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Female Autonomy and Fertility in Nepal*

by

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Abstract: We explore the effect of female autonomy on individual fertility in Nepal. We find that families where wives have high level of autonomy get fewer children than other families. Using gender of the first child as a natural experiment, we also find that son preferences are present in Nepal. Moreover, the results indicate that women have more influence when the first born is a boy, compared to when the first child is a girl. We discuss policy implications with respect to the problem of excess children due to son preference.

JEL-classification: D19, J13, O12
Keywords: Fertility, empowerment of women, son preference

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1. Introduction

Most developing countries are experiencing decreasing fertility and are now managing a previously high population growth. But the population is still growing rapidly in some parts of the world, and in particular in South- and East-Asia the fall in fertility has led to a new problem where a widespread son preference leads to a noticeable gender bias in the population. This is explained by the use of new technology, such as ultrasound, and sex-selective abortion (Arnold, Kishor and Roy 2002). Amartya Sen was among the first to address the issue of an excess of boys in his article "More Than 100 Million Women Are Missing" (Sen 1990).

Sex-selective abortion is not as common in Nepal as in India, but as fertility rates decline it may become a problem as son preference appears to exist in Nepal as well, see for example Koolwal (2007). In the present paper we investigate whether son-preference interacts with female autonomy to determine fertility rates. If this is the case then empowerment of women may help Nepal to avoid the gender bias that we observe in neighboring states of India. During the last fifteen years, Nepal has had a reduction in the fertility rate from about five children per women to below three according to the latest figures (Ministry of Health and Population [Nepal] (2007a) and UNFPA 2010). However, Nepal is still following the "normal" pattern with 105 boys born per 100 females, while in India and China, 108 and 120 boys are born per 100 girls respectively (UNFPA 2010).

Nepal is a patriarchal society, where most household decisions are made by the male household head, and where some traditional families still get many children. At the same time we see a decline in fertility in more modern families, where women have more influence on fertility choices and other household decisions. As for example Mason (1987) and Eswaran (2002) argue, empowerment of women may lead to lower fertility rates as women face higher costs of children than men.

When speaking of female autonomy, we use the term as a description of relative power-structures within the household, that is, to what degree the female household-member (in this case, the wife or female partner) is included in household decision-making. Thus, we are following the definition in similar literature (see for example Anderson and Eswaran (2009) and Morgan et al (2002)).

The aim of this paper is to investigate to what degree number of children is linked with level of female autonomy in Nepalese families. We also seek to investigate if preference for boys is present within Nepalese families. Son-preference is measured indirectly by use of a natural experiment where we investigate whether the gender of the first child affects the total number of children. Then we investigate whether this effect vary with the degree of female autonomy. We test these hypotheses using data from the Demographic and Health Survey (DHS) from 2006.

The following section gives background information on fertility in Nepal, section 3 presents the theoretical framework, while the empirical methodology is discussed in section 4. The data is presented in section 5, before the results are presented in section 6 and conclusions and final comments in section 7.

2. Background

In the developing world, fertility rates are rapidly declining as described by the Total Fertility Rate (TFR)[1] in Table 1. The decline is dramatic in most parts of the world, and may have widespread consequences for the labor market, the education level, technology of production and migration.

Table 1 about here

Nepal is ranked as 144 out of 182 countries in the last Human Development Index,[2] making it the poorest country in South Asia. About one third of the Nepali population lives below the poverty line (Bhatta and Sharma 2006), and there are large differences between rich and poor. But the economy has experienced growth during the last 20 years, which in turn has led to decreasing poverty, while inequality has increased (Hatlebakk 2008). Nepal has had a high fertility rate, but has experienced a remarkable decline in recent years, a drop from 4.6 in 1996 to 3.1 in 2006 according to the DHS (Ministry of Health and Population 2007a). The decline seems to continue according to more recent figures (UNFPA 2010 and World Bank 2010).

