 0.018 | 0.023 | 0.022 | 0.001 | 0.004 |
| household size)×age | [0.041] | [0.041] | [0.041] | [0.041] | [0.041] | [0.044] | [0.044] |
| log(land, per | | 0.092 | | | 0.021 | | -0.01 |
| capita adult equivalent) | | [0.062] | | | [0.070] | | [0.069] |
| log(land, per capita | | -0.001 | | | 0 | | 0.004 |
| adult equivalent)×age | | [0.009] | | | [0.010] | | [0.010] |
| log(asset, per capita | | | 0.104 | | 0.053 | | 0.088 |
| adult equivalent) | | | [0.075] | | [0.086] | | [0.080] |
| log(asset, per capita | | | -0.001 | | -0.002 | | -0.01 |
| adult equivalent)×age | | | [0.010] | | [0.012] | | [0.011] |
| log(expenditure, per capita | | | | 0.335** | 0.258* | | 0.249* |
| adult equivalent) | | | | [0.145] | [0.146] | | [0.147] |
| log(expenditure, per capita | | | | 0.007 | 0.009 | | 0.007 |
| adult equivalent)×age | | | | [0.021] | [0.021] | | [0.022] |
| father's education | | | | | | 0.039 | 0.023 |
| (class completed) | | | | | | [0.024] | [0.024] |
| father's education | | | | | | -0.004 | -0.003 |
| (class completed)×age | | | | | | [0.004] | [0.004] |
| mother's education | | | | | | 0 | -0.01 |
| (class completed) | | | | | | [0.037] | [0.036] |
| mother's education | | | | | | 0.006 | 0.005 |
| (class completed)×age | | | | | | [0.005] | [0.005] |
| Adjusted R-squared | 0.02 | 0.03 | 0.03 | 0.04 | 0.05 | 0.04 | 0.05 |
| Observations | 3778 | 3778 | 3778 | 3778 | 3778 | 3590 | 3590 |

Heteroskedasticity consistent standard errors clustered at the household level are in parentheses. The omitted household category is the extended family. Other controls are same as Table 5.* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Child's Height-for-Age z-score by Family Type –2SLS

| | Dependent Variable: Child's height-for-age z-score (0-10 years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nuclear$^{w/o}$ | -1.185 | -0.352 | -0.762 | -0.903 | -0.561 | -2.902 | -1.402 |
| | [3.630] | [4.602] | [4.369] | [3.614] | [5.185] | [5.531] | [5.025] |
| Nuclear$^{w/o}$×age | 0.243 | 0.117 | 0.199 | 0.158 | 0.108 | 0.242 | 0.043 |
| | [0.466] | [0.586] | [0.561] | [0.472] | [0.668] | [0.756] | [0.714] |
| Nuclear$^{w}$ | -0.077 | 0.032 | 0.155 | -0.207 | -0.089 | -1.726 | -0.802 |
| | [3.455] | [3.589] | [3.601] | [3.389] | [3.960] | [4.806] | [3.781] |
| Nuclear$^{w}$×age | 0.061 | 0.012 | 0.032 | 0.055 | 0.025 | 0.086 | -0.015 |
| | [0.414] | [0.438] | [0.432] | [0.419] | [0.488] | [0.568] | [0.475] |
| log (adult equivalent | -0.777 | -0.296 | -0.504 | -0.567 | -0.384 | -2.01 | -0.923 |
| household size) | [2.665] | [3.242] | [3.149] | [2.659] | [3.621] | [3.910] | [3.441] |
| log (adult equivalent | 0.171 | 0.087 | 0.136 | 0.112 | 0.079 | 0.166 | 0.025 |
| household size)×age | [0.341] | [0.410] | [0.401] | [0.345] | [0.462] | [0.538] | [0.494] |
| log(land, per | | 0.114 | | | 0.043 | | -0.015 |
| capita adult equivalent) | | [0.137] | | | [0.136] | | [0.124] |
| log(land, per capita | | -0.002 | | | -0.001 | | 0.004 |
| adult equivalent)×age | | [0.017] | | | [0.017] | | [0.015] |
| log(asset, per capita | | | 0.086 | | 0.032 | | 0.068 |
| adult equivalent) | | | [0.135] | | [0.134] | | [0.143] |
| log(asset, per capita | | | 0.002 | | -0.001 | | -0.011 |
| adult equivalent)×age | | | [0.018] | | [0.019] | | [0.022] |
| log(expenditure, per capita | | | | 0.344 | 0.272 | | 0.316 |
| adult equivalent) | | | | [0.229] | [0.287] | | [0.277] |
| log(expenditure, per capita | | | | 0.007 | 0.009 | | -0.001 |
| adult equivalent)×age | | | | [0.031] | [0.041] | | [0.039] |
| father's education | | | | | | 0.061 | |
| (class completed) | | | | | | [0.072] | |
| father's education | | | | | | -0.005 | 0.002 |
| (class completed)×age | | | | | | [0.009] | [0.003] |
| mother's education | | | | | | -0.083 | |
| (class completed) | | | | | | [0.169] | |
| mother's education | | | | | | 0.015 | 0.002 |
| (class completed)×age | | | | | | [0.022] | [0.004] |
| Overid test statistic | 0.3 | 0.06 | 0.11 | 0.02 | 0.04 | 0.3 | 0.11 |
| p-value | 0.86 | 0.97 | 0.95 | 0.99 | 0.98 | 0.86 | 0.94 |
| Observations | 3622 | 3622 | 3622 | 3622 | 3622 | 3453 | 3453 |

