Fertility, Household's size and Poverty in Nepal

François LIBOIS and Vincent SOMVILLE

CRED - October 2014

Department of Economics
Working Papers
2014/12

Fertility, Household's size and Poverty in Nepal*

François Libois[2] and Vincent Somville[3]

October 22, 2014

Abstract

Population control policies keep on attracting massive attention: having more children would directly contribute to household's poverty. Using household level data from Nepal, we investigate the links between household's fertility decisions and variations in their size and composition. We show that household size barely changes with additional births but household composition is affected. Couples with fewer children host, on average, more other relatives. This result implies that fertility of a household has an ambiguous impact on its per capita consumption which depends on the relative gains in lower consumption versus costs of a lower income. We use the gender of the first born child to instrument the total number of consecutive children and identify the causal relationship.

Keywords: Nepal ; Household size ; Household composition ; Poverty ; Fertility
JEL codes: I32 ; J13 ; D13 ; O53

---

*We are thankful to Arild Aakvik, Jean-Marie Baland, Catherine Guirkinger, Magnus Hatlebakk, Sylvie Lambert and Jean-Philippe Platteau for numerous comments as well as to seminar participants from CRED in Namur, CMI in Bergen, Heriott-Watt University, NTNU Trondheim, Bergen University, The Norwegian School of Economics - NHH and the NCDE conference in Helsinki. Vincent Somville acknowledges financial support from the Research Council of Norway through the Econpop program.

[2]Centre for Research in the Economics of Development, University of Namur, Belgium. E-mail: *francois.libois@unamur.be*

[3]Chr. Michelsen Institute, Norway E-mail: *vincent.somville@cmi.no*

1 Introduction.

Policies aiming to lower the fertility of poor people have been carried out in most developing countries of the world. They have sometimes been dramatically violent and invasive, as illustrated by the application of the Chinese one-child policy or the Indian sterilisation campaigns under Sanjay Gandhi.

We focus on fertility's incidence on households' composition and poverty. Our starting point is the argument illustrated by Figure 1. This poster of the India Ministry of Health and Family Welfare is well representative of the low-fertility campaigns and similar posters can be found in other countries or at other times. It pictures on the left side a family that has many children: that family is poor, badly dressed, living in a house that is in a very poor condition and with nothing growing on their land. On the right side there is a family that only had two children and looks much richer and happier. They have a nice house, nice clothes, a fertile land and a tractor. Even the tree regains its leaves when there are only two children. The argument is that poor and large families do not have the means to invest (in the education of their children, or in the activities that generate their incomes) and, to get out of poverty, the poor should have few children (two children is usually advocated).

Insert figure 1 here

While Becker et al. (1960) established an economic framework to study the effects of the parents' income on their fertility, their arguments formally link the income with the number of children and can be used to analyse the reverse relationship.

The mechanism that is implicitly assumed in the picture can be described as follows. The household has a limited amount of resources. When one additional child is born, the size of the household grows accordingly. There is an additional unproductive mouth to feed and therefore income per capita is lower. The household does not have the means any more to invest in their productive assets and in the education of their children.

Whether this message is correct or not is however of crucial importance to the poor. Is it really true that they will become rich and happy if they refrain from having children?

It is also crucial to policy makers. According to the picture, fertility control would be an effective tool to eradicate poverty. Before spending resources on this kind of campaign, or on more aggressive policies as has been done in India and China, policy-makers ought to know exactly what benefits to expect in terms of increased incomes and poverty alleviation.

Empirically, the effects of changes in fertility on various outcomes linked to household's welfare remain unclear. As Schultz et al. (2007) conclude from their review of the empirical literature, *"Policies that help individuals reduce unwanted fertility are expected to improve the well being of their families and society. But there is relatively little empirical evidence of these connections from fertility to family well-being and to intergenerational welfare gains, traced out by distinct policy interventions.* (...) *The hypothesis that policy-induced fertility declines have contributed to increases in family savings rates is intuitively plausible, as is the life-cycle savings hypothesis. No studies were found, however, to show exogenous sources of fertility decline have actually increased family life cycle savings and added over time to the accumulation of physical assets.*" (Schultz et al., 2007,p.3294-3295).

We use data from the Nepal Living Standards Surveys to investigate the links between household's fertility decisions and their consequent achievements in incomes.

First, we check how the size of households evolves with additional births. We find that on average, the size of the households is barely affected by additional births, only the household composition changes. To identify the causal effect of the number of children on the household's size and composition, we use the gender of the first-born as an instrumental variable. Because of a strong preference for sons, Nepalese parents whose first-born is a girl tend to have more children.

As we show below, the size of the young mothers' households slightly changes with an additional birth. The arrival of a new child is compensated by the absence of another member. On the other hand, older women's households decrease in size with the number of children. In this latest case, the data show that couples who had fewer children tend to host more grand-children and in-laws than couples with more of their own children. Because households are parts of extended family networks, those who have fewer children simply host more other relatives. This finding concurs with the arguments of Cox et al. (2007) who emphasised the importance of kinship networks in redistributing resources. In our case, people, rather than goods or money, move between households.

When the arrival of an additional child provokes the departure of another household member, it is not obvious any more that the household will have fewer resources per person. This will depend on the relative consumption and generation of income of the child versus the member who left.

Second, we test whether having an additional child leads to a lower level of income and consumption. Simply comparing the incomes of small and large families obviously does not allow to conclude anything about the causal effect of the family size on the household's income: poor parents may have more children because they are poor and will need their children support later in life, or on the contrary, rich parents may decide to have more children because they are rich and can afford more children. Despite our best efforts, we do not find significant correlations between the number of children and the income and consumption of households. We explain this absence of correlation by our previous finding, that household size is unrelated to the number of births.

The main result of the paper is that the theoretical prediction that larger families will get poorer does not materialise. Households include various people such as grand-parents, uncles and aunts, cousins, non blood-related people, etc. When a family has an additional children, some of the other people may move away leaving the size of the household constant. And similarly if a couple has few children at home they are likely to host more other relatives or acquaintances.[1]

Clearly, fertility decisions and the way household's composition and incomes vary with new births are context-dependent and most likely different families will adopt different behaviours. Childs (2001) for instance describes how in Nepal two geographically close villages followed opposite directories in terms of population growth. In one village, parents designated their daughters to be nuns, barring them from marriage, while in the other young daughters were getting married and having children. Our goal here is to check whether a general pattern emerges across local differences and we focus on average effects over a very large sample that covers most of Nepal's areas.

Other arguments have been used to justify the public control of the size of a population. The influence of Malthus (1798) is strong and many call for a limit on the world population given the limited amount of resources that are available. Those who contest this view generally argue that technological progress creates new resources and more efficient ways to use resources and that must be taken into account. And a larger population may make creative

[1]This argument is related to what anthropologists and biologists have called "cooperative breeding", see Kramer (2010). In economics, it is closely related to the argument of Cox et al. (2007) on the role played by kinship networks in the redistribution of resources.

ideas and technological progress more likely. Kremer (1993) supports this hypothesis and conclude that for most of human history, societies with larger initial populations indeed experienced faster technological change. We leave aside this debate to focus on the household-level dynamics that we outlined above.

In the next section, we present the data and the identification strategy. The empirical analysis is conducted in sections 3, 4 and 5. Section 6 concludes.

2 Data and empirical strategy.

The Nepal Living Standards Surveys (NLSS) have been carried out in 1995/96, 2003/04 and 2010/11 by the Nepalese Central Bureau of Statistics in collaboration with the World Bank. The surveys follow the World Bank's Living Standards Measurement Survey methodology and cover a wide range of topics: demography, consumption, income, access to facilities, housing, education, health, employment, credit, remittances, etc. The quality of the surveys has been tested by Hatlebakk (2007) who also discusses them in greater details. The details of the sampling, of the methodology and of the execution of the surveys are exposed in CBS (2011a). We use data from the three cross-sections. Our estimation sample consists of 8218 households: 2 105, 2 503 and 3 610 respectively from the first, second and third survey. The three surveys are referred to as T1, T2 and T3 and all monetary values are corrected for inflation using local prices and reported in 2010 NPR. Information related to children ever born comes from a specific section of the questionnaire about women maternity history. In that section, the respondent is asked about the number of children of each woman, the age of those children, their gender, whether they are still living with the household and other demographic informations. A drawback of this dataset is that this information is collected only if the women are below 50 years of age. To understand the relation between number of children, family size and household income per capita, we first assess the causal impact of the number of children on the family size and composition. We use, as an instrument, a binary variable that is equal to one if the first born child is a girl and to zero otherwise. The effects of the first-born's gender have been analysed in various papers (Rosenzweig and Wolpin, 2000), in Asia (Chowdhury and Bairagi, 1990; Clark, 2000; Dreze and Murthi, 2001; Lee, 2008) and more recently in Sub-Saharan Africa (Milazzo, 2012). As in other countries, there is in Nepal a strong preference for boys. Couples whose first child is a girl are more likely to have another child, hoping it will be a boy (Gudbrandsen, 2013; Hatlebakk, 2012). Given that households under study do not have the possibility to choose the gender of their child, or to know the gender of the baby in utero, they cannot select the gender of their offspring.[2] Whether their first-born is a girl or a boy is therefore a random event. To be a valid instrument, conditional on the covariates that we include, the gender of the first-born cannot have a direct effect on our dependent variables: the household's income and size. But its effect must go through the number of additional children. Such will not be the case if for instance (i) the gender of the children affects the reporting of the number of children ever born by their mother, (ii) if the gender of the first-born affects the dynamics of household creation (e.g. if a first born boy becomes the household head), or (iii) if the parents adopt different behaviours (related to income and the size of their household) because their first-born is a boy rather than a girl). We discuss and test these scenario in Section 7.

One downside of this instrumental variable, is that it can only be used on the sub-set of people who have had at least one child. This limits its external validity and the results cannot be used to assess the effects of having one child versus not having any children.[3] The following terminology is used in the analysis. A **household** comprises all people living together at the time of the survey. A **family** is composed of the head of the household, his/her spouse and their children. The size of the household is therefore equal to the size of the family, minus the number of family members living elsewhere, plus the non-family people living in the household. The income per capita is the total income earned by all household members divided by the size of

[2]See Valente (2013).