Nepal is an agricultural society with 85 percent of its 29 million population living in the countryside. The country is divided into three ecological zones, the Himalayan Mountains in the north, the flat terai belt in the south and the hills clustered in the middle. Most people live in the terai and the hills, with approximately equal shares, while some 1.5 million live in the mountains. Administratively, the country is divided into five regions, far-western, mid-western, western, central and eastern, with most people living in the two eastern regions.

Nepal is an ethnically diverse country, with The Hindu caste system as a central part of the social, economic and political division. In addition there are many ethnic groups, many of whom have their own language, and there are some religious minorities. The caste groups account for approximately 57 percent of the population, the ethnic groups 37 percent and the Muslims, the largest religious minority, four percent. Even though the ethnic groups and the Muslims are not strictly part of the caste system, they are still part of the hierarchical social system based on caste. As well as being divided by caste, there are also differences within groups, based on geography.

The system is highly complex and, and fertility-differentials across castes and ethnical groups can have multiple origins. As Gurung (2006) shows, high castes is ranked high on

most social indicators, including education, wealth, access to electricity and running water, and in holding government positions and other higher-status positions. The Dalits ("untouchables") and Muslims are typically in the other end of the scale. There are differences between the different ethnical groups as well, to some degree based on geographical division (Gurung 2006). Not controlling for these factors is likely to give results that are difficult to interpret. It is not our intention to give an extensive introduction to the caste system, but we categorize the population into the main castes and ethnic groups, which will be control variables in the empirical analysis.

Table 2 shows the respondents' ideal number of children[3] in the 1996 and 2006 DHS. A majority of Nepalese women regard two children as the optimal number, and that view has changed somewhat during the ten years between the two surveys. However, the fertility rate has declined more than the desired number of children, indicating that the increased availability of contraception has been an important facilitator of the decline, as is also suggested by Karki and Krishna (2008).

Table 2 about here

Preferences for sons relative to daughters are apparent in Nepal (Leone, Matthews and Zuanna 2003, Koolwal 2007 and Brunson 2010). When daughters get married, they are regarded as a member of the in-laws' family rather than their own parents' family. This means that they will not contribute towards old-age security or help out in their family's home after they are married. Daughters are also expected to bring dowry into their marriage, making them a monetary expense for the family. Furthermore, only sons can, according to tradition, perform the rituals at their father's funeral.[4] This is regarded as highly important in many families. It should be noted, that this tradition may be stronger in some groups that other, as it

is a Hindu tradition. Brunson (2010), however, claims through interviews that this tradition may be less important for young women today that for their mother's in law.

3. Theoretical Framework

The classical theory of population dynamics is the "Essay on the Principle of Population" by Thomas Malthus (1798). In the Malthusian model income per capita will stay at the subsistence level and population growth is limited by food production. The food production, according to Malthus, could only grow at an arithmetic rate, while population will potentially grow at a geometric rate. History has so far proved food production to be more able to keep up with population growth than his theory suggests, but Malthus's view on how the world is or is becoming "overpopulated" has gained some momentum as a consequence of the recent climate crisis and energy shortage.[5]

From the 1950s, economists started to develop theories to better understand how household choices affect population, using concepts from microeconomics to explain variation in fertility. Analyzing family behavior within a traditional economic model of utility-maximizing is largely influenced by the work of Gary S. Becker. His most important contribution to the economics of the family is his models that focus on a trade-off between the quantity of children and the quality of each child.[6] In short, the quality-quantity theory is based on an assumption that families face a trade-off between the quantity of children, that is, how many children they want, and the quality of the children, that is, how much they want to invest in each of them. In the present paper we investigate the role of female autonomy on this trade-off.

Eswaran (2002) analyzes the effect of female autonomy on fertility. Using a Nash bargaining model and the fact that the wife has a higher cost than the husband in getting and raising children, he shows that an increase in female autonomy will cause the family to get

fewer children and invest more in each child. The result is independent of whether female autonomy is represented by the bargaining power, or the threat point, in the Nash bargaining model.

