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# Gender of Children, Bargaining Power, and Intrahousehold Resource Allocation in China

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## ABSTRACT

*Based on the prevalent son preference in China, this paper proposes a new measure of relative bargaining power within the household. Using data from China Health and Nutrition Survey, we show that a woman with a first-born son has a 3.9 percentage points' greater role in household decision-making than a woman with a first-born daughter. Having a first-born son improves the mother's nutrition intakes and reduces her likelihood of being underweight. While thinking of these impacts as being channeled through intrahousehold bargaining power, we cannot fully rule out other possible direct effects of a first-born son on the outcomes.*

## I. Introduction

A growing body of evidence rejects the unitary model of intrahousehold resource allocation in developing countries (Quisumbing and Maluccio 2003; Brown 2009; Chen 2006; Park and Rukumnuaykit 2004). Men and women have

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different preferences and allocate resources differently. Comparing with their spouses, women are found to be more likely to spend family resources on nutrition, education, and health-related commodities (Hoddinott, Alderman, and Haddad 1997; Von Braun 1988; Thomas 1990). Most studies use cooperative Nash bargaining model as their theoretical framework (Manser and Brown 1980; McElroy and Horney 1981). The concept of intrahousehold bargaining is straightforward, but the lack of a proper measure for women's relative bargaining power makes the empirical examination of intrahousehold resource allocation difficult.

A valid measure for bargaining power should not only reflect a woman's relative bargaining position, but also be exogenous to outcomes under investigation. Wage and nonwage income are the most widely used measures for bargaining power (Hoddinott and Haddad 1995; Thomas 1990; Schultz 1990; Folbre 1984; Von Braun 1988; Garcia 1990; Chau et al. 2007). Some other studies focus on assets controlled by individuals at the time of household formation (Thomas, Contreras, and Frankenburg 1997; Quisumbing and Maluccio 2003; Zhang and Chan 1999; Brown 2009). These studies generally find that women's bargaining power has an important impact on household consumption patterns and labor force participation. However, using income as a measure for bargaining power and testing its impact could be problematic. Wage income is associated with the decision of labor supply, so that it is likely to be endogenous to the interested outcomes. Nonwage income or asset controlled by women is also affected by the labor supply in the previous period. Moreover, income and asset also could directly affect household consumption patterns. It is hard to differentiate the bargaining effect from the income effect (Behrman 1997).

Another group of studies explore variations in outside factors to identify changes in relative bargaining power. These factors include sex ratios at marriage ages and laws related to divorce (Rao and Greene 1991; Lundberg, Pollak, and Wales 1997; Chiappori, Fortin, and Lacroix 2002; Anderson 2003). For example, a higher male-female sex ratio indicates a greater chance of remarrying for women, thus increasing their bargaining position in the family. However, the sex ratio at marriage is affected by the average preference for fertility at the regional level, which could have an impact on intrahousehold resource allocations (Hoddinott, Alderman, and Haddad 1997). For laws related to divorce, usually there is little cross-sectional variation and the variation overtime is likely to be confounded with other factors.

Thus, finding an exogenous determinant of intrahousehold bargaining position would be a key to solve the endogeneity problem associated with the using of income-related measures. A woman's contribution to family income or assets is not the only thing that influences her bargaining power. In this paper, we propose a new measure that is related to a mother's contribution of a boy in the next generation. In China, there is a long-standing social norm that a son is generally preferred than a daughter (Lee and Wang 1999). Only sons could carry the family name and inherit the family patrimony (Bernhardt 1995). Women who give birth to a boy might receive more respect from the older generations and have a higher status in the family. The One-Child Policy in China placed a limit on the maximum number of children that a couple could legally have, making the gender of these children more important (Edlund et al. 2007; Qian 2008). Thus, the gender of children could reflect the mother's status within the family and serve as an effective measure for her relative bargaining position.

Although whether a woman has ever given birth to a boy is predetermined and not affected by current household resource allocation and consumption, it could be the outcome of family fertility choice through sex selection, especially when son preference is strong. Family characteristics that affect fertility choice also could affect resource allocation directly. If not properly controlled for, they will become omitted variables and bias our estimates. To deal with the potential endogeneity associated with “whether having a son,” we adopt whether the first-born child is a son to measure a woman’s relative bargaining power. Despite the abnormal sex ratio in China, the sex ratio of the first birth is quite normal and the gender of the first child could be viewed as exogenous (Ebenstein 2009, 2010; Meng 2009). We also conduct a direct test and find that the gender of the first child is not significantly impacted by any control variables in the empirical analysis.

To verify that the gender of her first-born child significantly affects a woman’s relative bargaining power within the family, we estimate its impact on her importance in household consumption decisions for durable goods using data from the 1993 China Health and Nutrition Survey (CHNS). The results suggest that having a first-born son could increase a mother’s role in these consumption decisions. The effect is stronger for rural, one-child and low-income families, which tend to have a stronger son preference.