Heteroskedasticity consistent standard errors clustered at the household level are in parentheses. The omitted household category is the extended family. Other controls and instruments are same as Table (6).* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Child's Education, Nuclear vs Extended Families – OLS

| | Dependent Variable: Class Completed (6-16 years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nuclear | -0.939** | -0.851* | -0.956** | -0.764* | -0.788* | -0.980* | -0.845* |
| | [0.472] | [0.438] | [0.412] | [0.431] | [0.407] | [0.508] | [0.484] |
| Nuclear×age | 0.131** | 0.129*** | 0.135*** | 0.107** | 0.117*** | 0.119** | 0.104** |
| | [0.051] | [0.047] | [0.043] | [0.045] | [0.042] | [0.053] | [0.050] |
| log (adult equivalent | -1.446** | -1.489*** | -1.252** | -1.442*** | -1.356*** | -1.400** | -1.263** |
| household size) | [0.606] | [0.565] | [0.523] | [0.544] | [0.523] | [0.591] | [0.535] |
| log (adult equivalent | 0.162** | 0.159** | 0.125** | 0.161*** | 0.138** | 0.161** | 0.141** |
| household size)×age | [0.069] | [0.064] | [0.058] | [0.061] | [0.058] | [0.067] | [0.060] |
| log(land, per | | -0.421*** | | | 0.093 | | 0.129 |
| capita adult equivalent) | | [0.138] | | | [0.153] | | [0.146] |
| log(land, per capita | | 0.067*** | | | 0 | | -0.009 |
| adult equivalent)×age | | [0.016] | | | [0.018] | | [0.017] |
| log(asset, per capita | | | -0.786*** | | -0.674*** | | -0.484*** |
| adult equivalent) | | | [0.117] | | [0.150] | | [0.169] |
| log(asset, per capita | | | 0.112*** | | 0.089*** | | 0.058*** |
| adult equivalent)×age | | | [0.013] | | [0.017] | | [0.019] |
| log(expenditure, per capita | | | | -1.518*** | -0.827** | | -0.908** |
| adult equivalent) | | | | [0.331] | [0.364] | | [0.382] |
| log(expenditure, per capita | | | | 0.219*** | 0.118*** | | 0.117*** |
| adult equivalent)×age | | | | [0.038] | [0.042] | | [0.043] |
| father's education | | | | | | -0.171*** | -0.121** |
| (class completed) | | | | | | [0.047] | [0.047] |
| father's education | | | | | | 0.024*** | 0.017*** |
| (class completed)×age | | | | | | [0.005] | [0.005] |
| mother's education | | | | | | -0.088 | -0.036 |
| (class completed) | | | | | | [0.063] | [0.064] |
| mother's education | | | | | | 0.021*** | 0.014* |
| (class completed)×age | | | | | | [0.007] | [0.007] |
| Adjusted R-squared | 0.52 | 0.55 | 0.6 | 0.57 | 0.61 | 0.62 | 0.65 |
| Observations | 1297 | 1297 | 1297 | 1297 | 1297 | 1131 | 1131 |