Sociologist Karen O. Mason (1987) also analyzes the relationship between intra-household power structures and fertility in developing countries. Similar to Eswaran she concludes that female autonomy is inversely related to fertility. Firstly, she argues that early marriage can be associated with high fertility, and female autonomy is likely to decrease the importance of early marriage. Concerning contraception usage, female autonomy can make the wife's voice in fertility-related issues stronger and encourage "innovative behavior, such as using modern contraceptives" (Mason 1987: 738). This second point obviously rests on the assumption that women have a desire for fewer children than men. Furthermore, the opportunity cost of children increases if more autonomous females are more likely to get education and well paid jobs. Lastly, if gender equality in the *society* is improved, then men's concern for women's well-being is improved as well. This could reduce fertility, again conditional on the demand for children differing between genders (Mason 1987). Both Dyson and Moore (1983) and Morgan et al. (2002) find that female autonomy is indeed negatively related to fertility behavior in South- and South-East Asia.

We estimate a reduced form equation where number of children ever born is regressed on a number of independent variables that reflects the theoretical models discussed here, including an interaction effect between female autonomy and son preference, as well as other control variables used in the empirical literature, e.g. Nguyen-Dihn (1990), Zhang (1990) and Hondroyiannis (2004).

4. Empirical Methodology

A major challenge is that number of children, the dependent variable, is an integer-valued variable that is not normally distributed. Traditionally, this is assumed to make the Ordinary Least Squares (OLS) estimator biased (Wooldridge 2006 and Winkelmann and Zimmermann 1994). The Poisson Regression model is specifically designed to deal with such data, and is therefore applied in analyses of fertility (Greene 1997). However, as we shall see in the empirical section, the OLS model is a good approximation to the Poisson model, and we report both for comparison. The OLS model assumes a linear relationship between the variables on the form:

$$Y = \alpha + \boldsymbol{\beta x} + \boldsymbol{u} \qquad (1)$$

where Y is the number of children, α is a constant, $\boldsymbol{\beta x}$ are vectors of explanatory variables and their coefficients, and $\boldsymbol{u}$ is the unknown error term, expected to be normally distributed around a zero mean. The Poisson model assumes that the data follow a Poisson distribution. The probability that a variable Y takes on a certain integer value y is given by:

$$Pr(Y_i = y) = \frac{e^{-\lambda_i}\lambda_i^n}{n!} \qquad (2)$$

where λ is the expected value, and also the variance, of the dependent variable. This is a problematic assumption, and is often regarded as incorrect for demographic data (Winkelmann and Zimmermann 1994). Furthermore, for the Poisson distribution to hold there has to be independence between events. Any event has to be independent of whether or when other events take place. If independence of events is present and the Poisson distribution is correct, then the variance and the mean of the dependent variable are the same (equidispersion). If events are positively correlated, the variance will exceed the mean (overdispersion), if they are negatively correlated, the mean will be smaller (underdispersion) (Nguyen-Dinh 1997).

Since the dependent variable is a count variable, the OLS normality assumption may not hold, as the right tail of the distribution, which is due to a large number of children in some families, may not be explained by the observables and thus must be due to a non-normal distribution of the error term. The Poisson equidispersion assumption, on the other hand, is also problematic, but Rodriguez and Cleland (1988) argue that the Poisson model has good properties when using births as the dependent variable, and Winkelmann and Zimmermann (1994) hold the Poisson model as superior to the OLS model for demographic count variables. As mentioned, the Poisson and OLS results are quite similar in our case, and we will focus on the OLS findings below.

The R-squared in the OLS analysis is between 0.42 and 0.50 (Table 3), indicating that around half of the variations in fertility can be explained by the variables in the model. The Poisson pseudo R-squared is not reported in the STATA survey command that we apply, so regressions without the survey command have been done to check the pseudo R-squared. This gives a McFadden pseudo R-squared of 0.18. The pseudo R-squared may not necessarily correspond to the OLS R-squared, but the low McFadden R-squared may indicate that the Poisson model is inferior to the OLS. A chi-squared test gives some indication that the Poisson distribution might be correct, and a Negative Binomial Regression indicates equidispersion.[7] There are no sign that the Negative Binomial Model should be preferred over the Poisson; in fact, since equidispersion is present the Negative Binomial *is* an ordinary Poisson regression, and gives equal coefficients and standard errors.