We then proceed to estimate the effect of a woman’s relative bargaining power, measured by the gender of her first child, on household resource allocation using data from five waves of the CHNS (1993, 1997, 2000, 2004, and 2006). While most existing studies focus on how time allocation and labor supply are affected by bargaining power, some have attempted to examine the results of resource allocation directly. For example, children’s nutrition and health conditions are found to be improved if the mother has more power in the family (Thomas 1990, 1994; Hoddinott and Haddad 1995; Duflo 2003). Since the gender of children and these outcomes are obviously correlated, it is hard to distinguish the effect of mothers’ bargaining power from the effect of child gender itself. Thus, this paper will focus on the effect of women’s bargaining power on their nutrient intakes and health conditions, which are critical components of women’s human capital.<sup>1</sup>

However, the gender of children could affect intrahousehold resource allocation through channels other than women’s relative bargaining power. In this paper, we use various robustness tests to identify the bargaining effect of child gender from alternative explanations. The evidence found suggests that the effect of having a first-born son is mainly through the increase of women’s relative bargaining power. The results show that having a first-born son significantly increases a woman’s nutrient intakes and lowers her probability of being underweight. These effects are very important for women’s human capital accumulation, which could further contribute to the alleviation of gender discrepancies in productivity, labor force participation and wage levels (Strauss and Thomas 2008). Using the gender of the first-born child as an instrument, the effect of ever having a son is also estimated as a

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1. Our study differs from Mangyo (2008), which studies how changes in household per-capita nutrient intakes affect the intrahousehold allocation of nutrients.

useful way to interpret and scale the “reduced-form” results of having a first-born son.

The remainder of this paper is organized as follows. Section II introduces the son preference and the possible effect of having a son on family members. Section III describes the data. Section IV provides evidence to justify the using of child gender as the measure for women’s bargaining power. Section V reports its impact on nutrition, health and other outcomes. Section VI concludes.

## **II. Son Preference and Possible Effects of Having a Son**

The parental preference for sons in China could be traced back to the origins of ancestral worship in the second and third millennia B.C. (Lee and Wang 1999). The patrilocal and patrilineal familial system developed during imperial state reinforced this preference (Bray 1997). Sons and their wives are expected to live with sons’ parents; daughters are married out and become part of another family. Therefore, only sons can guarantee the provision of financial support and care for the old parents. Generally, children are named with their father’s last name, not the mother’s. In another word, only sons could inherit the family name and carry on the family line. In such a society, girls are culturally considered inferior.

There are also economic concerns for the gender of children. In rural areas, men are thought to be more helpful and have a higher productivity in farming. In cities, the discrimination against females exists in the labor markets. Wages received by females are substantially lower than males with similar characteristics (Rozelle et al. 2002; Gustafsson and Li 2000; Maurer-Fazio and Hughes 2002). The higher expected value of boys provides economic incentives for son preference. The degree of son preference is found to be negatively associated with the economic status of women (Qian 2008).

In a society where son preference is prevalent, the gender of a woman’s children has an important impact on her status in the family. Especially in a patrilineal familial system where females are married out to live with their husbands’ families, giving birth to a boy would bring in more respect and care from family members and relatives, especially from the husband’s parents and grandparents. Thus, gender of children could affect their mothers’ relative bargaining power in family decisions. This has become a popular phenomenon in China (Das Gupta et al. 2003). The One-Child Policy that was enacted in 1979 further increased the importance of child gender within the extended family. Women who do not give birth to male infants are likely to be discriminated against and mistreated. Due to the prevalence of this kind of discrimination against women, the Law on Population and Birth Planning published in 2002 states that it is illegal to discriminate against women who give birth to girls and those who do not give birth (Edlund et al. 2007). This actually provides evidence on women’s status being related to the gender of their children in China.

In addition to changing the relative bargaining power within the household, the gender of children could have an impact on the mother and the household through

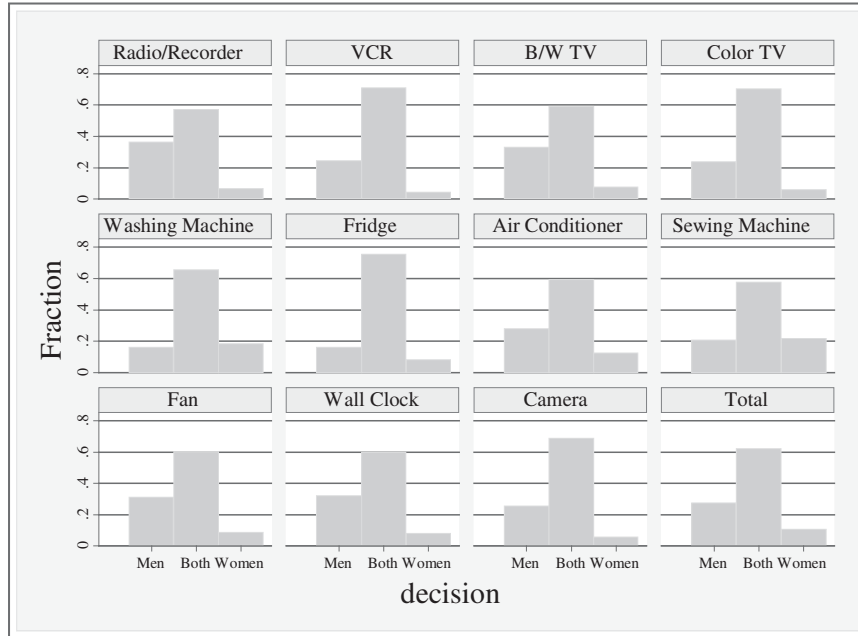
other channels. First, because sons are expected to be more productive and receive a higher income, having a son might affect the household current resource allocation due to an increase in expected future income. Second, having a son raises the couple's status in the extended family. They may receive more transfers from in-laws families, which could have a direct income effect on the mother and the family. Third, having a son could affect household resource allocation through the impact on household labor supply. When children grow up, they start to work and may partly substitute their parents' labor supply. Because a boy's propensity to work is different from that of a girl, gender of children would have an impact on household labor supply patterns, which further affects household income, resources allocation, and the members' nutrition and health.

