



# **Intra-Household Bargaining and Child Health Outcomes: Do Domestic Violence Laws Matter?**

Nuhu, Ahmed Salim

Eastern Illinois University

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# **Intrahousehold Bargaining and Child Health Development: Do Domestic Violence Laws Matter?**

**Ahmed Salim Nuhu<sup>1</sup>**

## **Abstract**

*In this paper, we explore a unique exogenous instrument to examine how the intra-familial position of women influence health outcomes of their children using micro data from Ghana. Using the 2SLS-IV estimation technique, I build a model of household bargaining and child health development with perceptions of women regarding wife-beating and marital rape in the existence of domestic violence laws, in Ghana. Even though the initial OLS estimates suggest that women's participation in decisions regarding purchases of household consumption goods help to improve child health outcomes, the IV estimates reveal that the presence of endogeneity underestimates the impact of women's bargaining power on child health outcomes. Our Hausman test for endogeneity also confirms that child-health investment decisions is mediated through domestic violence laws, which protect women from physical and sexual abuse in the household. Our results are also robust to rural residency and father characteristics controls.*

**Keywords:** Household Bargaining, Women Empowerment, Child Health Investment, Instrumental

Variables, Domestic Violence

**JEL Classification:** J12 J13

### **1. Introduction**

Mothers play a critical role in fostering early childhood development, strongly influencing children's long-term intellectual and physical health (Smith and Haddad, 2000). However, despite progress in the last few decades, women continue to be disadvantaged in economic as well as familial spheres in many societies, with obstacles ranging from discrimination in the labor market, access to credit, to inheritance and ownership rights in the family (World Bank, 2011).

The recognition that the unequal distribution of intra-household power may have heterogeneous implications for parental investments in children has ignited a growing interest in intra-household resource allocation and its implication for developmental outcomes of

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<sup>1</sup> Ahmed Salim Nuhu, Department of Economics, Eastern Illinois University, [anuhu@eiu.edu](mailto:anuhu@eiu.edu)

children. This project revolves around intra-familial position of women in Ghana and its implication for early childhood development regarding health.

A survey of the literature, however, reveals a lack of consensus on the measures of bargaining power. In the literature, bargaining power within households has been measured using direct and indirect proxies like relative income contribution, educational attainment, and direction of dowry, inheritance and ownership rights (e.g. Blumberg, 1988; Anderson and Eswaran, 2009; Friedmann-Sanchez, 2006). The differences in the measures of women's bargaining power may be attributed to the diversity in the political and social institutions and norms across countries and cultures.

It is therefore important from a policy point of view to understand the effect of women's bargaining power on early childhood development in each country through the lens of the norms and institutions that are peculiar to the culture of that country.

In this project, I argue that the effect of women's bargaining power on child health in Ghana is mediated through domestic violence laws, which protect women from marital rape and wife beating. The choice of domestic violence laws as an instrument for bargaining power will enable me to address any endogeneity associated with the direct measure of bargaining power. In the literature, when child development outcomes are regressed on direct measures such as women's degree of control over household decisions, they tend to yield biased and inconsistent Ordinary Least Square (OLS) estimates due to the endogeneity of the main regressor (Bernal and Keane).

Endogeneity may arise because in many societies, women with high quality (healthy and well-educated) children tend to gain more respect in the family and community, hence more bargaining power. In this case, the reverse causality becomes a threat to consistency. Endogeneity may also arise because in the Ghanaian society there is a traditional predilection for male children. As a result, women with male children tend to have a lot of respect within the family, obtain more bargaining power and may be able to invest more in their children (especially when they are all males).

To deal with the endogeneity, the 2-Stage Least Squares –Instrumental Variable (2SLS-IV) estimation technique is employed. I make use of the existence of domestic violence laws (which is captured as women's attitude towards wife-beating for refusing to have sex with the husband) as an exogenous instrument for women's bargaining power. This instrument is exogenous because in jurisdictions like Ghana with judicial systems that protect women's rights, strong incentives exists for women to exercise their rights and participate more actively at all levels of decision making. These laws therefore confer bargaining power on women independent of the child.

The Domestic Violence (DV) Law, which has been in enforcement since 2007 contains provisions that criminalize various acts of violence – physical, economic and psychological abuse, intimidation, and harassment (Manuh, 2007). Therefore, there is an indication of low self-esteem or non-empowerment if a woman (even after the passage of this law) believes that a husband is justified in beating his wife for refusing sex. Such a perception could act as a barrier for women in accessing effective health care for themselves and their children (Ghana Demographic and Health Survey, 2008).

To understand this whole interaction within a structure, this paper develops a model of household bargaining with women's attitude towards wife beating and marital rape and its implication for child health outcomes. The implications of the model is tested using the 2008 Ghana Demographic and Health Surveys (*hence* GDHS) data. The choice of Ghana is important because it allows me to explore the existence of domestic violence laws as unique instrumental variable for the first time in the literature.

It also helps to provide robust empirical support for designing policy measures targeted at bridging gender gaps to affect child development outcomes in Ghana where women lack influence in household decision-making, mainly because of strong patriarchal family structures, even though, they constitute more than 50% of the population (Baden et al, 1994)

This is the first paper to explore domestic violence as an instrumental variable for women's bargaining power whilst testing its implications for child health outcomes using a unique micro data set.