We run four regressions, three OLS and one Poisson. In the first regression (OLS), all respondents who have at least one child (the dependent variable is larger or equal to one) are included together with a dummy for the gender of the first child. In the second OLS model, we include the interaction term, where the effect of female autonomy conditional on the gender of the first child is tested, with the same sample as in the first model. In the third

(OLS) and fourth (Poisson) models, the sample is reduced to only include respondents with at least two children, and the gender-dummies indicate whether the two first born children are two boys, two girls or one of each.

Although we also present the Poisson results, we focus on the OLS results for a number of reasons. First a large R-squared indicates that the model fits quite well. Second the Poisson results can be challenging to interpret, while the OLS results have straight forward interpretations. Third the results are quite similar, so the discussion is not greatly affected by the choice of model. Finally the assumptions behind the Poisson model seem too strong, especially those regarding independent events. As Nguyen-Dinh (1997) points out there is correlation between previous and succeeding births, although not systematic. He estimates the correlation between births by doing a regression analysis with number of births in previous age intervals as independent variables. Births are, according to his findings, positively correlated for women younger than 34, but negatively correlated for older respondents.

The sample for the 2006 Nepal DHS is based on a two-stage stratified design. At the first stage, the country is divided into 13 strata[8]. The strata are based on the five administrative regions and the three ecological zones that divide the country east-west and north-south respectively. However, the far-western, mid-western and western mountain-regions are combined due to low population in the north-western area. 260 clusters or primary sampling units (PSUs) are selected (178 in rural and 82 in urban area), with the probability of being selected corresponding to the population size.[9] Sample weights are applied to correct for oversampling of urban respondents. The survey-command in STATA gives robust standard errors, account for independent sampling of PSUs for each stratum, and control for intra-cluster correlation.

5. Data

We have data for 10 793 women of age 15-49 in 8 707 households from the Nepal DHS, 2006. This includes information on the respondents' health, family relations, household characteristics, education, occupation, births, children's health and other questions related to socioeconomic status, health and demography. Even though some men are also interviewed, we only use information from the female respondents. The variables concerning husbands are thus based on information from the wife in the family. Excluded from the dataset are respondents who have no children, as well as respondents defined as "not de jure residents of the household" i.e. not real members of the household. The dependent variable is the total number of children surviving to the age of five.

The measure of female autonomy is based on the variable "Final say on visits to family and relatives". The different answers, "respondent alone", "respondent and husband/partner", "someone else" and "husband/partner alone" are coded as dummy variables. "Respondent alone" is regarded as the highest level of female autonomy, "husband/partner alone" the lowest, while the two other groups are not ranked. We expect the mother-in-law to be influential in the cases where the response is "someone else". The husband and his family have considerable power over the wife in the traditional Nepalese family, so a wife having the last say in such decisions, may also have a higher level of bargaining power in other respects. We therefore argue that it is a reasonable indicator of female influence in intra-household power relations. As a measure of traditions and family values, we have constructed a dummy variable that takes on the value 1 for respondents who have had or have more than 5 siblings. If significantly positive, coming from a large family increases the chance that the respondent has a large family herself.

The importance of son preference is measured indirectly by the influence of the gender of the first (two) born child (ren) on the total number of children. The gender of the first born

children serves as a natural experiment for testing the preference for boys[10]. If families get more children when their first born child is a daughter, compared to getting a boy first, preferences for boys is present. Interaction effects between the gender of the first born child and female autonomy are also included. In addition, we include other control variables, such as education, household wealth[11], caste and ethnicity, electricity, geography, and an indicator for a family planning program.

For the respondents (women), education is reported with a single dummy variable, taking the value one if the respondent has any education *or* was able to read a certain sentence in the questionnaire at the time of the interview. For the husbands, two education variables are included, secondary education and higher education. Ethnicity is divided into the following groups, hill origin high castes, other hill origin groups (Dalits and ethnic groups), terai Dalits, terai middle castes, terai ethnic groups and Muslims.