In order to help us identify the bargaining effect of child gender, several robustness checks are conducted. First, we compare the impact on mothers with fathers to differentiate the bargaining effect from the income effect. If having a son increased household consumption because of higher expected or current income, its effect should be similar across the father and the mother. Otherwise there must be some gender-specific reasons. Second, we use information on intergenerational transfers received from the couple's parents to examine whether having a first-born son has a direct income effect. Third, we have two ways to partly rule out the effect caused by the children's labor supply. One is dropping mothers with older children from our sample, and the other is directly examining the impact of having a first-born son on the parent's labor supply. Even though we cannot fully rule out the possibility that a first-born son affects women and the household through other channels, these robustness tests should tell whether bargaining plays an important role in determining intrahousehold resource allocation.

### III. Data

Our data come from the China Health and Nutrition Survey administered by the Population Center at the University of North Carolina in 1993, 1997, 2000, 2004, and 2006. The survey was conducted in nine provinces in China, including the developed east coast and the inland. Four counties and 167 communities are randomly selected in each province. There are 4,400 households with a total of 16,000 individuals in each survey. We restrict our sample to mothers who have at least one child. Although these different waves of data could form an unbalanced panel data set, family composition changes very little overtime. Thus, we use the data as pooled cross-sectional data in this paper just like Park and Rukumnuaykit (2004).

In addition to health and nutrition conditions, CHNS also contains information on the household decision-making process. For example, people are asked to answer who decides for the purchasing of durable goods, including TV, washing machine, etc. The provided choices are husband, wife or both. These answers could reflect a woman's relative bargaining position within the family and make it possible to test whether giving birth to a boy is an effective measure for a mother's relative bargaining power.



**Figure 1**  
*Distribution of Who Decide in the Purchasing of Durable Goods*

Data source: CHNS 1993.

Figure 1 shows the distribution of who decide in the purchasing of 11 durable goods (radio/recorder, VCR, black/white TV, color TV, washing machine, sewing machine, fridge, air conditioner, wall clock, electric fan, and camera). In more than half of the families, decisions are jointly made by both the husband and the wife. Wives decided to buy radios in 6.6 percent families, black/white TVs in 7.6 percent families, and electronic fans in 8.8 percent families. For the purchasing of washing machines and sewing machines, which are often used by women, the fraction of “wife decides” is much higher. In 18.3 percent families, it is the wife who decides to buy washing machines; in 21.9 percent families, the wife decides to buy sewing machines.

The household nutrition survey in the CHNS contains detailed information on individual nutrient intakes. Based on the daily consumption of various kinds of food, the amount of calorie and protein intakes is calculated and provided in the data set. Table 1 lists the mean, standard deviation, and number of observations of the three-day averaged calorie and protein intakes. The average daily calorie intake is 2,346 for women and 2,676 for men. The average consumption of protein is 67.7 grams for women and 77.9 grams for men.

CHNS also provides information on health conditions based on a physical examination. The health indicator that is most closely related to nutrition is Body Mass

**Table 1**  
*Summary Statistics*

	Observations	Mean	Standard deviation	Minimum	Maximum
Nutrition indicators					
Calorie intake	10,718	2,346	719.9	337	8,777
Protein intake	10,707	67.7	22.7	5.3	193.1
Calorie intake (men)	10,101	2,676	803.4	206	8,556
Protein intake (men)	10,075	77.9	25.6	4.5	199.5
Health indicators					
BMI	10,690	22.41	2.867	9.50	34.63
Underweight	10,690	0.197	0.397	0	1
Overweight	10,690	0.181	0.385	0	1
Obese	10,690	0.011	0.106	0	1
Other variables					
Age	10,718	37.6	6.37	18.3	65.2
Age (men)	10,101	39.5	7.0	19.3	72.6
Years of education	10,718	6.573	4.700	0	18
Years of education (men)	10,101	8.470	3.993	0	18
Ethnic Han	10,718	0.855	0.352	0	1
Living in rural area	10,718	0.746	0.435	0	1
Household per capita income (10k RMB)	10,718	0.387	0.432	-0.360	14.887
Mother has given birth to a boy	10,718	0.773	0.419	0	1
First child is a boy	10,718	0.508	0.500	0	1
Household size	10,718	4.505	1.251	2	13
Days of working per week	4,845	5.034	2.931	0	7
Hours of working per day	4,834	6.614	3.913	0	18
Transfer from parents (RMB/year)	4,601	27.61	413.23	0	20,000

Source: CHNS 1993, 1997, 2000, 2004, and 2006.

Note: Unless specially noted, these summary statistics are for women. Data on transfers from parents is only available in 2000, 2004, and 2006.

Index (BMI), which is defined as weight over height square. The normal range of BMI is between 20 and 25. Underweight people have a BMI below 20; overweight people have a BMI over 25; being obese means a BMI over 30. Underweight is often caused by malnutrition. It is a bad health indicator since it is often a symptom of some underlying diseases. Obese people have a higher mortality rate and a higher probability toward developing diabetes. Overweight might not be a bad health indicator for Chinese people who suffered from malnutrition and poverty for a long time. It could be a signal for the improvement of living standard. Underweight, overweight, and obese are the health indicators we focus on in this paper. In our

sample, women's average BMI is 22.4. 19.7 percent people are underweight, 18.1 percent are overweight, and 1.1 percent are obese. There are other health indicators in the survey, such as blood pressure and diabetes. However, these diseases are more complicated. Aging, stress, diet and infection, all these factors could play a role. We do not examine these indicators in this paper.