[3]The original dataset contains information about 13 273 households. A total of 4 135 households are dropped from the dataset because their head never had a child yet. From the remaining data, we drop 748 households for which the maternity section is missing because the mother is above 49 years old and we further discard 149 households with twins. The results are not affected by the inclusion of households with twins, but they complicate the discussion and the interpretation of some results without generating any important insight. Finally, we lose 23 households with missing data about the age of the head. Also note that one observation is dropped when we include both the sex of the first born and ward fixed effects in the regressions because of perfect multi-collinearity. In income regressions, we further lose 40 households with incomplete information about income.

the household. We also refer to the head of the household, his/her spouse and their children when we use the terms **nuclear members**. **Child** and **children** are used to identify the sons and daughters of the household head. While a child is obviously younger than his father, children can be old. They comprise babies and infants but also adult children. We count all the children ever born, including those that were dead at the time of the survey.[4]

3 Empirical analysis.

As shown in Table 1, there has been an important increase in income per capita in Nepal between the surveys. The mean income per capita more than tripled and the median doubled. This change is both driven by the increase of the absolute level of income and by the significant reduction in household size. First, absolute income increase is related to the expansion of non-farm activities and to growing in-flow of remittances (see CBS, 2011b). Notice that the mean in the last survey is heavily influenced by a few extremely high incomes. The income of the 25th, 50th and 75th percentiles nonetheless all doubled over the period, indicating similar decreases in poverty over the different initial levels of income. Second, household size goes down and it correlates to a decline in fertility. On average, household heads have had 4 children in the first survey, 3.65 in the second survey and 3.3 in the last survey. The median number of children went down from four to three. On the other hand, the median household size did not change as much: the median number of household members remained constant and equal to 5 over all three surveys.

Insert table 1 here

Figure 2 breaks the mean household per capita income down for different offspring numbers. From this picture, it is clear that households that have between one and three children have on average higher incomes per capita than households with more children. There is however no clear difference in incomes between the households that have one, two or three children. There is neither a difference in incomes among the households that have more than three children. The negative correlation between the number of children and

[4]Our results are robust to the use of the number children still alive at the time of the survey.

household income per capita is consistent with the expectations that poorer parents decide to have more children to have a guaranteed support later in life. It could be as well that having more children increases the pressure on the household's resources, and decreases per capita income.

Insert figure 2 here

3.1 Preference for boys.

As already mentioned, we use the gender of the first child as an exogenous determinant of the total number of children. This instrument has both statistical relevance and anthropological soundness. Table 8 shows that on average, at the time of the survey the couples had 3.8 children if they first had a girl and 3.4 children if they first had a boy. The median number of children is 4 among the families with a first born girl and 3 among the families with a first born boy. Figure 3 shows that there is first order stochastic dominance of the number of births distribution in first born girl families over first born boy families.[5] This is in line with our expectations that people keep having children as long as they don't reach their desired number of boys.

Insert table 8 here

Insert figure 3 here

Onesto (2005) summarizes the preference for boys by quoting a countryside saying: *"To get a girl is like watering a neighbor's tree. You have the trouble and expense of nurturing the plant but the fruits are taken by somebody else."* A daughter *"is useful and valuable in her childhood years when she can do chores and serve the household"*. Afterwards, she marries and all long term investment benefits flow to her husband. In a more in-depth study of a Tamang community, Fricke (1986) reports that there is a slightly greater desire for male children but that babies are equally treated. Women provide labour force as long as there are member of the household and form a corner stone of extended reciprocity relationships. However, sons remain the only one who formally inherit land and who take (financial) charge of their parents

[5]This is confirmed by a two-sample Wilcoxon rank-sum test which rejects the equality of distributions with an associated p-value < 0.0001

funerals. Inability of a women to have sons is almost one of the only reasons to observe polygyny.

Nepalese have at least two good reasons to wish to have at least two boys. As already mentioned, boys traditionally inherit the family's land. Having a boy to take care of the land and inherit the family's assets is the tradition. In addition, it is easier for a boy to migrate. In the last couple of years, the returns to migration are very high and remittances constitute a very important part of household's revenues (CBS, 2011b). Families also report wanting a second boy to get an education while the first takes care of the land. Additionally, it is a son who is supposed to lit the parents' funeral pyre.

Under the assumptions that the sex ratio at birth is equal to 0.5 and that the number of children is not bounded, if households want to have two boys and don't especially want girls, then the probability to observe n children in a household is equal to $(n-1)\,(0.5)^n$. The process behind this probability is depicted in the appendix (see figure A.1). In Table 3, we compare the expected number of children under the rule "having two boys", to the real number of children in the data (we use the sample of households with at least 2 children). The similarity between the expected and observed numbers is striking ; we interpret it as a complementary evidence in favour of our instrument.[6]

Insert table 3 here

3.2 The different household members.

As we can see from Table 4, households are composed of people with various links to the household head. 43.62% of individuals in our sample live in non-nuclear families. The number of households that match the picture in Figure 1 is in fact quite small. Only 14.4% of the households have two children and live in a household that is only composed of the parents and their children.[7]

[6]Obviously, if households aim at having two girls instead of two boys, we obtain the same predicted number of children. This table nonetheless shows that the data are consistent with the assumption that households aim at having two children of a certain gender while we could not find any anthropological argument to support the "two girls hypothesis".

[7]This proportion drops to 10.2% in the whole sample survey, including households without any birth.

Insert table 4 here

In the appendix, we show how the composition of households correlates with some of their characteristics. Table A.1 displays the evolution of household average composition through the life-cycle of its head. The size of the household is relatively constant, it varies from 4.49 (youngest heads) to 5.78 (50-60 years old). The number of births increase: the 20% youngest heads have on average 2.3 children and the oldest have 4.6.[8] Globally, households composition changes as follows: when the head gets older, he/she lives with (i) less of his children, parents, siblings and siblings-in-law and (ii) more of his grand-children and children-in-law. All-in-all, the average number of people in the household barely changes and remains close to the average of 5.22 people in all five categories. Note that despite an increase in the number of births as heads get older, the number of children in the household actually follows an inverted-u shape relationship. In Table A.2, we display how the household composition evolves with the number of births from the head. The average number of children living in the household increases by less than one with an additional birth. Couples that have few children are (i) more likely to live with their parents, siblings, nephew and nieces, or other relatives, they are (ii) less likely to live with their spouse, grand-children and children-in-law. In Table 5, the composition of the households is divided between households with a first born girl or boy. The table confirms that households with a first born girl tend to have more children, 3.79 on average against 3.4 if the first born is a boy. However those with a first born boy tend to host more children-in-law and grand-children. This is consistent with the Nepalese patriarchal habits. The daughters tend to leave the household while sons stay longer, potentially with their wife and first children.

Insert figure 5 here

3.3 Additional summary statistics.

The covariates used in the regressions are summarised in Table 6. A household head is on average 39 years old, and four times out of five, a male. The average age of mothers is 35, but this is an underestimation since mothers

[8]The next columns show the average number of the member type in the age category. For instance, the households of the heads that are less than 30 years old include on average 0.7 spouse, 2.13 children, 0 grand-child, 0.23 parents, etc.

older than 49 do not respond to the maternity file. Polygyny is rare with only 1% of households having a head with two spouses. Nepali households are on average quite poor with a thin asset ownership as well as low income and consumption expenditures[9]. We also provide the share of the households living in the Terai or in the Hills. Less than 8% of our sample comes from the Mountains. Note that all regressions include ward fixed effects and therefore control for all variables that are constant at the ward level.

4 Number of children and household size

We first look at the effect of the total number of children on household size and show that, on average, the net effect is barely positive. As we explained above, we use the gender of the first born child as an instrument for the total number of children. Presumably, the effect will depend on the mother's age. We observe that households with more children host less non-nuclear relatives and do not host more nuclear relatives in the long run. The replacement effect is nonetheless not instantaneous. An additional birth first increases the household size and decreases it only after some time. To capture this effect, we include the mother's age and the interaction between the mother's age and the number of births in our regressions.[10] We estimate equation (1), where the dependent variable y_{itw} has a value for each household i at time t in ward w and is given by: whether the household is composed of nuclear relatives only (Table 7) ; the number of household members (Table 8) ; the number of nuclear members (Table 9) ; the number of extended family members (Table 10). Our main variables of interest are: K_{itw}, the number of children of the household's head ; A_{itw}, the mother's age and $K_{itw} * A_{itw}$, the interaction between both variables. $\mathbf{X}$ is a vector of control variables presented in Table 6 with associated parameter vector $\mathbf{\Phi}$. Regressions also include time and ward fixed effects. We cluster the standard errors at the

[9]Consumption expenditures do include food monetary expenses, a valuation of home consumption, infrequent expenditures, health related expenses and housing expenses (rent, water, electricity, garbage, communication, fuel). It does not include the purchase of productive inputs nor of durable assets. Income is the sum of all wage incomes from permanent and casual employment, income from self-employed activities, in agriculture or outside, including a market price valuation of home consumption, capital income and transfers received.

[10]Results are qualitatively similar if we run separate estimations by mother's age intervals.

ward level.[11]

$$y_{itw} = \beta_1 K_{itw} + \beta_2 A_{itw} + \beta_3 K_{itw} * A_{itw} + \mathbf{X_{itw}} \mathbf{\Phi} + \alpha_w + \delta_t + \varepsilon_{itw} \quad (1)$$

4.1 The gender of the first born instruments the number of children.

In Tables 7 to 10, we estimate the effect of one additional child on household structure. We use four dependent variables: (i) the probability to observe a nuclear household, (ii) the size of the household, equal to the number of household members, (iii) the number of nuclear members, where we only count the head, his spouse(s) and their children, and (iv) the number of other members, that is the household size minus the number of nuclear members. In the four tables we first present ordinary least squares regressions, and then two stage least square regressions. We control for some household characteristics that may also affect the household structure as well as for productive assets owned by the households. Household characteristics are head's gender, a dummy identifying polygynous households, ethnicity dummies as well as head's age and its square and mother's age. The last two covariates aim at capturing generational effects. Productive assets include the amount of land and the number of cows owned, the average education level among the adults of the household, and a binary variable equal to one if the household owns a non-agricultural business. All regressions also include time and ward (village) fixed effects. The standard errors are clustered at the ward level. On top of a direct effect of age on the household structure - which is captured by the controls mentioned above, the number of children might have a heterogeneous effect on household structure across time. Therefore, we add an interaction term between the mother's age and the number of children. That interaction is instrumented by the interaction between the mother's age and the gender of her first born child. Notice that our results are unaffected by the inclusion of the age of the first born among the controls. In Table 7, according to the 2SLS estimates, having one more child decreases the probability of hosting extended family members by 6%. In column (7), we see that the negative effect of an additional child becomes stronger with time.