The family planning variable, labeled FPAN in Table 3, equals one if the household lives in a district where the Family Planning Association of Nepal (FPAN) had 6 or more family planning projects in 2008. FPAN is the largest and oldest family planning NGO in Nepal, contributing to 25-30 percent of all family planning projects in the country.

6. Results

First we note that there is a significant son preference, if the first born is a girl then people get more children. Second we find fewer children in families where the wife has more influence. However, the level of the wife's influence depends on the gender of the first child. If the first born is a girl, then families where the wife or someone else (presumably the mother in law) has the final say get significantly fewer children. Stated differently, the families where the husband *does not* have the final say get fewer children than families where the husband does have a say. If the first born is a boy, on the other hand, then the wife has more say in fertility

decisions, only families where the husband has the final say get significantly more children. This indicates that in families where they have secured a male child they are more relaxed, and can allow the wife's preference for fewer children to influence the fertility decisions.

Table 3 about here

We also find that traditions matter, the dummy for coming from a large family is positive and significant. This indicates that norms and traditions affect choices, hardly a controversial statement. We also find that organized programs for family planning appear to have a positive effect, as the FPAN variable is significant. That it is insignificant in the model with the largest sample is reasonable as family planning programs should have more visible effect among families who have given birth to more children (few family planning programs advice parent to get fewer than two children).

Next we find that the terai ethnic groups, as well as the terai Dalits, get as few children as the hill origin high castes. It is expected that the hill origin high castes get few children, but we did not expect that the higher castes in the terai get more children than the Terai Dalits and ethnic groups. Muslims get more children than any of the other groups, which is also an expected result. Morgan et al. (2002), finds in a study comparing four Asian countries (India, Thailand, Malaysia and the Philippines) that Muslim women get more children that non-Muslims, but at the same time find few evidences that this difference is linked with level of autonomy. Apart from the results referred to above, we find no significant effects from the ethnicity variables on fertility. Omitting the wealth indicator does not change these findings, and invite more in-depth analysis of the relationship between fertility and ethnicity in Nepal.

Families with electricity get fewer children. Apart from the straight forward interpretation, electricity can be an indicator of economic status that is not measured by the

wealth variables. This can reflect household level wealth, but maybe more importantly the general level of development in the community (Herrin 1976). The other effects have the expected signs. For the wife the critical level of education is whether she can read and write. For the husband the critical level is secondary education, and even more so higher education. From the results that are only reported in the appendix we find that women working in the (presumably modern) service sector get fewer children, and number of children declines with the wealth level of the household.

7. Conclusions and Final Remarks

We find a son preference in Nepal that leads to more children when the first born is a girl, and there is a clear interaction with female autonomy. If the first born is a girl, then we observe fewer children in families where the husband has limited influence on family decisions. If the first born is a boy, then the wife has more influence and for a larger set of families we observe relatively few children, but still the families get more children if the husband has the final say. We do not know any previous study that documents this interaction between female autonomy and son preference. The results indicate that empowerment of women may reduce fertility levels, in particular if such empowerment has an effect not only on the fertility decision itself, but also on the preference for boys over girls.

The female autonomy finding supports the analysis by Eswaran (2002) and Mason (1987), indicating that women faces higher costs of children than men, and hence prefer fewer children than their husband. The son preference finding, which supports similar findings by others, should be a sign of warning for policy makers in Nepal. The neighboring countries are experiencing a gender-biased population composition, in particular in the Indian states across the border from Nepal. Empowerment of women may lead to improved birth control, but to

avoid a gender-biased birth-control the empowerment should include measures to counteract son preferences.

The findings in the paper have some implication for policy-makers, both with respect to a hopefully continuous decline in fertility levels, and with respect to the possible danger that Nepal will experience a gender-biased population if the decline does indeed continue. Firstly, family-planning programs seem to have the desired effect, and further focusing on such programs should be encouraged. Educated women get fewer children than uneducated women. There are reasons to assume that educating women also increases their autonomy, even though the evidence regarding this is questioned (Jeffery and Jeffery 1994). Introducing means to increase school enrollment for girls should be welcomed for a number of reasons, empowering women and reducing fertility included. Opportunities for young women in the labor market is likely to have the effect that women will want fewer children as the opportunity cost of raising children increases. In addition, it may also increase the overall status of women, possibly reducing the preference for sons.