Table 1 also shows the summary statistics for other control variables. Women's average age is around 38 years. The annual household per capita income is about 3,870 RMB *yuan*. Around 74.6 percent people live in rural areas and 85.5 percent are of the majority ethnicity, Han. 77.3 percent women in our sample have ever given birth to a son and 50.8 percent of the first child is a son.

#### IV. Impact of Having a First-Born Son on Women's Bargaining Power

The information on who decide in the household consumption of durable goods could be used to test whether having a first-born son is an effective measure for a woman's relative bargaining power within the family. Based on answers to the survey question "who in your household decided to buy XXX (one of the 11 durable goods)," we construct a variable to measure a woman's role in the purchase of durable goods, with a value of "0" if the husband makes the decision alone, "0.5" if both the husband and the wife decide, and "1" if the wife decides alone. We then take an average of these scores to get a measure for women's role in all decisions.<sup>2</sup> This mean score, in the range between 0 and 1, is used as a proxy for women's status in the family. As an alternative, we also generate a variable to measure a woman's participation in decision-making, which is defined as the fraction of decisions she participate in (decisions made either by both husband and wife or wife alone).<sup>3</sup>

Table 2 lists the summary statistics for these decision variables generated using data from CHNS 1993.<sup>4</sup> The mean score of women's role in the purchase of 11 types of durable goods is 0.385. Women participated in 68.3 percent of all decisions. The mean values of the decisions for washing and sewing machines are higher compared with other goods, which may reflect that women are the main user of those two goods. Although a large value of the decision variable may purely reflect the fact that the wife specializes in buying that goods, taking an average over all these goods and comparing across families should provide us with useful information

2. Mean of women's role in all decisions =  $\sum_{i=1}^{11} \text{Women's Role}_i / N$ , where N is the number of nonmissing values of women's role related to goods i. Women's role = 0 if the husband decides alone, "0.5" if both the husband and the wife decide, and "1" if the wife decides alone.

3. Women's participation in decision-making =  $\sum_{i=1}^{11} \text{I(Women Participate)}_i / N$ , where  $\text{I(Women Participate)} = 1$  if the decision is made either by both the husband and the wife or by the wife alone. N is the number of nonmissing values of women's role related to goods i.

4. CHNS 1991, 1993, and 1997 contain information on decision-making, but Wave 1997 has a large fraction of missing values and Wave 1991 does not ask for women's fertility information.



**Table 2**  
*Summary Statistics—Decision-making*

	Mean	Standard deviation	Observations
Women's Role in the Decision to Purchase:			
(1) Radio/ recorder	0.351	0.296	817
(2) VCR	0.379	0.264	87
(3) Black/white TV	0.359	0.278	1068
(4) Color TV	0.426	0.241	509
(5) Washing machine	0.500	0.281	616
(6) Fridge	0.473	0.219	331
(7) Air conditioner	0.447	0.369	19
(8) Sewing machine	0.494	0.325	981
(9) Electronic fan	0.374	0.284	1297
(10) Wall clock	0.346	0.281	807
(11) Camera	0.412	0.294	131
Mean of women's role in all decisions	0.385	0.256	1885
Women's participation in decision-making	0.683	0.425	1885

Source: CHNS 1993.

Note: Women's role = 1, if wife decides; = 0.5, if both wife and husband decide; = 0, if husband decides. Women's participation in decision-making = 1 if wife decides or both the husband and the wife decide; = 0 if husband decides.

on household decision-making process and reflect women's relative role in the family.

As stated above, whether a woman has ever given birth to a boy is related to her fertility choice and might be reversely affected by her bargaining power. Furthermore, family characteristics that affect fertility choice also could affect resource allocation directly. Thus we use the gender of the first child as a source of exogenous variation. In fact, the sex-selection techniques came to be available in China only in the late 1980s and were mainly used in higher birth parities (Meng 2009). Using the census data, Ebenstein (2009) find that the sex ratio of first-order births remained stable and was close to the natural rate during the 1980s.<sup>5</sup>

To further check whether the gender of the first child is truly exogenous, we run a regression of the gender of the first child on control variables that will be used later in the examination of decision-making, nutrient intakes and health conditions. Table 3 reports the results using both a linear probability model and a probit model. None of the control variables is statistically significant in explaining the gender of

5. There are statistics that first-born children are increasingly male in recent years. However, because our sample focuses mainly on the time window where many rural families anticipated having a second child after a daughter, the sex of the first child is plausibly exogenous.

**Table 3**  
*Regression of Gender of the First Child on Control Variables*

	Dependent variable: having a first-born son	
	(1) Linear Probability Model	(2) Probit Model
Household income per capita	0.089 (0.075)	0.095 (0.081)
Live in rural areas	0.034 (0.043)	0.035 (0.043)
Ethnic Han	-0.001 (0.059)	-0.002 (0.060)
Years of education	0.010 (0.007)	0.011 (0.008)
Years of education difference (husband's-wife's)	0.002 (0.007)	0.002 (0.007)
Age	0.005 (0.003)	0.005 (0.003)
Age difference (husband's-wife's)	0.007 (0.007)	0.007 (0.007)
Province dummies	Yes	Yes
Occupation dummies	Yes	Yes
Observations	1,645	1,645
R-squared	0.034	

Source: CHNS 1993.

Note: Column 2 reports the marginal effects in a probit model. Standard errors are shown in parentheses.  
 \* Significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent.

the first child. In the following, we will conduct the “reduced-form” examinations by directly estimating the impact of having a first-born son.