[11] All our regressions with instruments are estimated using *xtivreg2,* developed in Schaffer (2012).

The older the mother is at the time of the survey, the lower is the probability that she hosts non-nuclear family if she had more children, as shown on the first column of figure 4, which presents the estimated marginal effect of an additional child on the probability to observe a nuclear household in function of mother's age.

Insert figure 4 here

Table 8 shows that on average, having one more child leads to households having 0.34 more members (column 3). The positive effect is weaker (stronger) for older (younger) mothers. This average positive effect is driven by the number of nuclear members who increases by around 0.59 for each additional birth (Table 9, column 3). Conform to the intuition, the number of nuclear members do increase more when the mother is young as depicted in Table 9. On the other side, an additional birth decreases the average number of non-nuclear members by 0.25 member (see Table 10). This effect is clearly driven by households with older mothers. For instance, households host 0.57 less other members when mothers are 40 years old. The second column of figure 4 and figure 5 respectively summarize these effects for household size and household composition.

Insert figure 5 here

Our result contributes to the understanding of household splits. By decomposing effects across relations to the head, we see that the positive effect on household size effectively comes from an increase in the number of head's children living with their parents. This is counter-balanced by a decrease in daughters-in-law and grand children hosted by the household, as shown in table A.6 and A.7 as well as figure 6. Larger offspring implies earlier household splits. In his study of a Tamang village, Fricke (1986) notice that split decisions (and consequently the moment at which men take their inheritance) are highly strategic. *"A Tamang male (...) is constantly weighing the happiness of his wife in a home where she has no power, the size of his family and the potential for his inheritance to grow from the continued acquisitions of his father and brothers."(p143)*

As we emphasised in the introduction, the literature assumes a mechanical link between the number of children and the households' income per capita. By increasing the number of capita, but without contributing substantially to the income, additional children are expected to impoverish the households. In this section, we have however shown the lack of effect of additional children on household size. The expected mechanism does not materialise because the arrival of a new nuclear-members in the household is compensated by a similar reduction in the number of other members.

Consequently, new births also affect the adult/children ratio in the households. As shown in Table 11, an additional birth increases the number of children in the household. On the other hand, it decreases the number of adults in the household as we can see in Table 12 and in figure A.2. This change in the household composition is crucial to assessing the links between fertility and poverty. It is usually accepted that a child consumes less than an adult. And therefore, an additional birth could either increase or decrease the household's consumption per head, depending on the importance of the gains in consumption versus the potential loss in income. We turn to that question in the next two sections.

5 Number of children and household's income and consumption.

Policies aiming at reducing fertility implicitly assume that additional births decrease household per capita income. Indeed, if additional children do not contribute substantively to the household's income, but increase the number of people in the household, they must decrease the per capita income. We estimate the correlation between the number of children and the household income and consumption. To take into account changes in the composition of the household (more children and less adults), we also use the *OECD - modified scale* to adjust the household size. That scale assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child.

Our regressions are similar to those presented in the previous section and we use the same instrument. We test the correlation between the household income and the number of children in Tables 13 and 15. We test the correlation between the household consumption and the number of children in Tables 14 and 16. The four tables have the same structure. The first three columns show OLS regressions of (i) the dependent variable (the logarithm of the household income or consumption) (ii) the dependent variable divided by the household size and (iii) the dependent variables divided by the adjusted household size. The next columns show the first and second stages of 2SLS estimations of the same variables. Tables 15 and 16 differ from Tables 13 and 14 ; they include an interaction term between the mother's age and the number of children.

As we can see in column (1) of Table 13, there is a positive correlation between the number of children and households income. This positive correlation vanishes when the number of children is instrumented. In IV estimations, there is no indication of a positive correlation, and if something comes out, it is negative. The number of children however has a significant negative effect on the household per capita income (and adjusted per capita income), reflecting the effect of the additional births on the household's size.

Based on results of the previous section, conclusions have to adapted with respect to mother's age since household composition is highly dependant on mother's age and number of births. Having more children increases the number of nuclear members when the mother is young. As time passes, mothers who had more children host less other relatives and their household size declines.

As expected from our results about the evolution of the household size, the coefficient of "# children" is negative but the interaction with the mother's age has a positive coefficient. We again note the absence of significant correlation between the number of children and the household's income (column 6). There is neither any significant correlation between the number of children and the household's income per capita when it is adjusted with the equivalence scale (column 8). Looking only at the household's income per capita, both variables have statistically significant coefficients. The youngest mother in our sample is 17 years old. The interacted coefficient (Mother's age*# children) therefore becomes $17 * 0.02 = 0.34$ for the youngest mother. The Wald test fails to reject the hypothesis that the coefficient of "# children" is equal to -0.34. Hence, we cannot reject the hypothesis that the effect of the number of children on the household income per capita is null.

In Tables 14 and 16 we repeat the same analysis but with the household consumption instead of the household income. Results are similar. We find a significant and negative effect (Table 14) that dissipates when we take into account the mother's age (Table 16). Again, at the 0.05 rejection level, we cannot reject the hypothesis that the coefficients of "# children" and "Mother's age*# children" cancel out (the most demanding Wald test is when the Mother's age equals seventeen, the youngest mother, leading to valid conclusions for the the older mothers as well).

6 Estimating a poverty-neutral equivalence scale.

Instead of using a standard equivalence scale as we did in the previous section, we now estimate the equivalence scale that is such that an additional birth on average leaves the income per capita constant. Consider a household with income I. It had B births, and is composed of N people: C children and A adults. The adjusted number of people in the household is equal to $M = A + xC$ where x is the scale parameter that we are looking for. The effect of an additional child on the household's adjusted income per capita is given by:

$$\left(\frac{I}{M}\right)' = \frac{I'M - IM'}{M^2} \tag{2}$$

We look for x such that $\left(\frac{I}{M}\right)' > 0$, that is:

$$\frac{I'\left(A + xC\right) - I\left(A + xC\right)'}{\left(A + xC\right)^2} > 0 \tag{3}$$

Which can be written as:

$$\begin{cases} x > \frac{IA' - I'A}{CI' - C'I} & \text{if} \quad CI' > C'I \\ x < \frac{IA' - I'A}{CI' - C'I} & \text{otherwise} \end{cases} \tag{4}$$

The mean number of adults, children and the mean incomes in the sample are: $I = 193$, $A = 2.71$ and $C = 2.51$. Without interaction with the mother's age, the estimated coefficients are: $A' = -0.205$, $C' = 0.534$ and $(lnI)' = -0.04 \Leftrightarrow I' = I(lnI' = -0.04 * 193 = -7.72$. On average, an additional birth leads to an increase in the adjusted household's income per capita if $x < 0.34$. Note that this is very close to the standard equivalence scales. In other words, if a child consumes less than a third of what an adult consumes, then the negative effect of an additional birth on the household's income is more than compensated by the reduction in the number of adult members, and the income per capita increases.

7 Results in perspectives.

In this section we discuss alternative channels which might explain our results and we show that our story is robust.

First, sex ratio at birth are stable across birth ranks and remain close to 108 boys for 100 girls. This is consistent with medical wisdom and means that systematic under-reporting of girls, and therefore of total number of births, is not an issue in our data. Under girl under-reporting, households with fewer children would have relatively less girls, less nuclear members and relatively more non-nuclear members. This, by itself, could explain our results but is clearly ruled out by basic descriptive statistics on the sex of the first born across birth ranks. On top of that, our results hold when we use the number of children alive instead of the number of births. It rules channel going through gender biased infant mortality rate. It advocates in favour of other mechanisms explaining the difference between OLS and IV estimates.

Second, a more salient source of bias comes from the absence of future young mothers who have not yet given birth. Their absence in our sample drives the effect of additional births on the departure of non-nuclear members down except if we think that some non-nuclear members would join the household at the first birth. A more realistic mechanism is the devolution of headship at the arrival of the first born boy. Under this mechanism, the birth of a boy would transform the head and spouse in parents, the father into a head, former head's children into siblings of the new head, the mother into head's spouse, ... The birth of a girl would only add a grand-daughter in the household while leaving the rest of household structure unchanged. We do not however find any significant relationship between the sex ratio of the first born and the age of the head nor with the age of the head's spouse. At the opposite of the age spectrum, the absence of old mothers goes in favour of our conclusions if the trend that we observe before 50 years of age stabilizes or even continues. It means that the average household size would be even less affected by the number of children.

Third, to check that our results are not driven by the order of the gender-birth sequence, we provide additional tables where we repeat the same analysis but using the gender of the second child as an instrument for the number of consecutive births. In Tables A.3 to A.5, we only consider heads who have at least 2 children. We control for the gender of the first child. We instrument the number of additional children by the gender of the second child. This process allows us to check that the results are not driven directly by the gender of the first child by relaxing the exclusion restriction on the first born. It could indeed be argued that the first boy, who is the heir, is specific and that his gender could play a direct role on how the parents compose their household. This strategy also allow us to control for the gender composition among older siblings, and eventually for the birth spacing between the first and the second born. The results are robust over these Tables and consistent with our findings so far: an additional child increases the number of nuclear members but decreases the number of other members by a similar amount and the household size barely changes[12].

In conclusion, our instrumental variable approach shows that additional children increase the number of nuclear members but decrease the number of non-nuclear members. This is especially true when head's children become older, leading to their departure and to the absence of the head's daughters-in-law and grandchildren in large sibship. The direction of the OLS bias with respect to IV estimates indicates that household size has a positive feedback effect on the number of children. This can be explained by a preference for large households in households with more members or by scale economies in larger household decreasing the cost of child bearing.

8 Conclusion

Analysing data from around eight thousand households surveyed in the Nepal Living Standard Surveys, we find little correlation between the number of children of a couple and their household's total income and per capita income. To avoid endogeneity biases, we use the gender of the first born child as an instrument for the total number of children.

If the household's total income and per-capita income are barely independent from the number of children, it must be that the number of children barely affects the number of people in the household. That is precisely what we have shown and explained. The more children a couple has and the fewer other people they will host, leaving the household size almost constant. Nepalese households are embedded into larger social networks and those households with fewer children tend to host more other people.

The regressions paint a very clear picture, an additional child increases the number of nuclear family members but decrease the number of other hosts

[12]Note that using the sex of the first two born as instrument for the number of children yields qualitatively similar conclusions

by a similar amount, leaving the household's size unchanged over household life cycle.

This result has important policy implications. In particular, it predicts that population control policies should not be expected to have a large impact on poverty levels.