Heteroskedasticity consistent standard errors clustered at the household level are in parentheses. The omitted household category is the extended family. All regressions include child's age (completed in years) dummies for female, site, and their interaction with child's age. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10: Child's Education, Nuclear vs Extended Families – 2SLS

| | Dependent Variable: Class Completed (6-16 years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nuclear | -1.469 | -2.087* | -1.681 | -1.701 | -1.832* | -3.622** | -4.673*** |
| | [1.189] | [1.189] | [1.062] | [1.127] | [1.076] | [1.715] | [1.605] |
| Nuclear×age | 0.197 | 0.273* | 0.219* | 0.217 | 0.232* | 0.383** | 0.501*** |
| | [0.144] | [0.142] | [0.127] | [0.135] | [0.128] | [0.193] | [0.178] |
| log (adult equivalent | -1.747* | -2.264** | -1.610* | -1.997** | -1.935** | -2.962** | -3.700*** |
| household size) | [1.031] | [1.026] | [0.931] | [0.999] | [0.925] | [1.292] | [1.171] |
| log (adult equivalent | 0.198 | 0.246** | 0.163 | 0.226* | 0.198* | 0.315** | 0.391*** |
| household size)×age | [0.122] | [0.120] | [0.109] | [0.118] | [0.107] | [0.150] | [0.135] |
| log(land, per | | -0.366** | | | 0.194 | | 0.188 |
| capita adult equivalent) | | [0.151] | | | [0.162] | | [0.159] |
| log(land, per capita | | 0.062*** | | | -0.011 | | -0.016 |
| adult equivalent)×age | | [0.017] | | | [0.018] | | [0.018] |
| log(asset, per capita | | | -0.837*** | | -0.794*** | | -0.751*** |
| adult equivalent) | | | [0.124] | | [0.159] | | [0.171] |
| log(asset, per capita | | | 0.118*** | | 0.102*** | | 0.083*** |
| adult equivalent)×age | | | [0.014] | | [0.018] | | [0.019] |
| log(expenditure, per capita | | | | -1.402*** | -0.628 | | -0.707 |
| adult equivalent) | | | | [0.361] | [0.405] | | [0.440] |
| log(expenditure, per capita | | | | 0.209*** | 0.098** | | 0.096* |
| adult equivalent)×age | | | | [0.042] | [0.047] | | [0.050] |
| father's education | | | | | | -0.112** | |
| (class completed) | | | | | | [0.057] | |
| father's education | | | | | | 0.017*** | 0.004** |
| (class completed)×age | | | | | | [0.007] | [0.002] |
| mother's education | | | | | | -0.117 | |
| (class completed) | | | | | | [0.073] | |
| mother's education | | | | | | 0.026*** | 0.013*** |
| (class completed)×age | | | | | | [0.008] | [0.003] |
| Overidentification test statistic | 19.21 | 18.78 | 18.66 | 17.8 | 18.66 | 14.28 | 16.58 |
| p-value | 0.38 | 0.4 | 0.41 | 0.47 | 0.41 | 0.71 | 0.55 |
| Observations | 1172 | 1172 | 1172 | 1172 | 1172 | 1024 | 1024 |