To estimate the effect of having a first-born son on women’s role in household decision-making, the empirical model is:

$$(1) \quad y = \alpha * First\_boy + X\beta + \varepsilon$$

Where  $y$  is either women’s role in all decisions or women’s participation in decision-making.  $First\_boy$  is a dummy variable indicating the gender of the first child, with a value of 1 for a son and 0 otherwise. We control for various individual and household characteristics in  $X$ , such as the woman’s age, age difference between the woman and her husband, her years of education, the difference in years of education between the woman and her husband, living in rural or urban areas, household per capita income, province dummies, and occupation dummies.

Table 4 Column 1 reports the estimation results on the mean of women’s role in all decisions. The coefficient for having a first-born son is positive and statistically significant. If a woman’s first child is a son, her mean role in household decision-

**Table 4**  
*Impact of Having a First-Born Son on Women's Role in Decisions*

	Mean of Women's Role in All Decisions			Women's Participation in Decision-making		
	(1)	(2)	(3)	(4)	(5)	(6)
Having a first-born son	0.039*** (0.012)	0.040*** (0.012)	0.043*** (0.014)	0.043** (0.020)	0.044** (0.020)	0.056** (0.023)
Household size	0.002 (0.005)	0.002 (0.005)	0.002 (0.005)		0.006 (0.009)	0.008 (0.009)
Number of sons			-0.004 (0.009)			-0.015 (0.014)
Live in rural areas	-0.023 (0.015)	-0.024 (0.015)	-0.023 (0.015)	-0.055*** (0.025)	-0.057** (0.025)	-0.053** (0.026)
Ethnic Han	0.069*** (0.019)	0.070*** (0.019)	0.070*** (0.019)	0.102*** (0.032)	0.104*** (0.032)	0.106*** (0.032)
Household income per capita	0.051* (0.027)	0.051* (0.027)	0.050* (0.028)	0.119*** (0.046)	0.120*** (0.046)	0.116** (0.046)
Years of education	-0.006** (0.003)	-0.006** (0.003)	-0.006** (0.003)	-0.007 (0.004)	-0.007 (0.004)	-0.007 (0.004)
Years of education difference (husband's-wife's)	-0.008*** (0.002)	-0.008*** (0.002)	-0.008*** (0.002)	-0.010** (0.004)	-0.010** (0.004)	-0.010*** (0.004)
Age	-0.003** (0.001)	-0.003** (0.001)	-0.002** (0.001)	-0.005** (0.002)	-0.005** (0.002)	-0.004** (0.002)
Age difference (husband's-wife's)	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.002 (0.004)	-0.002 (0.004)	-0.002 (0.004)
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes
Occupation dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1645	1645	1645	1645	1645	1645
R-squared	0.149	0.149	0.149	0.141	0.141	0.142

Source: CHNS 1993.

Note: Standard errors are shown in parentheses. \* Significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent.

making would be increased by 0.039, which could be interpreted as a 3.9 percentage points increase in women's bargaining power, or 10 percent relative to a mean of 0.385. The regression on women's participation in decision-making gives similar results (Column 4). Having a first-born son increases women's participation in household consumption decisions by 0.043.

Household size and number of sons are potentially important determinants of women's status in the household, too. With son preference, what matters may include not only whether she has had a son, but also the number of sons. On the other hand, household size could be viewed as a proxy for the influence of traditional culture. A larger household size usually corresponds to an older-fashion culture and lower status for woman in the family. However, these two variables are likely to be endogenous to households' fertility decision. Thus, we choose to add them into the regression only as alternative specifications. In Columns 2 and 5 we add household size; in Columns 3 and 6 we further add the number of sons. The coefficient is positive for household size and negative for number of sons, but neither is statistically significant. At the same time, the estimated coefficient for having a first-born son has very little change. These results suggest that after conditioning on having a first-born son and other control variables, household size and number of sons are no longer important factors. In subsequent tables we use the specification in Column 1, and do not control for household size or the number of sons.

Looking at other control variables, we find that the coefficient on both a woman's education and the education difference between her husband and her are negative, and the education difference has a larger magnitude. Summing up these two coefficients generates a positive effect for a woman's education, while her husband's education has a negative effect on her role in the family. At the same time, a woman's role in household decision is relatively less important when she becomes older and when her family is poorer. All these results are intuitive, but their magnitude seems to be less significant than the impact of having a first-born son.<sup>6</sup> Being ethnic Han has a larger impact than having a first-born son, which shows the significant influence of ethnic culture in determining women's status in the family.

Table 5 divides the sample into different groups to examine the heterogeneous effect of having a first-born son. To save space, we only report the coefficient and standard error for having a first-born son in this table. Presumably, the effect of having a first-born son on women's bargaining power should be larger where son preference is stronger. For example, since men tend to have a higher productivity and are more helpful in farming than women, rural people might be more affected by traditional social norms on son preference, so that the demand for boys in rural areas is higher than urban families. In Panel A, we present the results for rural and urban sample, respectively. As expected, the impact of having a first-born son is much larger and statistically more significant in rural areas, suggesting that child gender affects mothers' relative bargaining power mainly in the rural areas.

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6. For example, the economic impact of having a first-born son equals to the impact of a 20 years' increase in the woman's education, or a 13-year decrease in her age, or an 8,000 RMB increase in her household per capita income, which is more than twice of the average.