The argument relies on uncoordinated and independent fertility decisions between households. It should be clear that if all households have fewer children, and the population size decreases, the average size of the households must decrease (or the number of households must decrease). In this case, the usual presumption that fewer children will translate into higher incomes per capita may be true. More precisely, if the average size of households does not grow with the number of children that people have, an increase in population size should be expected to increase the number of households rather than the size of each household. This could have important consequences in terms of poverty and environmental impact.

Numerous goods are public at the household level, from the primary consumption goods such as a common roof or heating, to more complex products such as insurance arrangements. It follows that increasing the number of households rather than the average size of households should result in a lower consumption per capita that could not be captured in our study. Similarly, public bads and pollution are prominent at the household rather than individual level. As Axinn and Ghimire (2011) argue, households rather than people determine for instance land use and deforestation. These important questions could not be answered here.

We also estimate the consumption equivalence scale that leaves the household's consumption per capita unaffected by an additional birth. According to our estimates, if a child consumes less than what an adult consumes, then the negative effect of an additional birth on the household's income is more than compensated by the reduction in the number of adult members, and the income per capita increases.

Finally, the changes in income in Nepal over the last decade are impressive. They are not due to changes in fertility and the underlying forces that greatly reduced poverty therefore remain to be explained.

References

Axinn, W. G. and Ghimire, D. J. (2011). Social organization, population, and land use. *American Journal of Sociology*, 117(1):209–258.

Becker, G. S., Duesenberry, J. S., and Okun, B. (1960). An economic analysis of fertility. In *Demographic and Economic Change in Developed Countries*, pages 225–256. Columbia University Press.

CBS (2011a). Nepal living standards survey household 2010-2011. Statistical Report Vol. 1, Nepal Central Bureau of Statistics.

CBS (2011b). Nepal living standards survey household 2010-2011. Statistical Report Vol. 2, Nepal Central Bureau of Statistics.

Childs, G. (2001). Demographic dimensions of an intervillage land dispute in nubri, nepal. *American Anthropologist*, 103(4):1096–1113.

Chowdhury, M. K. and Bairagi, R. (1990). Son preference and fertility in bangladesh. *Population and Development Review*, 16(4):749–757.

Clark, S. (2000). Son preference and sex composition of children: Evidence from india. *Demography*, 37(1):95–108.

Cox, D., Fafchamps, M., Schultz, T. P., and Strauss, J. A. (2007). Chapter 58 extended family and kinship networks: Economic insights and evolutionary directions. In *Handbook of Development Economics*, volume Volume 4, pages 3711–3784. Elsevier.

Dreze, J. and Murthi, M. (2001). Fertility, education, and development: Evidence from india. *Population and Development Review*, 27(1):33–63.

Fricke, T. E. (1986). *Himalayan households: Tamang demography and domestic processes*. UMI Research Press.

Gudbrandsen, N. H. (2013). Female autonomy and fertility in nepal. *South Asia Economic Journal*, 14(1):157–173.

Hatlebakk, M. (2007). LSMS data quality in maoist influenced areas of Nepal. CMI Working Paper WP 2007: 6.

Hatlebakk, M. (2012). Son-preference, number of children, education and occupational choice in rural nepal. *CMI Working Paper*, 8.

Kramer, K. L. (2010). Cooperative breeding and its significance to the demographic success of humans. *Annual Review of Anthropology*, 39(1):417–436.

Kremer, M. (1993). Population growth and technological change: One million B.C. to 1990. *The Quarterly Journal of Economics*, 108(3):681–716.

Lee, J. (2008). Sibling size and investment in children's education: An asian instrument. *Journal of Population Economics*, 21(4):855–875.

Malthus, T. R. (1798). *An Essay on the Principle of Population, as it affects the future Improvement of Society, with Remarks on the Speculations of Mr. Godwin, M. Condorcet, and Other Writers.* J. Johnson, London, 1st edition.

Milazzo, A. (2012). Son preference, fertility, and family structure. evidence from reproductive behavior among nigerian women. Bocconi University.

Onesto, L. (2005). *Dispatches from the People's War in Nepal.* Pluto P.

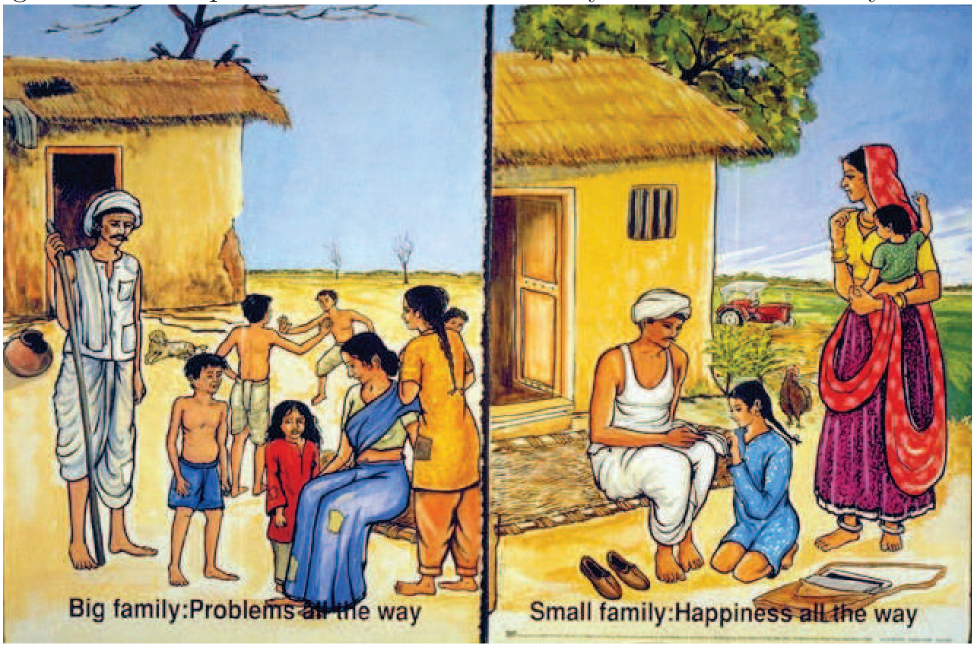
Rosenzweig, M. R. and Wolpin, K. I. (2000). Natural "Natural experiments" in economics. *Journal of Economic Literature*, 38(4):827–874.

Schaffer, M. E. (2012). Xtivreg2: Stata module to perform extended iv/2sls, gmm and ac/hac, liml and k-class regression for panel data models. *Boston College Department of Economics, Statistical Software Components*, S456501.

Schultz, T. P., Schultz, T. P., and Strauss, J. A. (2007). Chapter 52 population policies, fertility, women's human capital, and child quality. In *Handbook of Development Economics*, volume 4, pages 3249–3303. Elsevier.

Valente, C. (2013). Access to abortion, investments in neonatal health, and sex-selection: Evidence from nepal. *Journal of Development Economics*, Forthcoming.

Figure 1: A 1992 poster from the India Ministry of Health and Family Welfare



credit: courtesy of the Media/Materials Clearinghouse at the Johns Hopkins University, Bloomberg School of Public Health, Center for Communication Programs.

Figure 2: Number of children and incomes in the household

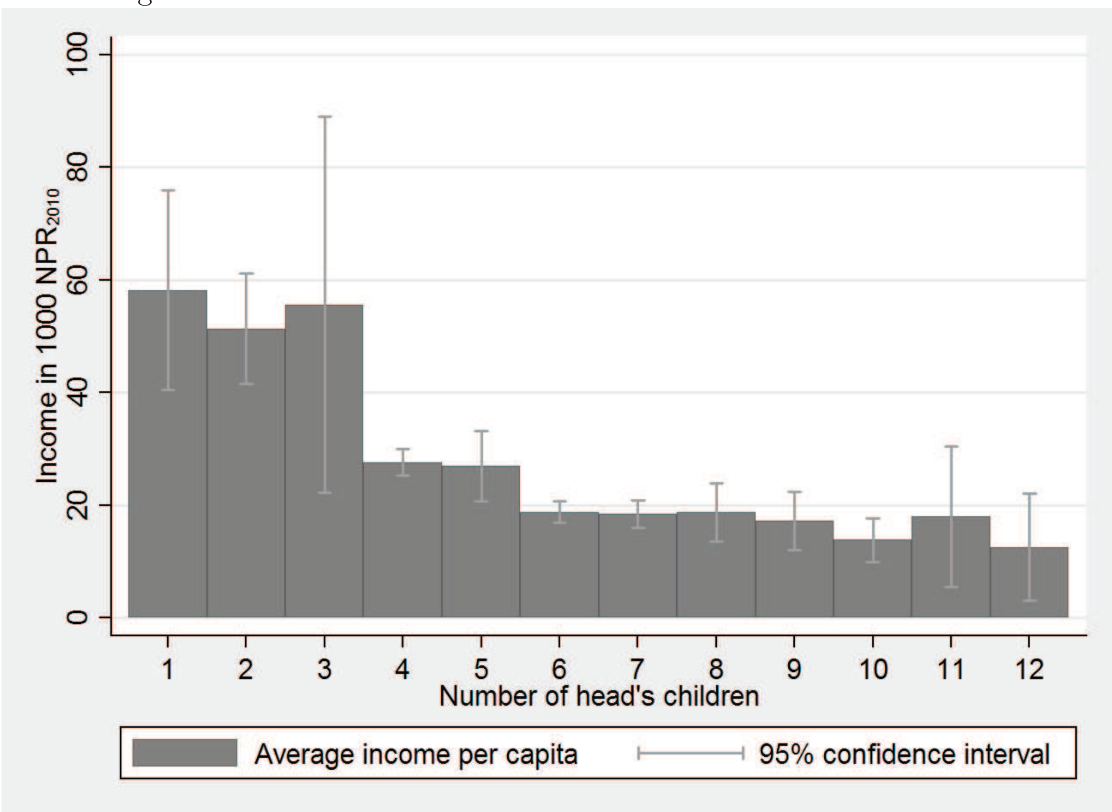


Figure 3: Distribution of households by number of births and gender of the first born