Heteroskedasticity consistent standard errors clustered at the household level are in parentheses. The omitted household category is the extended family. All regressions include child's age (completed in years) dummies for female, site, round and their interaction with child's age. Number of child's father's brothers(hbro), child's father's birthorder (hbor), dummies for child's grand-father(gfliv) and grand-mother alive(gmliv), and their interactions- hbro × hbor, hbro × gfliv, hbor × gmliv, hbor × gmliv, and each of these variables interaction with child's age are used as instruments. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 11: Child's Education by Family Type – OLS

| | Dependent Variable: Class Completed (6-16 years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nuclear$^{w/o}$ | -0.880* | -0.796* | -0.908** | -0.672 | -0.697 | -0.984* | -0.779 |
| | [0.496] | [0.463] | [0.436] | [0.452] | [0.434] | [0.535] | [0.511] |
| Nuclear$^{w/o}$×age | 0.117** | 0.116** | 0.124*** | 0.090* | 0.102** | 0.111** | 0.091* |
| | [0.053] | [0.049] | [0.046] | [0.047] | [0.045] | [0.056] | [0.053] |
| Nuclear$^{w}$ | -1.195** | -1.101** | -1.162** | -1.121** | -1.128** | -1.143** | -1.199** |
| | [0.559] | [0.530] | [0.488] | [0.525] | [0.478] | [0.564] | [0.514] |
| Nuclear$^{w}$×age | 0.186*** | 0.181*** | 0.179*** | 0.172*** | 0.174*** | 0.157*** | 0.160*** |
| | [0.061] | [0.056] | [0.051] | [0.056] | [0.050] | [0.058] | [0.053] |
| log (adult equivalent | -1.397** | -1.435** | -1.210** | -1.362** | -1.274** | -1.398** | -1.186** |
| household size) | [0.629] | [0.584] | [0.542] | [0.567] | [0.542] | [0.623] | [0.561] |
| log (adult equivalent | 0.149** | 0.147** | 0.115* | 0.145** | 0.124** | 0.153** | 0.126** |
| household size)×age | [0.071] | [0.066] | [0.060] | [0.063] | [0.059] | [0.071] | [0.063] |
| log(land, per | | -0.427*** | | | 0.092 | | 0.123 |
| capita adult equivalent) | | [0.139] | | | [0.155] | | [0.148] |
| log(land, per capita | | 0.068*** | | | 0 | | -0.009 |
| adult equivalent)×age | | [0.016] | | | [0.018] | | [0.017] |
| log(asset, per capita | | | -0.786*** | | -0.669*** | | -0.483*** |
| adult equivalent) | | | [0.117] | | [0.150] | | [0.170] |
| log(asset, per capita | | | 0.111*** | | 0.088*** | | 0.057*** |
| adult equivalent)×age | | | [0.013] | | [0.017] | | [0.019] |
| log(expenditure, per capita | | | | -1.537*** | -0.850** | | -0.942** |
| adult equivalent) | | | | [0.331] | [0.363] | | [0.384] |
| log(expenditure, per capita | | | | 0.220*** | 0.121*** | | 0.121*** |
| adult equivalent)×age | | | | [0.038] | [0.041] | | [0.043] |
| father's education | | | | | | -0.167*** | -0.112** |
| (class completed) | | | | | | [0.048] | [0.048] |
| father's education | | | | | | 0.023*** | 0.016*** |
| (class completed)×age | | | | | | [0.005] | [0.005] |
| mother's education | | | | | | -0.095 | -0.045 |
| (class completed) | | | | | | [0.064] | [0.064] |
| mother's education | | | | | | 0.022*** | 0.015** |
| (class completed)×age | | | | | | [0.007] | [0.007] |
| Adjusted R-squared | 0.52 | 0.56 | 0.6 | 0.58 | 0.61 | 0.62 | 0.65 |
| Observations | 1297 | 1297 | 1297 | 1297 | 1297 | 1131 | 1131 |