**Table 5**  
*Impact of Having a First-Born Son on Women's Role in Decisions—By Groups*

	Mean of Women's Role in All Decisions		Women's Participation in Decision-making	
	(1)	(2)	(3)	(4)
Panel A: Rural vs. Urban				
	Rural	Urban	Rural	Urban
Having a first-born son	0.036** (0.015)	0.030 (0.021)	0.066** (0.034)	0.017 (0.025)
Observations	1,160	485	1,160	485
R-squared	0.142	0.193	0.120	0.236
Panel B: One-Child Families vs. Multichildren Families				
	One-Child	Multichildren	One-Child	Multichildren
Having a first-born son	0.076*** (0.022)	0.024* (0.015)	0.112*** (0.035)	0.016 (0.025)
Observations	477	1,168	477	1,168
R-squared	0.181	0.170	0.243	0.126
Panel C: Low-Income Families vs. High-Income Families				
	Low income	High income	Low income	High income
Having a first-born son	0.053*** (0.018)	0.022 (0.016)	0.052* (0.030)	0.027 (0.027)
Observations	824	821	824	821
R-squared	0.157	0.193	0.154	0.152

Source: CHNS1993.

Note: All regressions have the same control variables as in Table 4, Column 1. Standard errors are shown in parentheses. \* Significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent.

The number of children itself might contain some useful information on the degree of son preference of the family. Families with a stronger son preference might choose to have more children if the first one is a girl, which suggests that a multichildren family structure may indicate a stronger son preference than a one-child family. However, since the One-Child policy restricted the maximum number of children that one couple could have, the son preference might be stronger in those one-child families. The reason is that these families are usually the ones that are allowed to have only one child, and the gender of the only child would be very important. Thus, it remains an empirical question whether son preference is stronger in multichildren families relative to one-child families. Table 5 Panel B presents results for one-child and multichildren families, respectively. The coefficient of having a first-born son is much larger and more significant for one-child families, suggesting a stronger son preference in these families.

The degree of son preference might also be different across household income levels. Low-income families might have a higher demand for sons that are expected to get a higher future earning than daughters. We divide the sample into a low-income group and a high-income group using the median per capita income as the cutoff. The results in Panel C indicate that women's position in low-income families responds more strongly to the gender of their children than high-income families. In sum, having a first-born son increases mothers' role in household decision-making, especially in rural, one-child and low-income families. The gender of the first child serves as an effective measure for a woman's relative bargaining power.

## V. Impact of Having a First-Born Son on Women's Nutrition and Health

In this section, we estimate the impact of whether the first-born child is a son on women's nutrition and health outcomes and household expenditure patterns. Although we think of these impacts as being channeled through a woman's bargaining power within the household, we cannot rule out that there could be direct effects of a first-born son on the outcomes. Nonetheless, at the end of this section, we present an IV specification in which we instrument for a woman's bargaining power using the gender of the first child; we think of this as a useful scaling of the reduced-form results, rather than as a causal estimate.

### A. Empirical Specification and Baseline Results

Nutrient intakes are positive and continuous variables. Our empirical specification is:

$$(2) \quad \log(\text{Nutrition}) = \theta * \text{First\_boy} + Z\gamma + e$$

Where *Nutrition* represents calorie intake or protein intake,  $\theta$  measures the reduced-form effect of having a first-born son. Taking logarithm on *Nutrition* makes it easier to interpret  $\theta$ , which in this case measures the percentage point change of *Nutrition* in response to the gender of the first child. *Z* represents control factors that are likely to be related to fertility choice, including age, years of education, ethnicity, whether living in rural areas, household per capita income, province dummies, and occupation dummies. As stated above, we do not control for household size. In fact, results controlling for it are very similar.

A higher nutrition intake does not necessarily mean a better health condition. For example, overnutrition could lead to obesity. We then examine women's health indicators that are related to BMI. Since the dependent variables are binary outcomes, we adopt a linear probability model as follows:

$$(3) \quad \text{Health} = \theta * \text{First\_boy} + Z\gamma + e$$

Where *Health* represents one of the three health indicators, namely underweight, overweight, and obese. For each of these three indicators, a value of one means a bad health outcome.

To save space, we only report the estimated coefficients and standard errors of “having a first-born son” from now on (estimates for control variables are available from the authors upon request). Table 6, Column 1 presents the results. The first two rows are for nutrition intakes. For the women sample, the impact of having a first-born son is positive and statistically significant. If a woman has a first-born son, her calorie and protein intakes would rise by 1.8 percent and 2.1 percent, respectively.

The next three rows list results for health outcomes. Having a first-born son decreases a woman’s probability of being underweight by 2.6 percentage points, which is consistent with the finding of higher nutrition intakes. Although the coefficients on overweight and obese are both small in magnitude and statistically not significant, they have the expected negative sign. Since underweight is a much more severe problem than overweight and obese for Chinese women, the significant result on underweight should be taken as evidence of health improvement. In sum, a woman’s health conditions are generally found to be better if her first child is a boy. Although health is affected by many factors, our results suggest that increasing women’s bargaining position in the household can help them get more household resources, which further contribute to an improvement of their health.

### ***B. Impact on Household Consumption Structure***

In this subsection, we present additional evidence to show the impact of child gender on household consumption patterns. Using data from CHNS 1993 and 1997,<sup>7</sup> we examine the impact of having a first-born son on the household consumption of food, cigarettes and alcohol. We first examine the logarithm of the amount of per person expenditure on these goods. Because data on cigarettes and alcohol has many zeros, we only present results for food. Next we examine the expenditure share of each of these three types of goods, where the expenditure share is defined among the total expenditure of these goods. Table 6, Rows 6–9 list these results. It is found that having a first-born son increases the amount of food consumed per person and decreases the expenditure share of cigarettes. The consumption of alcohol is not significantly affected. These results are consistent with the assumption of the collective model that women and men have different preferences. If women have more control over family resources, their family are more likely to spend on food and nutrition related goods, rather than cigarettes, which are mainly consumed by men in China (Strauss 2009). The results are also consistent with our argument that child gender influences women’s bargaining power, which further affects intrahousehold resource allocation.