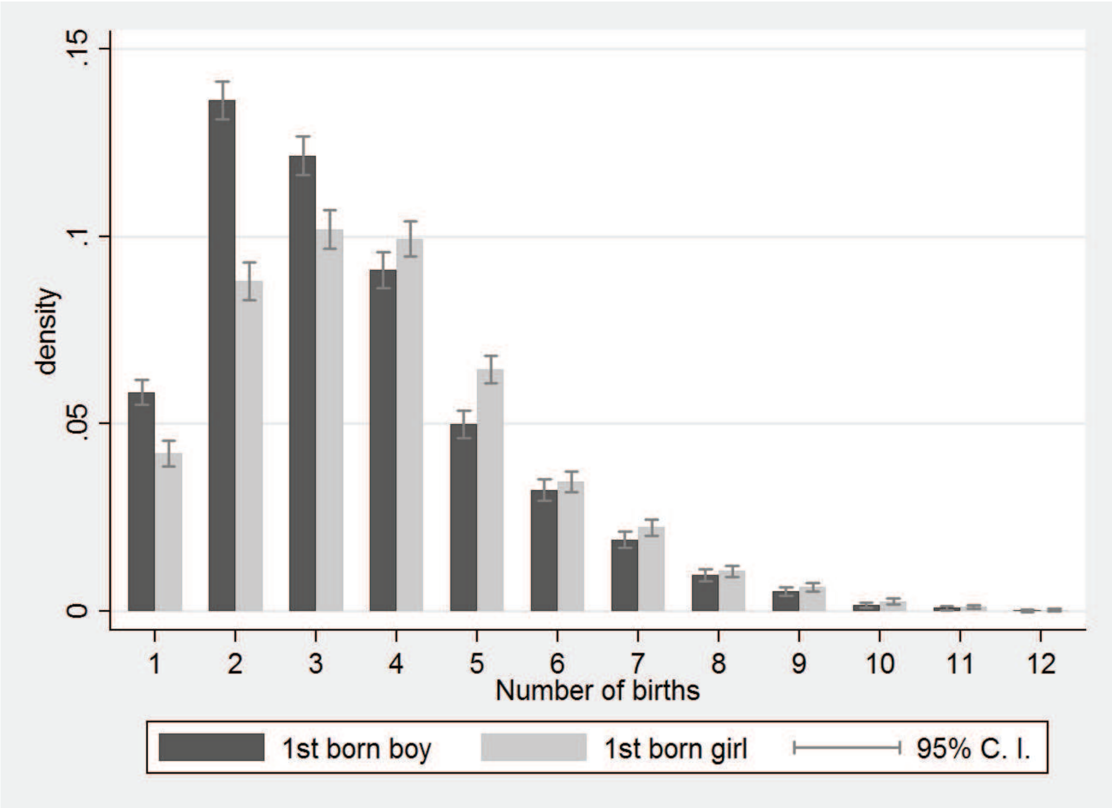


Figure 4: Marginal effect of an additional birth on household size and form

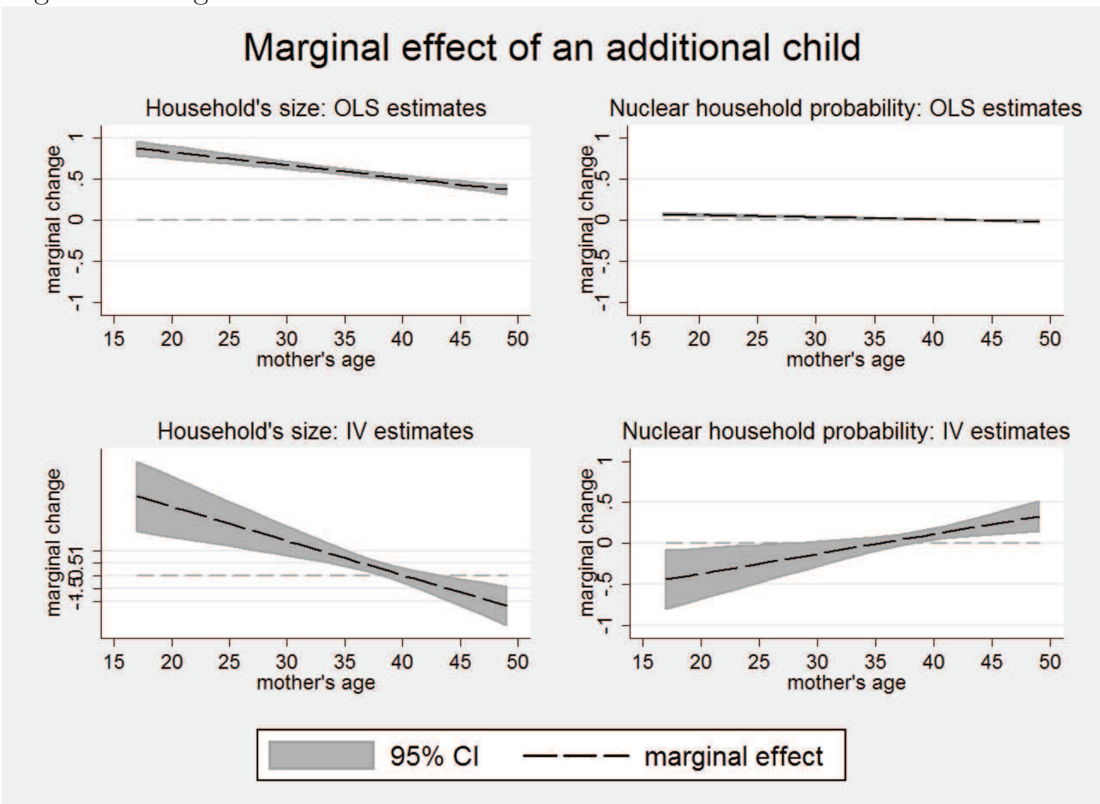


Figure 5: Marginal effect of an additional birth on household composition

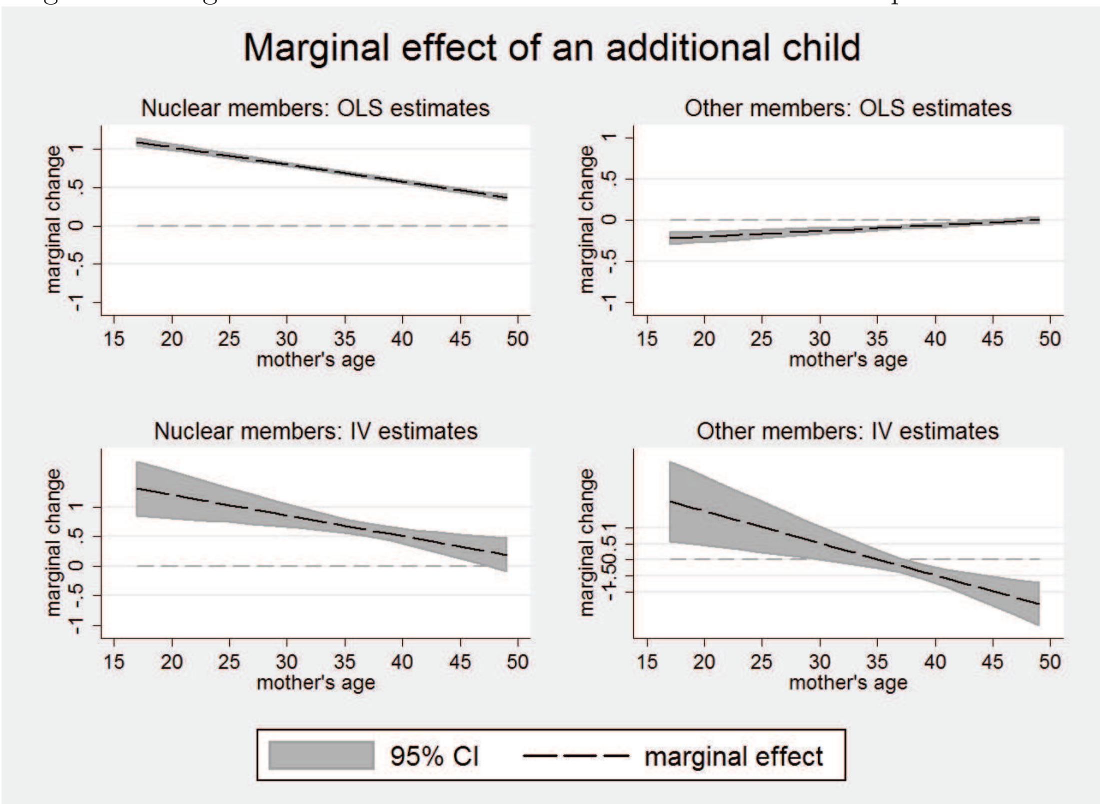


Figure 6: Marginal effect of an additional birth on children-in-law and grand children

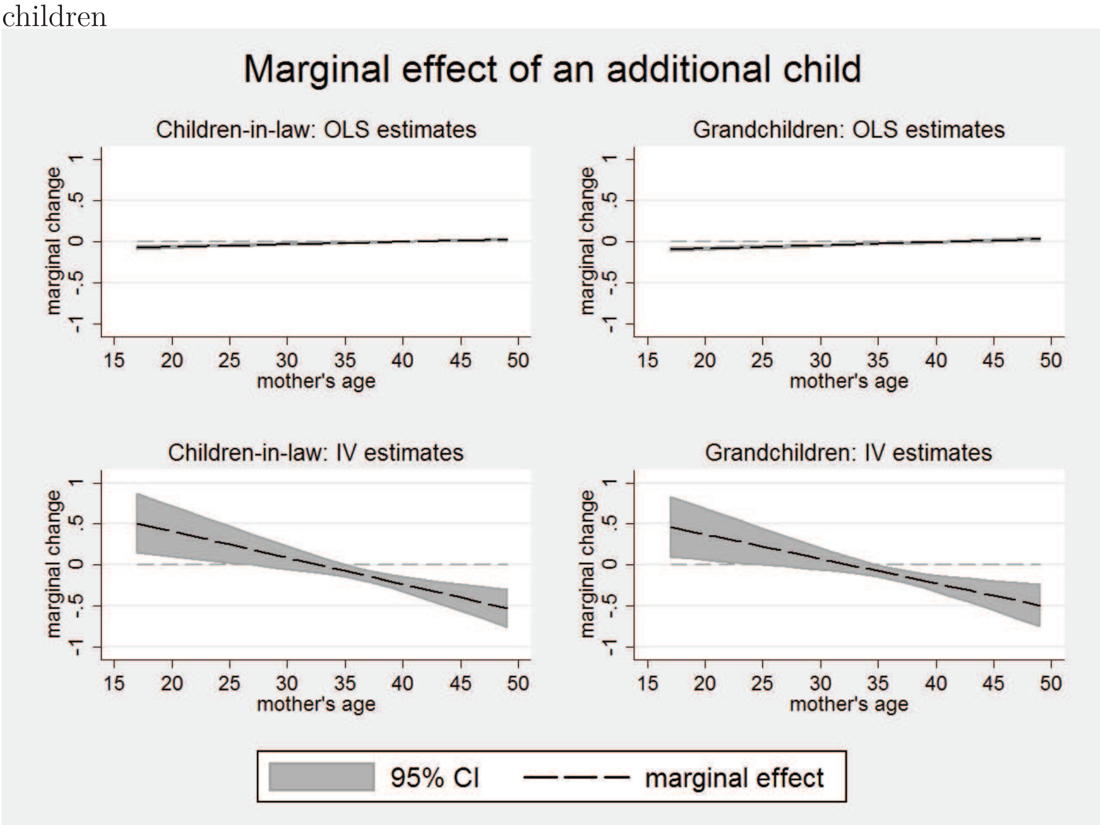


Table 1: Income per capita (NPR_{2010})