Reducing fertility rates have the potential to increase the gender-bias in the population. As more families get one or two children, but the preference for boys is present, more baby boys than baby girls will be born. If or when ultrasound-technology becomes widespread, one should take action to prevent the possibility to make abortions on the basis of gender, for example by keeping the gender secret for the parents and / or posing restrictions to abortions (however, this last point obviously is problematic regarding women's rights). The habit of dowry is a habit that increases the cost of raising girls. As dowries are banned in Nepal, increasing enforcement of the ban will possibly change the parents' gender preferences.

Table 1: Total Fertility Rate in selected regions and the world

Region	1990	1995	2000	2005
East Asia & The Pacific	2,62	2,16	2,01	1,96
Europe & Central Asia	2,30	1,85	1,61	1,62
Latin America & The Caribbean	3,23	2,89	2,66	2,36
Middle East & North Africa	4,89	3,85	3,21	2,89
South Asia	4,29	3,87	3,45	3,08
Sub-Saharan Africa	6,29	5,93	5,59	5,30
World	3,26	2,91	2,72	2,59

Source: The World Bank (2010)

Table 2: Ideal number of children in Nepal, 1996 and 2006

1996			2006		
# of children	Frequency	Percent	# of children	Frequency	Percent
0	2	0.02	**0**	37	0.34
1	218	2.64	**1**	787	7.31
2	2,987	36.24	**2**	6,477	60.14
3	2,844	34.50	**3**	2,577	23.93
4	1,767	21.44	**4**	748	6.95
5	259	3.14	**5**	94	0.87
6	102	1.24	**6**	36	0.33
7	25	0.30	**7**	6	0.06
8	21	0.25	**8**	4	0.04
9	5	0.06	**9**	1	0.01
10	11	0.13	**10**	2	0.02
12	2	0.02	**12**	-	
Total	10,769	100.00	**Total**	8,243	100.00

Source: Demographic and Health Surveys, Nepal 1996 & 2006

Table 3: Estimation results

VARIABLES	OLS-1 At least one child sample	OLS-2 At least one child sample (with interactions)	OLS-3 At least two children sample	Poisson-1 At least two children sample
Gender of first child: girl	0.314***	0.213***		
	(0.036)	(0.072)		
Gender of two first: one of each			0.271***	0.082***
			(0.045)	(0.014)
Gender of two first: two girls			0.710***	0.199***
			(0.052)	(0.015)
Has electricity	-0.105*	-0.108*	-0.146***	-0.041***
	(0.056)	(0.056)	(0.055)	(0.016)
Has education	-0.098**	-0.097**	-0.142***	-0.054***
	(0.041)	(0.041)	(0.047)	(0.015)
Husband has secondary education	-0.110***	-0.109***	-0.131***	-0.036***
	(0.037)	(0.036)	(0.037)	(0.011)
Husband has higher education	-0.313***	-0.310***	-0.422***	-0.143***
	(0.059)	(0.059)	(0.058)	(0.019)
Husband has last say	0.252***	0.250***	0.239***	0.067***
	(0.050)	(0.072)	(0.057)	(0.016)
Someone else has last say	-0.005	-0.062	0.086	0.022
	(0.047)	(0.061)	(0.054)	(0.016)
Husband and wife (joint) has last say	0.157***	0.055	0.083	0.024*
	(0.048)	(0.065)	(0.052)	(0.014)
First born is girl * husband say		0.007		
		(0.111)		
First born is girl * someone else say		0.119		
		(0.089)		
First born is girl * joint say		0.209**		
		(0.086)		
Hill Brahmin/ Chettri	0.0453	0.047	0.062	0.017
	(0.089)	(0.090)	(0.087)	(0.025)
Other Hill Groups	0.137	0.138	0.211**	0.058**
	(0.089)	(0.089)	(0.092)	(0.026)
Terai Dalit	0.050	0.049	0.048	0.012
	(0.097)	(0.098)	(0.108)	(0.031)
Terai Middle Caste	0.217***	0.218***	0.246***	0.069***
	(0.080)	(0.081)	(0.085)	(0.023)
Muslims	0.576***	0.579***	0.622***	0.165***
	(0.159)	(0.160)	(0.167)	(0.043)
FPAN	-0.072	-0.074	-0.117**	-0.033**
	(0.055)	(0.055)	(0.054)	(0.015)
5+ siblings	0.054*	0.055*	0.074**	0.025**
	(0.032)	(0.032)	(0.035)	(0.010)
Constant	-0.699*	-0.667*	-0.141	0.031
	(0.384)	(0.388)	(0.492)	(0.146)
Observations	7,412	7,412	6,083	6,083
R-squared	0.500	0.501	0.421	