### ***C. Identifying the Effect through Women’s Bargaining Power***

In order to help us identify the bargaining effect of child gender, various robustness tests are conducted. First, we compare the impact of child gender on mothers with fathers to differentiate the bargaining effect from the income effect. If the change in income induced by having a first-born son affects the household resource allo-

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7. Detailed information on daily food consumption is only available in these two waves.

**Table 6**  
*The Impact of Having a First-born Son on Nutrition, Health, and Other Outcomes*

Outcomes	Sample		
	Women	Men	Women with children younger than 18
	(1)	(2)	(3)
(1) Log calorie intake	0.018** (0.008)	0.012 (0.008)	0.014** (0.006)
(2) Log protein intake	0.021** (0.009)	0.009 (0.010)	0.015** (0.007)
(3) Underweight	-0.026** (0.013)	-0.001 (0.013)	-0.034** (0.014)
(4) Overweight	-0.004 (0.012)	-0.007 (0.011)	-0.009 (0.013)
(5) Obese	-0.004 (0.003)	0.000 (0.003)	-0.004 (0.003)
(6) Log food expenditure	0.030* (0.015)		0.042** (0.017)
(7) Food expenditure share	0.002 (0.009)		-0.007 (0.010)
(8) Cigarette expenditure share	-0.007** (0.003)		-0.007** (0.003)
(9) Alcohol expenditure share	0.004 (0.010)		0.014 (0.012)
(10) Days of working per week	-0.071 (0.100)	0.028 (0.111)	-0.039 (0.107)
(11) Hours of working per day	0.041 (0.132)	0.140 (0.146)	0.052 (0.138)
(12) Transfers from parents	12.484 (15.250)		13.413 (17.663)

Note: This table reports the estimated coefficients and standard errors of "having a first-born son" on nutrition, health and other outcomes. Estimates for control variables are not listed. Nutrition and health data is from CHNS 1993, 1997, 2000, 2004, and 2006. The number of observations is 10,718 for the women sample, 10,101 for the men sample and 8,427 for women with children younger than 18 years old. Household expenditure data is from CHNS 1993 and 1997, with an observation of 4,965 for food, 3,464 for cigarettes, and 3,344 for alcohol. Expenditure share is calculated among the total of food, cigarettes and alcohol. The number of observations with nonmissing data on the expenditure of all three types of goods is 2,398, which is the number of observations for the regressions on expenditure share. The sample used in the regression of labor supply is restricted to people who have a record of working time, with an observation number of 4,845 for women and 5,187 for men. Transfer data is from CHNS 2000, 2004, and 2006, with an observation number of 4,601. Standard errors shown in parentheses are clustered at the household level. \* Significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent.



cation, it should have a similar effect on the woman and her husband. Table 6, Column 2 reports the results on the father. Comparing with mothers, the effects of having a first-born son on men's nutrition and health outcomes are much smaller and statistically not significant. This finding is consistent with the hypothesis that the increase of women's relative position in the family changes the intrahousehold resource allocation toward favoring themselves. The income effect is not supported by empirical results.

As discussed before, when a child grows up, he or she may start to work, which increases household income and changes the parent's labor supply. These changes could further affect the intrahousehold resource allocation and household members' nutrition and health conditions. Given that we do not have good measures for individual income and labor supply, we make two efforts to partly rule out the effect through children's labor supply. The first is to exclude women with older children, who are more likely to work. Dropping these women could eliminate most of the effect caused by children's labor participation. Table 6, Column 3 reports the results for women whose children are younger than 18 years. We get significant results on the same set of outcomes. Having a first-born son increases a woman's calorie intake and protein intake both by around 1.5 percent. The probability of being underweight is decreased by 3.4 percentage points, family food consumption is increased by 4.2 percent, and cigarette expenditure share drops by 0.7 percentage point. The magnitude of these estimates is similar to the whole sample. The second effort we made is to directly check whether the gender of the first child affects parents' labor supply. Table 6, Rows 10 and 11 show the estimates of having a first-born son on women and men's working days per week and working hours per day, respectively. No significant effect is found for having a first-born son. Parents' labor supply seems not to be affected by the gender of their first child. These results suggest that the effect through labor supply is not important.

Having a first-born son also could raise the couple's status in the extended family and bring in more transfers, which generate a direct income effect on the mother and the family. This hypothesis could be directly tested using information on the amount of intergenerational transfers received from the couple's parents last year. Such information is available in the survey data of CHNS 2000, 2004, and 2006. Table 6, Row 12 reports the results for these intergenerational transfers. No significant effect is found. Having a son at the first birth does not significantly increase the amount of transfer from the couple's parents. This suggests that the direct income effect of having a first-born son is not important.

When family resources are limited, the parent may sacrifice their own consumption when having an additional child. Due to son preference or other reasons, it is possible that there is gender difference in sacrifice, that is, fathers sacrifice more relative to mothers when the additional child is a son, and vice versa (Park and Rukumnuaykit 2004). In this case, having a son may lead to a larger reduction in the father's nutrition intake than that of the mother. With the control of household income and other variables, we do not find a reduction in nutrition intake for either women or men. But even if this "sacrifice effect" exists, it is consistent with our bargaining argument in the sense that who sacrifice more could be viewed as a result of bargaining. That is, a bigger reduction in the father's nutrition intake is due to an increase in the bargaining power of the mother, who has given birth to a boy.