Variable	Survey	Mean	Std. Dev.	Median	25% <	25% >	Observations
Income per capita (NPR_{2010})	T1	19 696	41 839	12 888	8 556	21 295	2090
	T2	28 602***	141 046	16 026	10 149	27 015	2494
	T3	61 554***	542 409	25 838	15 210	47 286	3594
Income (NPR_{2010})	T1	101 275	138 469	72 114	43 753	118 072	2090
	T2	133 681**	563 154	79 589	51 556	137 172	2494
	T3	287 367**	3 236 167	121 081	72 003	209 480	3594
Household size	T1	5.71	2.42	5	4	7	2105
	T2	5.29***	2.12	5	4	6	2503
	T3	4.89***	1.97	5	4	6	3610
Head's number of children	T1	4.00	2.03	4	3	5	2105
	T2	3.65***	1.91	3	2	5	2503
	T3	3.30***	1.70	3	2	4	3610

*S*tatistical significance of the difference in means between periods: * p<0.1, ** p<0.05, *** p<0.01.

Table 2: The gender of the first born and the distribution of consecutive children

Gender of the first born	Mean # children	25%	50%	75%	100%
Girl	3.8	2	4	5	12
Boy	3.4	2	3	4	12

*T*he difference in means is statistically significant at the 99% level of confidence.

Table 3: Expected and realised number of children

# Children	Expected distribution $(n-1)(0.5)^n$	Real distribution in the sample	
	%	%	frequency
2	25.00	22.40	1842
3	25.00	22.33	1835
4	18.75	19.03	1564
5	12.50	11.44	940
6	7.81	6.69	550
7	4.69	4.15	341
8	2.73	2.03	167
9	1.56	1.18	97
10	0.88	0.43	35
11	0.49	0.21	17
12	0.27	0.05	4

Table 4: Frequency of different household members

Relation to the head	Frequency	(%)
Head	8218	19.14
Spouse	6746	15.71
Child	21984	51.21
Grand-child	1065	2.48
Father/Mother	1460	3.40
Sibling	726	1.69
Nephew/Niece	601	1.40
Child-in-law	1068	2.49
Sibling-in-law	238	0.55
Parent-in-law	293	0.68
Other Relative	375	0.87
Servant	126	0.29
Tenant	1	0.002
Other	29	0.07
Total	42930	
Prop. living in nuclear hh.		56.34
Prop. of nuclear hh.		65.33

Table 5: The gender of the first born and the composition of the households

	# Hh.	Pr(nuclear hh.)	Size of Hh.	# Birth	Spouse	Child	Grand-child
First born boy	4322	0.64 **	5.17**	3.40***	0.82	2.57***	0.16 ***
First born girl	3896	0.67	5.28	3.79	0.82	2.80	0.09
All sample	8218	0.65	5.22	3.58	0.82	2.68	0.13

# Children	Parents	Siblings	Nephew/niece	Child-in-law	Sibling-in-law	Parent-in-law	Others
First born boy	0.17*	0.08	0.07	0.17***	0.03	0.03	0.07
First born girl	0.19	0.09	0.08	0.09	0.03	0.04	0.06
All sample	0.18	0.09	0.07	0.13	0.03	0.04	0.06

*S*tatistical significance of the difference in means: * p<0.1, ** p<0.05, *** p<0.01.

Table 6: Summary statistics of the main covariates

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Male head	0.78	0.42	0	1	8218
Age of head	39.05	9.1	18	80	8218
Mother's age	35	7.67	17	49	8218
# spouses	0.79	0.43	0	2	8218
Household's size	5.22	2.16	1	29	8218
1st born girl	0.47	0.5	0	1	8218
# children	3.58	1.87	1	12	8218
Land owned (Ha.)	0.53	1.14	0	29	8218
Cows owned	2.09	2.52	0	22	8218
Avg. adult education	3.88	3.74	0	17	8218
Non-farm business	0.32	0.47	0	1	8218
Household's income (1000 NPR_{2010})	192.94	2170.37	0.235	181274	8178
Frequent consumption (1000 NPR_{2010})	107.79	75.42	5.63	1309.94	8218
Rural	0.70	0.46	0	1	8218
Hills	0.51	0.5	0	1	8218
Terai	0.41	0.49	0	1	8218
Survey 2	0.3	0.46	0	1	8218
Survey 3	0.44	0.5	0	1	8218

Table 7: Number of births and probability to observe a purely nuclear household

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	2SLS-1st stage	2SLS-2d stage	OLS	2SLS-1st stage	2SLS-1st stage	2SLS-2d stage
# children	0.01***		0.06**	0.12***			-0.82***
	(3.52)		(2.14)	(6.80)			(-2.67)
Age mother				-0.00***			0.02***
*nb. children				(-6.17)			(2.93)
1st born girl		0.42***			-0.19	-16.16***	
		(12.59)			(-1.28)	(-2.71)	
Age mother					0.02***	0.92***	
*1st born girl					(3.92)	(4.86)	
Mother's age	-0.01***	0.10***	-0.02***	-0.00	0.09***	6.94***	-0.10***
	(-6.40)	(17.66)	(-4.67)	(-0.54)	(15.49)	(29.96)	(-3.51)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.07	0.33	0.05	0.08	0.33	0.53	-0.45
K-P statistics			158.60				12.00

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 8: Number of bitrhs and household size

	(1) OLS	(2) 2SLS-1st stage	(3) 2SLS-2d stage	(4) OLS	(5) 2SLS-1st stage	(6) 2SLS-1st stage	(7) 2SLS-2d stage
# children	0.54***		0.34***	1.14***			5.28***
	(31.55)		(3.60)	(14.55)			(4.43)
Age mother				-0.02***			-0.13***
*nb. children				(-7.81)			(-4.19)
1st born girl		0.42***			-0.19	-16.16***	
*1st born girl		(12.59)			(-1.28)	(-2.71)	
Age mother					0.02***	0.92***	
					(3.92)	(4.86)	
Mother's age	-0.04***	0.10***	-0.02	0.02*	0.09***	6.94***	0.46***
	(-5.94)	(17.66)	(-1.61)	(1.76)	(15.49)	(29.96)	(3.98)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.35	0.33	0.33	0.36	0.33	0.53	-0.21
K-P statistics			158.60				12.00

t statistics in parentheses. The standard errors are clustered at the ward level. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 9: Number of births and nuclear members

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	2SLS-1st stage	2SLS-2d stage	OLS	2SLS-1st stage	2SLS-1st stage	2SLS-2d stage
# children	0.61***		0.59***	1.47***			1.85***
	(53.06)		(10.43)	(34.57)			(4.58)
Age mother				-0.02***			-0.03***
*nb. children				(-19.78)			(-3.11)
1st born girl		0.42***			-0.19	-16.16***	
		(12.59)			(-1.28)	(-2.71)	
Age mother					0.02***	0.92***	
*1st born girl					(3.92)	(4.86)	
Mother's age	-0.07***	0.10***	-0.06***	0.01**	0.09***	6.94***	0.06
	(-16.18)	(17.66)	(-9.26)	(2.50)	(15.49)	(29.96)	(1.44)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.53	0.33	0.53	0.57	0.33	0.53	0.56
K-P statistics			158.60				12.00

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 10: Number of births and non-nuclear members

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	2SLS-1st stage	2SLS-2d stage	OLS	2SLS-1st stage	2SLS-1st stage	2SLS-2d stage
# children	-0.07***		-0.25***	-0.33***			3.43***
	(-5.77)		(-3.18)	(-5.41)			(3.21)
Age mother *nb. children				0.01***			-0.10***
				(4.46)			(-3.49)
1st born girl		0.42***			-0.19	-16.16***	
		(12.59)			(-1.28)	(-2.71)	
Age mother *1st born girl					0.02***	0.92***	
					(3.92)	(4.86)	
Mother's age	0.03***	0.10***	0.04***	0.00	0.09***	6.94***	0.40***
	(4.99)	(17.66)	(4.31)	(0.37)	(15.49)	(29.96)	(3.93)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.13	0.33	0.10	0.13	0.33	0.53	-0.78
K-P statistics			158.60				12.00

t statistics in parentheses. The standard errors are clustered at the ward level. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 11: Number of births and children members

	(1) OLS	(2) 2SLS-1st stage	(3) 2SLS-2d stage	(4) OLS	(5) 2SLS-1st stage	(6) 2SLS-1st stage	(7) 2SLS-2d stage
# children	0.50***		0.52***	1.41***			3.81***
	(41.27)		(8.27)	(27.91)			(5.57)
Age mother				-0.02***			-0.09***
*nb. children				(-18.58)			(-4.85)
1st born girl		0.42***			-0.19	-16.16***	
		(12.59)			(-1.28)	(-2.71)	
Age mother					0.02***	0.92***	
*1st born girl					(3.92)	(4.86)	
Mother's age	-0.09***	0.10***	-0.09***	-0.01	0.09***	6.94***	0.22***
	(-21.10)	(17.66)	(-12.12)	(-1.44)	(15.49)	(29.96)	(3.36)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.36	0.33	0.36	0.40	0.33	0.53	0.07
rkf			158.60				12.00

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 12: Number of births and number of adult members ($\geq$ 16 years)