Note: Standard errors in parentheses
*** Significance at 1 percent level
** Significance at 5 percent level
* Significance at 10 percent level
Variables included in the model, but excluded in Table 3: Age, age squared, marriage duration, marriage duration squared, household wealth, respondent and respondent's husbands occupation, terai-dummy, rural-dummy and whether distance to nearest health facility is regarded a "major problem" to get necessary medical assistance.

Appendix: Full estimation results

VARIABLES	OLS-1 At least one child sample	OLS-2 At least one child sample (with interactions)	OLS-3 At least two children sample	Poisson-1 At least two children sample
Gender of first child: girl	0.314***	0.213***		
	(0.036)	(0.072)		
Gender of two first: one of each			0.271***	0.082***
			(0.045)	(0.014)
Gender of two first: two girls			0.710***	0.199***
			(0.052)	(0.015)
Age	0.111***	0.112***	0.111***	0.033***
	(0.027)	(0.027)	(0.033)	(0.009)
Age squared	-0.002***	-0.002***	-0.002***	-0.000***
	(0.000)	(0.000)	(0.001)	(0.000)
Marriage duration	0.158***	0.157***	0.099***	0.043***
	(0.012)	(0.012)	(0.014)	(0.004)
Marriage duration squared	-0.001***	-0.001***	-0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Poorer wealth quintile	-0.219***	-0.219***	-0.233***	-0.062***
	(0.070)	(0.070)	(0.079)	(0.020)
Middle wealth quintile	-0.364***	-0.362***	-0.359***	-0.096***
	(0.083)	(0.083)	(0.087)	(0.023)
Richer wealth quintile	-0.416***	-0.414***	-0.406***	-0.108***
	(0.087)	(0.088)	(0.091)	(0.024)
Richest wealth quintile	-0.537***	-0.535***	-0.534***	-0.151***
	(0.103)	(0.103)	(0.103)	(0.028)
Has electricity	-0.105*	-0.108*	-0.146***	-0.041***
	(0.056)	(0.056)	(0.055)	(0.016)
Has education	-0.098**	-0.097**	-0.142***	-0.054***
	(0.041)	(0.041)	(0.047)	(0.015)
Husband has secondary education	-0.110***	-0.109***	-0.131***	-0.036***
	(0.036)	(0.036)	(0.037)	(0.011)
Husband has higher education	-0.313***	-0.310***	-0.422***	-0.143***
	(0.059)	(0.059)	(0.058)	(0.019)
Employed in service sector	-0.176**	-0.173**	-0.116	-0.039*
	(0.074)	(0.074)	(0.073)	(0.023)
Has no work	-0.006	-0.007	0.012	0.006
	(0.050)	(0.051)	(0.059)	(0.018)
Employed in industry	-0.030	-0.025	-0.032	-0.016
	(0.131)	(0.131)	(0.146)	(0.046)
Employed in service sector (husb.)	0.010	0.009	-0.008	0.001
	(0.047)	(0.047)	(0.053)	(0.015)
Has no work (husb.)	-0.099	-0.107	-0.155	-0.037
	(0.087)	(0.088)	(0.109)	(0.033)
Employed in industry (husb.)	-0.013	-0.012	-0.077	-0.019
	(0.043)	(0.044)	(0.047)	(0.013)
Husband has last say	0.252***	0.250***	0.239***	0.067***
	(0.050)	(0.072)	(0.057)	(0.016)
Someone else has last say	-0.005	-0.062	0.086	0.022
	(0.047)	(0.061)	(0.054)	(0.016)
Husband and wife (joint) has last say	0.157***	0.055	0.083	0.024*
	(0.048)	(0.065)	(0.052)	(0.014)
First born is girl * husband say		0.007		
		(0.111)		
First born is girl * someone else say		0.119		
		(0.089)		
First born is girl * joint say		0.209**		