In sum, these robustness checks provide us with evidence against alternative channels through which having a first-born son affects women's nutrition, health, and other outcomes. Although we cannot fully rule out alternative channels, these results give us confidence on the importance of relative bargaining power in the intrahousehold resource allocation.

#### *D. IV Estimation*

The results presented so far show an impact of having a first-born son on a woman's role in household decision-making, her nutrition intake and health condition. Although these results are consistent with the hypothesis that having a first-born son improves a woman's bargaining power within the household, we cannot fully rule out that a first-born son could affect women and the household through channels other than bargaining power. Nonetheless, we present IV results as a way to scale our reduced-form results. Under the assumption that a first-born son affects outcomes only through bargaining, our results provide an estimate of the causal impact of bargaining power on a woman's outcomes. Even if this assumption is not valid, our results at least provide a useful guidance on the magnitude of the effect.

Table 7 reports the IV estimates using the two-stage least square (2SLS) method. The gender of the first child is used as an instrument for having a son. Columns 1–3 present the results for women's role in decisions. The first column shows that having a son at the first birth significantly increases the chance of "having a son."<sup>8</sup> The second column reports the second-stage result of having a son on the mean of women's role in all decisions, which is positive and statistically significant. This IV estimate (0.094) simply equals to the ratio of the reduced-form coefficient (0.039, as shown in Table 4) to the first-stage estimate (0.415). It is quantitatively large enough to bring an average woman from the mean decision score (0.385) to a value of 0.479 that is close to 0.5, meaning that she will be almost as important as her husband in the household decision-making. Column 3 shows the results for women's participation in decision-making. Similarly, the IV estimates are positive and statistically significant. Having a son increases a woman's participation in household consumption decisions related to durable goods by about 10 percentage points.

Columns 4–9 present the results for nutrition and health outcomes. The first-stage coefficient for having a first-born son is 0.455 (Column 4). The second-stage coefficients for having a son on the log of calorie and protein intake are 0.040 and 0.047 (Columns 5 and 6). These results show that a higher bargaining power raised by ever giving birth to a boy could increase a woman's calorie and protein intakes by 4.0 percent and 4.7 percent, respectively. Columns 7–9 report the effects on those weight-related health indicators. Having a son lowers the probability of being underweight and obese by 5.8 and 0.8 percentage points. Since the average probability of being underweight is 19.7 percent and that of being obese is 1.3 percent, these estimates show that the effect of having a son is quantitatively significant. If we assume that a first-born son affects outcomes only through intrahousehold bargain-

8. The first-stage F-statistic is 23.0, with a p-value less than 0.0001.

**Table 7**  
*Impact of Having a Son: IV Estimation*

	Women's Role in Decision			Women's Nutrition and Health					
	1st Stage	2nd Stage	Women's Participation in Decision-making	1st Stage	2nd stage	Log Protein Intake	Underweight	Overweight	Obese
Having a son		Mean of Women's Role in All Decisions	Having a son	Log Calorie Intake	Log Protein Intake	Underweight	Overweight	Obese	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Having a son		0.094*** (0.029)	0.103** (0.048)	0.455*** (0.013)	0.040** (0.017)	0.047** (0.020)	-0.058*** (0.017)	-0.008 (0.016)	-0.008* (0.005)
Having a first-born son	0.415*** (0.017)								
Observations	1,645	1,645	1,645	10,718	10,718	10,707	10,690	10,690	10,690
R-squared	0.359	0.141	0.142	0.377	0.117	0.075	0.056	0.066	0.014

Note: This table reports the estimated coefficients and standard errors of "having a son" and "having a first-born son" in 2SLS regressions. Columns 1-3: model specification is like Equation 1, data is from CHNS 1993. Columns 4-9: model specification is like Equations 2 and 3, data is from CHNS 1993, 1997, 2000, 2004, and 2006, and standard errors are clustered at the household level. \* Significant at 10 percent; \*\* significant at 5 percent; \*\*\* significant at 1 percent.

ing, our IV results suggest that the causal impacts of bargaining power on a woman's nutrition and health are quantitatively important.

## VI. Conclusion

In this paper, we propose a new measure for women's relative bargaining power in the family and examine its impact on individual nutrient intakes and health outcomes. The measure we used is related to the gender of children a woman has. Due to the prevalent son preference in China, women's status within the family would be increased if their first child is a son or if they have given birth to a boy. We use the information about who decides in household major consumption decisions to show that having a first-born son increases the mother's relative bargaining position within the family. We find that there will be an improvement in the mother's calorie and protein intakes, as well as a reduction in the chance of being underweight if she has a first-born son.

With the use of the gender of children as a measure for women's bargaining position in the family, we have actually tested the Nash-bargaining model of intra-household allocation. The result rejected the unitary model. Instead, statistically significant effect of bargaining power on individual outcomes was found. Women might allocate more resources on themselves or on the consumption of products they lack. Their human capital levels could be improved if they have more power in the determination of household resources allocation. It should be noted that our measure of relative bargaining power is not general enough to be used in all cases, especially for cultures without son preference. However, son preference is prevalent in East Asia, where women tend to have a low socioeconomic status and a bad nutrition condition (Sen 1990). In this sense, our results have an important implication for a large population of the world.

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