	(1) OLS	(2) 2SLS-1st stage	(3) 2SLS-2d stage	(4) OLS	(5) 2SLS-1st stage	(6) 2SLS-1st stage	(7) 2SLS-2d stage
# children	0.04***		-0.18***	-0.27***			1.47**
	(3.95)		(-2.76)	(-5.86)			(2.15)
Age mother				0.01***			-0.04**
*nb. children				(6.74)			(-2.45)
1st born girl		0.42***			-0.19	-16.16***	
		(12.59)			(-1.28)	(-2.71)	
Age mother					0.02***	0.92***	
*1st born girl					(3.92)	(4.86)	
Mother's age	0.05***	0.10***	0.08***	0.02***	0.09***	6.94***	0.23***
	(12.02)	(17.66)	(9.08)	(4.23)	(15.49)	(29.96)	(3.57)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.33	0.33	0.27	0.33	0.33	0.53	0.03
rkf			158.60				12.00

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 13: Number of births and household income

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS 1st stage	(5) 2SLS 2nd stage	(6) 2SLS 2nd stage	(7) 2SLS 2nd stage
	Income (ln)	Inc./cap. (ln)	Inc./cap. adj. (ln)	# Birth	Income (ln)	Inc./cap. (ln)	Inc./cap. adj. (ln)
# children	0.03***	-0.08***	-0.04***		-0.04	-0.12***	-0.08**
	(4.82)	(-13.41)	(-6.48)		(-0.95)	(-3.11)	(-2.03)
1st born girl				0.43***			
				(12.51)			
Mother's age	0.01***	0.02***	0.01***	0.10***	0.02***	0.02***	0.01***
	(3.40)	(6.97)	(4.02)	(17.52)	(3.32)	(4.95)	(3.20)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8178	8178	8178	8177	8177	8177	8177
r2	0.19	0.15	0.13	0.33	0.18	0.15	0.13
K-P statistics					156.39	156.39	156.39

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include mother's age, head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 14: Number of births and household consumption

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS 1st stage	(5) 2SLS 2nd stage	(6) 2SLS 2nd stage	(7) 2SLS 2nd stage
	Consumption (ln)	Cons./cap. (ln)	Cons./cap. adj. (ln)	# Birth	Consumption (ln)	Cons./cap. (ln)	Cons./cap. adj. (ln)
# children	0.04***	-0.06***	-0.02***		-0.02	-0.10***	-0.05***
	(12.87)	(-18.20)	(-6.52)		(-0.73)	(-4.57)	(-2.69)
1st born girl				0.42***			
				(12.59)			
Mother's age	0.00**	0.01***	0.00***	0.10***	0.01***	0.02***	0.01***
	(2.10)	(9.08)	(3.43)	(17.66)	(3.45)	(6.56)	(3.38)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8218	8218	8217	8217	8217	8217
r2	0.33	0.23	0.20	0.33	0.29	0.22	0.19
K-P statistics					158.60	158.60	158.60

t statistics in parentheses. The standard errors are clustered at the ward level. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

All regressions include ward and time fixed effects.

Hh. controls include mother's age, head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 15: Number of births and household income ; interaction with mother's age

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS 1st stage	(5) 2SLS 1st stage	(6) 2SLS 2nd stage	(7) 2SLS 2nd stage	(8) 2SLS 2nd stage
	Income (ln)	Inc./cap. (ln)	Inc./cap. adj. (ln)	# Birth	# BirthXage	Income (ln)	Inc./cap. (ln)	Inc./cap. adj. (ln)
# children	0.06**	-0.19***	-0.07***			0.01	-0.90**	-0.63
	(2.36)	(-7.57)	(-3.02)			(0.03)	(-2.24)	(-1.63)
Mother's age	-0.00	0.00***	0.00			-0.00	0.02**	0.01
*nb. children	(-1.23)	(4.45)	(1.51)			(-0.14)	(1.98)	(1.47)
Mother's age				0.02***	0.90***			
*1st born girl				(3.79)	(4.72)			
1st born girl				-0.17	-15.42**			
				(-1.16)	(-2.57)			
Mother's age	0.01***	0.01**	0.01**	0.09***	6.94***	0.02	-0.05	-0.04
	(3.32)	(2.35)	(2.05)	(15.38)	(29.76)	(0.58)	(-1.40)	(-1.08)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8178	8178	8178	8177	8177	8177	8177	8177
r2	0.19	0.16	0.14	0.33	0.53	0.18	0.07	0.08
K-P statistics						11.67	11.67	11.67

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include mother's age, head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table 16: Number of births and household consumption ; interaction with mother's age

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS 1st stage	(5) 2SLS 1st stage	(6) 2SLS 2nd stage	(7) 2SLS 2nd stage	(8) 2SLS 2nd stage
	Cons. (ln)	Cons./cap. (ln)	Cons./cap. adj. (ln)	# Birth	# BirthXage	Cons. (ln)	Cons./cap. (ln)	Cons./cap. adj. (ln)
# children	0.13***	-0.11***	0.00			0.11	-0.81***	-0.54**
	(9.20)	(-7.62)	(0.27)			(0.54)	(-3.45)	(-2.54)
Mother's age	-0.00***	0.00***	-0.00*			-0.00	0.02***	0.01**
*nb. children	(-6.32)	(3.48)	(-1.82)			(-0.64)	(3.14)	(2.37)
1st born girl				-0.19	-16.16***			
				(-1.28)	(-2.71)			
Mother's age				0.02***	0.92***			
*1st born girl				(3.92)	(4.86)			
Mother's age	0.01***	0.01***	0.01***	0.09***	6.94***	0.02	-0.05**	-0.04**
	(5.55)	(4.17)	(3.66)	(15.49)	(29.96)	(1.15)	(-2.45)	(-2.02)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8218	8218	8217	8217	8217	8217	8217
r2	0.33	0.23	0.20	0.33	0.53	0.29	-0.04	0.01
K-P statistics						12.00	12.00	12.00

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include mother's age, head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

A APPENDIX

Table A.1: The age of the household's head and the composition of the households

Head's age	# Households	Pr.(nuclear hh.)	Size of Hh.	# Births	Spouse	Child	Grand-child
< 31	1627	0.66	4.49	2.32	0.70	2.13	0.00
$31 \leq . \leq 40$	3197	0.71	5.24	3.45	0.79	2.88	0.02
$41 \leq . \leq 50$	2574	0.61	5.50	4.24	0.87	2.77	0.24
$51 \leq . \leq 60$	742	0.54	5.76	4.56	1.01	2.69	0.46
$61 \leq$	78	0.67	5.42	4.58	1.00	2.56	0.42
All sample	8218	0.65	5.22	3.58	0.82	2.68	0.13

Head's age	Parents	Siblings	Nephew/niece	Child-in-law	Sibling-in-law	Parent-in-law	Others
< 31	0.23	0.18	0.06	0.01	0.04	0.06	0.07
$31 \leq . \leq 40$	0.20	0.09	0.09	0.05	0.03	0.04	0.06
$41 \leq . \leq 50$	0.15	0.05	0.08	0.23	0.03	0.02	0.07
$51 \leq . \leq 60$	0.10	0.03	0.02	0.36	0.02	0.01	0.06
$61 \leq$	0.01	0.00	0.10	0.26	0.00	0.00	0.06
All sample	0.18	0.09	0.07	0.13	0.03	0.04	0.06

Table A.2: The number of births and the composition of the households

# Children	# Households	Pr.(nuclear hh.)	Size of Hh.	Spouse	Child	Grand-child
1	826	0.62	3.57	0.79	0.98	0.02
2	1842	0.68	4.19	0.78	1.79	0.05
3	1835	0.68	4.91	0.80	2.45	0.10
4	1564	0.65	5.66	0.84	3.07	0.17
5	940	0.63	6.18	0.86	3.50	0.19
6	1211	0.62	7.10	0.89	4.36	0.28
All sample	8218	0.65	5.22	0.82	2.68	0.13

# Children	Parents	Siblings	Nephew/niece	Child-in-law	Sibling-in-law	Parent-in-law	Others
1	0.23	0.21	0.09	0.03	0.05	0.05	0.10
2	0.18	0.11	0.07	0.06	0.03	0.04	0.09
3	0.17	0.08	0.07	0.10	0.03	0.04	0.06
4	0.20	0.06	0.07	0.16	0.02	0.03	0.05
5	0.17	0.06	0.11	0.18	0.02	0.04	0.06
6	0.14	0.04	0.05	0.27	0.01	0.02	0.04
All sample	0.18	0.09	0.07	0.13	0.03	0.04	0.06

Table A.3: Number of births and household composition - second born

	(1)OLS	(2)OLS	(3)OLS	(4)2SLS 1st stage	(5)2SLS 2d stage	(6)2SLS 2d stage	(7)2SLS 2d stage
	Hh. size	Nucl. mb.	Non-nucl. mb.	# children	Hh. size	Nucl. mb.	Non-nucl. mb.
# children	0.53***	0.59***	-0.06***		0.32***	0.65***	-0.33***
	(28.09)	(45.78)	(-4.22)		(2.97)	(9.86)	(-3.59)
1st born girl	-0.10**	-0.01	-0.09**	0.43***	-0.01	-0.03	0.03
	(-2.24)	(-0.27)	(-2.52)	(12.78)	(-0.11)	(-0.93)	(0.57)
2nd born girl				0.37***			
				(10.92)			
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7392	7392	7392	7388	7388	7388	7388
r2	0.33	0.48	0.13	0.31	0.31	0.48	0.07
K-P statistics					119.27	119.27	119.27

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include mother's age, head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table A.4: Number of births and household income - second born

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS 1st stage	(5) 2SLS 2nd stage	(6) 2SLS 2nd stage	(7) 2SLS 2nd stage
	Income (ln)	Inc./cap. (ln)	Inc./cap. adj. (ln)	# Birth	Income (ln)	Inc./cap. (ln)	Inc./cap. adj. (ln)
# children	0.02***	-0.07***	-0.04***		-0.04	-0.12**	-0.07
	(3.97)	(-11.74)	(-6.10)		(-0.81)	(-2.47)	(-1.43)
2nd born girl				0.37***			
				(10.89)			
1st born girl	-0.02	-0.01	-0.01	0.43***	0.00	0.01	0.00
	(-1.41)	(-0.79)	(-0.70)	(12.65)	(0.09)	(0.18)	(0.03)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7358	7358	7358	7354	7354	7354	7354
r2	0.19	0.16	0.14	0.31	0.18	0.15	0.13
K-P statistics					118.51	118.51	118.51

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include mother's age, head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table A.5: Number of births and household consumption - second born