Heteroskedasticity consistent standard errors clustered at the household level are in parentheses. The omitted household category is the extended family. Other controls are same as Table (9).* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 12: Child's Education by Family Type – 2SLS

| | Dependent Variable: Class Completed (6-16 years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Nuclear$^{w/o}$ | -0.983 | -1.557 | -0.886 | -0.899 | -0.931 | -4.651 | -4.464 |
| | [1.689] | [1.609] | [1.459] | [1.565] | [1.507] | [3.034] | [2.759] |
| Nuclear$^{w/o}$×age | 0.164 | 0.225 | 0.141 | 0.141 | 0.139 | 0.522 | 0.493 |
| | [0.205] | [0.193] | [0.175] | [0.190] | [0.181] | [0.358] | [0.318] |
| Nuclear$^{w}$ | -2.414* | -2.724** | -2.390** | -2.481** | -2.415** | -3.879** | -4.572*** |
| | [1.320] | [1.314] | [1.194] | [1.257] | [1.176] | [1.896] | [1.718] |
| Nuclear$^{w}$×age | 0.261* | 0.318** | 0.271** | 0.273** | 0.276** | 0.421* | 0.491** |
| | [0.147] | [0.145] | [0.130] | [0.138] | [0.129] | [0.217] | [0.192] |
| log (adult equivalent | -1.26 | -1.808 | -0.924 | -1.295 | -1.225 | -3.741 | -3.509* |
| household size) | [1.409] | [1.333] | [1.215] | [1.310] | [1.209] | [2.311] | [2.049] |
| log (adult equivalent | 0.165 | 0.206 | 0.098 | 0.162 | 0.126 | 0.421 | 0.383 |
| household size)×age | [0.167] | [0.156] | [0.141] | [0.156] | [0.141] | [0.276] | [0.238] |
| log(land, per | | -0.338** | | | 0.24 | | 0.216 |
| capita adult equivalent) | | [0.154] | | | [0.171] | | [0.170] |
| log(land, per capita | | 0.059*** | | | -0.015 | | -0.018 |
| adult equivalent)×age | | [0.017] | | | [0.019] | | [0.019] |
| log(asset, per capita | | | -0.830*** | | -0.785*** | | -0.682*** |
| adult equivalent) | | | [0.124] | | [0.159] | | [0.190] |
| log(asset, per capita | | | 0.117*** | | 0.101*** | | 0.078*** |
| adult equivalent)×age | | | [0.014] | | [0.018] | | [0.021] |
| log(expenditure, per capita | | | | -1.468*** | -0.765* | | -0.657 |
| adult equivalent) | | | | [0.368] | [0.423] | | [0.550] |
| log(expenditure, per capita | | | | 0.216*** | 0.111** | | 0.091 |
| adult equivalent)×age | | | | [0.042] | [0.048] | | [0.061] |
| father's education | | | | | | -0.113* | -0.029 |
| (class completed) | | | | | | [0.062] | [0.060] |
| father's education | | | | | | 0.017** | 0.007 |
| (class completed)×age | | | | | | [0.007] | [0.007] |
| mother's education | | | | | | -0.104 | -0.06 |
| (class completed) | | | | | | [0.088] | [0.086] |
| mother's education | | | | | | 0.024** | 0.018* |
| (class completed)×age | | | | | | [0.010] | [0.010] |
| Overid test statistic | 18.78 | 18.85 | 18.48 | 17.23 | 18.04 | 13.1 | 15.36 |
| p-value | 0.28 | 0.28 | 0.3 | 0.37 | 0.32 | 0.67 | 0.5 |
| Observations | 1172 | 1172 | 1172 | 1172 | 1172 | 1024 | 1024 |

Heteroskedasticity consistent standard errors clustered at the household level are in parentheses. The omitted household category is the extended family. Other controls and instruments are same as Table (10).* significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 2: Land holdings of head's father, by household type. Clock-wise from top left: nuclear$^{w/o}$, nuclear$^{w}$, and extended.