		(0.086)		
Terai	0.068	0.070	0.037	0.011
	(0.073)	(0.074)	(0.072)	(0.021)
Rural	0.036	0.037	-0.002	-0.001
	(0.054)	(0.055)	(0.053)	(0.016)
Hill Brahmin/ Chettri	0.045	0.047	0.062	0.017
	(0.089)	(0.090)	(0.087)	(0.025)
Other Hill Groups	0.137	0.138	0.211**	0.058**
	(0.089)	(0.089)	(0.092)	(0.026)
Terai Dalit	0.050	0.049	0.048	0.011
	(0.097)	(0.098)	(0.108)	(0.031)
Terai Middle Caste	0.576***	0.218***	0.622***	0.165***
	(0.159)	(0.081)	(0.167)	(0.043)
Muslims	0.217***	0.579***	0.246***	0.069***
	(0.080)	(0.160)	(0.085)	(0.023)
FPAN	-0.072	-0.074	-0.117**	-0.033**
	(0.055)	(0.055)	(0.054)	(0.015)
Distance to health fac., big problem	0.059	0.060	0.043	0.014
	(0.043)	(0.044)	(0.050)	(0.014)
5+ siblings	0.054*	0.055*	0.074**	0.025**
	(0.032)	(0.032)	(0.034)	(0.010)
Constant	-0.699*	-0.667*	-0.141	0.031
	(0.384)	(0.388)	(0.492)	(0.146)
Observations	7,412	7,412	6,083	6,083
R-squared	0.500	0.501	0.421	

Note: Standard errors in parentheses
*** Significance at 1 percent level
** Significance at 5 percent level
* Significance at 10 percent level

Endnotes

[1] TFR is the expected total births per women if she lived through all her fertile years.

[2] Human Development Index (UNDP 2010).

[3] Response to the question: ”If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?” and “If you could choose exactly the number of children to have in your whole life, how many would that be?”, asked of respondents with and without children respectively. The non-numeric answers (181 in 1996 and 23 in 2006) are removed.

[4] However, at former Prime Minister G.P. Koirala’s funeral in March 2010 his daughter actually lit the funeral pyre.

[5] See for example Jeffrey Sachs’s short comment *The Specter of Malthus Returns* (2008), Cohen (1995) and Guillebaud and Hayes (2008).

[6] See for example Becker (1960), Becker and Lewis (1973) and Becker (1992).

[7] In the Negative Binomial Regression an overdispersion parameter is constructed. This being equal to zero implies an equidispersed correct Poisson distribution. The parameter is *not* significantly different from zero.

[8] It is not clear from the documentation that there are in fact 13 strata, but we have assumed so based on personal communication with the Nepal DHS team. The data-file includes an additional variable that indicates a higher number of strata. For the documentation see Ministry of Health and Population [Nepal] (2007b).

[9] The PSUs are sub-wards in urban areas. In rural areas the PSUs are wards or a collection of wards. A ward is the smallest unit of administrative division in Nepal.

[10] The variable is based on births, not surviving children (which would no longer be a random experiment). If the parents have preferences towards getting at least one boy and they get a daughter, they are likely to try to get another child, regardless of whether the first born survives till she is five years old (the *decision* is probably made relatively soon after the first child is born).

[11] The wealth variable is a composite variable, consisting of a combination of household characteristics and assets. The variable splits the population into five quintiles, ranging from the poorest to the richest 20 percent. It is constructed, using Principle Component Analysis.

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