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS 1st stage	(5) 2SLS 2nd stage	(6) 2SLS 2nd stage	(7) 2SLS 2nd stage
	Consumption (ln)	Cons./cap. (ln)	Cons./cap. adj. (ln)	# Birth	Consumption (ln)	Cons./cap. (ln)	Cons./cap. adj. (ln)
# children	0.04***	-0.06***	-0.02***		0.02	-0.06**	-0.01
	(10.29)	(-16.76)	(-7.21)		(0.86)	(-2.36)	(-0.34)
1st born girl	-0.02**	-0.01	-0.01	0.43***	-0.02	-0.01	-0.02
	(-2.55)	(-1.32)	(-1.23)	(12.78)	(-1.25)	(-0.94)	(-1.35)
2nd born girl				0.37***			
				(10.92)			
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7392	7392	7392	7388	7388	7388	7388
r2	0.33	0.25	0.21	0.31	0.32	0.25	0.21
rkf					119.27	119.27	119.27

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include mother's age, head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table A.6: Number of births and children-in-law

	(1) OLS	(2) 2SLS-1st stage	(3) 2SLS-2d stage	(4) OLS	(5) 2SLS-1st stage	(6) 2SLS-1st stage	(7) 2SLS-2d stage
# children	-0.00		-0.16***	-0.12***			1.06***
	(-1.24)		(-6.78)	(-7.56)			(3.14)
Age mother				0.00***			-0.03***
*nb. children				(7.00)			(-3.55)
1st born girl		0.42***			-0.21	-16.56***	
		(12.53)			(-1.40)	(-2.77)	
Age mother					0.02***	0.93***	
*1st boorn girl					(4.03)	(4.92)	
Mother's age	0.02***	0.10***	0.03***	0.01***	0.09***	6.93***	0.15***
	(11.06)	(17.58)	(10.24)	(2.84)	(15.40)	(29.80)	(4.35)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.14	0.33	-0.19	0.15	0.33	0.53	-1.63
rkf			157.09				10.98

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table A.7: Number of births and grandchildren

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	2SLS-1st stage	2SLS-2d stage	OLS	2SLS-1st stage	2SLS-1st stage	2SLS-2d stage
# children	-0.01**		-0.16***	-0.16***			0.97***
	(-2.14)		(-5.40)	(-7.65)			(2.76)
Age mother				0.00***			-0.03***
*nb. children				(6.57)			(-3.09)
1st born girl		0.42***			-0.21	-16.56***	
		(12.53)			(-1.40)	(-2.77)	
Age mother					0.02***	0.93***	
*1st born girl					(4.03)	(4.92)	
Mother's age	0.02***	0.10***	0.04***	0.01***	0.09***	6.93***	0.14***
	(11.12)	(17.58)	(9.82)	(3.38)	(15.40)	(29.80)	(3.89)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.12	0.33	-0.04	0.13	0.33	0.53	-0.76
rkf			157.09				10.98

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table A.8: Number of births and Parents and parents-in-law

	(1) OLS	(2) 2SLS-1st stage	(3) 2SLS-2d stage	(4) OLS	(5) 2SLS-1st stage	(6) 2SLS-1st stage	(7) 2SLS-2d stage
# children	-0.01***		0.04	-0.01			0.29
	(-3.94)		(1.59)	(-0.38)			(1.08)
Age mother				-0.00			-0.01
*nb. children				(-0.42)			(-0.97)
1st born girl		0.42***			-0.21	-16.56***	
		(12.53)			(-1.40)	(-2.77)	
Age mother					0.02***	0.93***	
*1st born girl					(4.03)	(4.92)	
Mother's age	-0.00	0.10***	-0.01**	-0.00	0.09***	6.93***	0.02
	(-0.97)	(17.58)	(-2.30)	(-0.37)	(15.40)	(29.80)	(0.72)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.10	0.33	0.07	0.10	0.33	0.53	0.05
rkf			157.09				10.98

t statistics in parentheses. The standard errors are clustered at the ward level. * p<0.1, ** p<0.05, *** p<0.01

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Table A.9: Number of births and Other relatives

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	2SLS-1st stage	2SLS-2d stage	OLS	2SLS-1st stage	2SLS-1st stage	2SLS-2d stage
# children	-0.04***		0.03	-0.06			1.10**
	(-5.15)		(0.53)	(-1.53)			(1.97)
Age mother				0.00			-0.03**
*nb. children				(0.62)			(-2.03)
1st born girl		0.42***			-0.21	-16.56***	
		(12.53)			(-1.40)	(-2.77)	
Age mother					0.02***	0.93***	
*1st born girl					(4.03)	(4.92)	
Mother's age	-0.01***	0.10***	-0.02**	-0.01**	0.09***	6.93***	0.09*
	(-2.76)	(17.58)	(-2.42)	(-2.31)	(15.40)	(29.80)	(1.80)
Hh characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hh. assets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8218	8217	8217	8218	8217	8217	8217
r2	0.09	0.33	0.08	0.09	0.33	0.53	-0.07
rkf			157.09				10.98

t statistics in parentheses. The standard errors are clustered at the ward level. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

All regressions include ward and time fixed effects.

Hh. controls include head's age and its square, head's spouses number, head's ethnicity and households productive assets

Productive assets include land and cows owned, average education of adult members and a dummy for the ownership of a non-farm business.

Figure A.1: The process behind the number of children

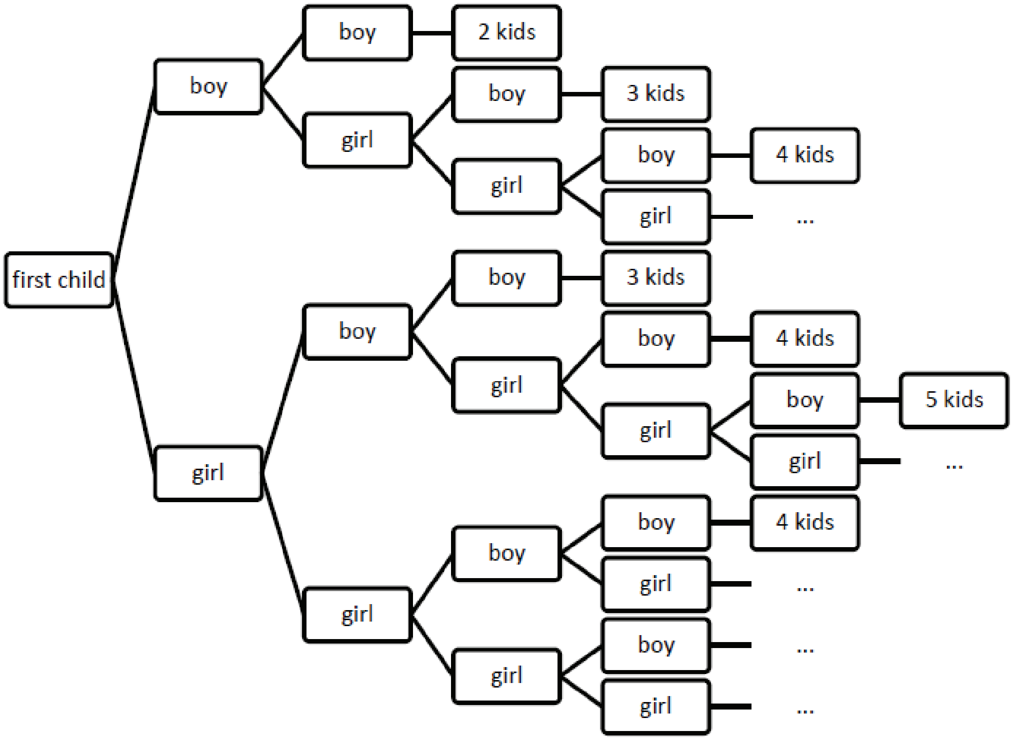


Figure A.2: Marginal effect of an additional birth on household age composition

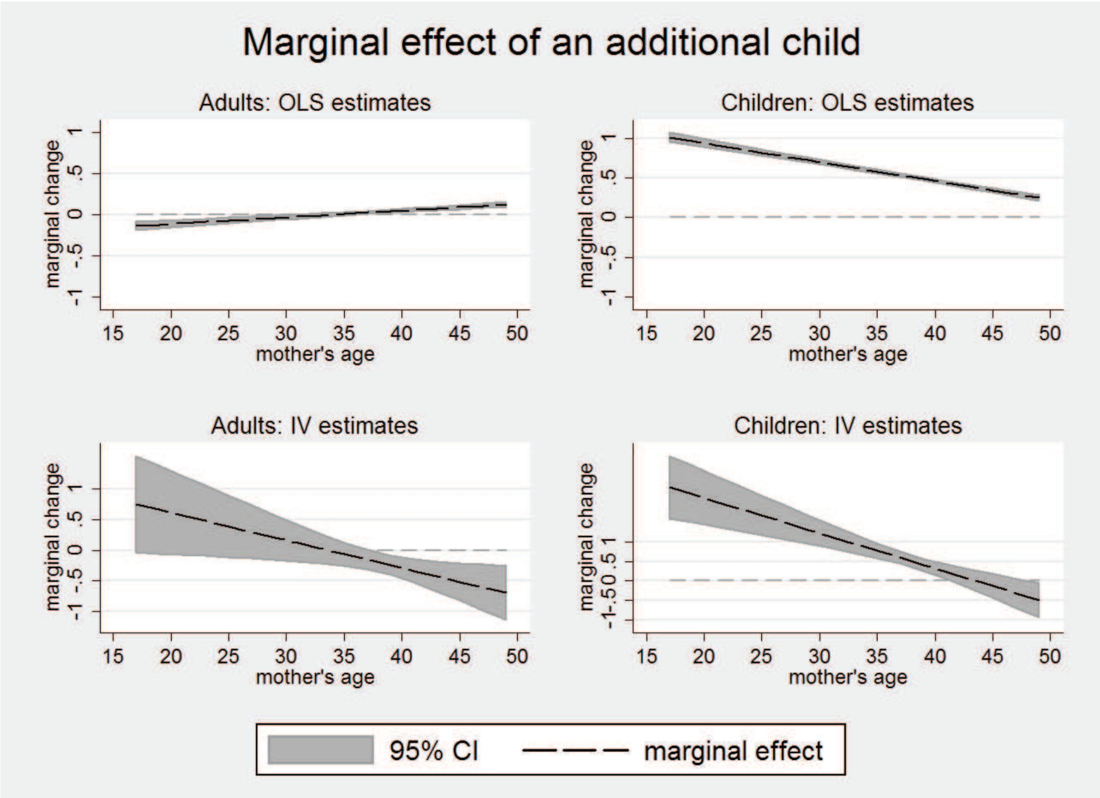


Figure A.3: Marginal effect of an additional birth on parents and other relatives presence