## **2. Research Questions**

I have two objectives. First to identify an exogenous instrument for women's bargaining power and to construct a model with this exogenous instrument to examine the effect of this power on child health outcomes using micro-level data from Ghana.

## **3. Literature Review**

### **a. Theoretical Literature**

Several useful models on intra-household resource allocation and bargaining have emerged after a substantial body of literature on household bargaining questioned the validity of the traditional unitary household model. The unitary model, which treated household as a single unit with common preferences, utility, decisions and choices, has been unable to withstand a number of empirical verifications (e.g. Schultz, 1990 and Thomas 1990).

As a result, there is a growing consensus in the literature that the household behavior cannot be modelled as though members of the household had a set of stable preferences. However, though there exist several useful alternatives, there is no agreement on the best way to model household behavior. Indeed, the literature recognizes that models on household bargaining may differ to reflect the social, economic and cultural contexts in which they are

used (Chiappori et al, 2006). In this section, I provide a brief overview of some of the existing models proposed to replace the unitary model.

### **Collective Model**

The collective model developed Chiappori, (1988) and restructured by Chiappori et al (2006) recognizes individual preferences within a household and enables individual bargaining power to influence household choices and outcomes. The model assumes that regardless of how decisions are made, outcomes made under these assumptions are always Pareto efficient. The implications of this model have been upheld by several empirical studies (e.g. Vermeulen, 2000)

### **Non-Cooperative Model**

The non-cooperative model assumes that resources earned by individuals are expended according to individual preferences and interests (Ulph, 1988). There exists no pooling of resources as it happens in the unitary or cooperative models. There is however, mixed opinions in the literature on whether outcomes made under the assumptions of this model are pareto-efficient (Bourguignon et al (1993) and Udry (1996)).

### **The Cooperative Bargaining Model**

The cooperative bargaining model, also like the collective model, assumes that household bargaining outcomes are Pareto-efficient. It however establishes more firmly, the process by which the pareto-efficient outcomes are attained, by assuming the presence of a threat point for each household member (McElroy and Horney, 1981 and Manser and Brown, 1980). The threat point is usually an external utility option to members of the household. An example of this outcome is “divorce”, where the threat point for the household is dissolving the marriage. The efficiency of divorce as a threat point for intra-household bargaining however remains largely debatable ((Lundberg and Pollak, 1993). Per the data used in this paper, household decisions are made under of the assumptions of the cooperative bargaining model where resources are pooled and decisions made reflect individual preferences. The threat point for making pareto-efficient decisions lies in the ability of any ‘abused’ member of the household to exploit or use domestic violence laws to seek redress.

#### **b. Empirical Literature**

A number of studies suggest that women’s participation in economic activities is a sustainable way to help build human capital in developing countries. This section surveys the results of extant studies, on the subject of intra-household bargaining and child development outcomes.

Using women’s ethnicity, “arguably”, as an instrument for bargaining power, Lepine and Strobl (2013) found that women with bargaining power tend to have children with better nutritional status in rural Senegal. Whilst Ueyama (2006), with household survey data from rural Malawi, found that women’s participation in agriculture has a positive effect on child

health, through the added ‘income effect’ and ‘food effect’. Afridia et al (2012) also studying the impact of India’s National Rural Employment Guarantee Scheme (NREGS) on children’s educational outcomes via women’s labour force participation, found that greater participation of mothers in the program was associated with better educational outcomes of their children.

Similarly, Smith et al. (2003) also using DHS household surveys for 36 South Asian, Sub-Saharan Africa, Latin American and the Caribbean countries, found a strong association between the index of women’s decision-making power and her child’s nutrition.

On his part, Kishor (2000) used data from the Egypt’s 1995 DHS and employed multivariate analyses to explore the correlations between women’s empowerment and child health. The study found that a woman’s lifetime exposure to employment is significantly correlated with both child survival and health.

Furthermore, studies such as Haddad et al. (1997), Thomas (1997), Quisumbing and Maluccio (2000), Doss (2001), Duflo and Udry (2004) and Fantahun et al, (2007) also found a positive relationship between women’s empowerment and either child development outcomes.

Even though cultural norms and political institutions strongly influence child outcomes by either constraining or improving women’s bargaining positions, there exists major gaps, in the literature, in spelling out the dynamics of these processes (Agarwal, 1997). This is because, majority of the literature has tended to focus on more direct and observable measures such as incomes, education, participation in a microfinance program or agriculture etc. For example, in view of the societal preference for male children in China, women with first-born sons have been found to have greater bargaining power than women with first-born daughters (Li and Wu, 2011).

This paper thus seeks to fill this gap by investigating how the existence of institutions that protect women from domestic violence influence women’s bargaining positions and subsequently how this translates into child development outcomes. The implications of this model, I believe can be replicated in other societies with little regard to the cultural or economic setting of the society.

### c. Domestic Violence Laws

Like many developing societies with strong patriarchal family structures, marriage in Ghana is associated high social esteem. For many societies, though the certificate of marriage confers certain rights and powers on the partners involved, the degree of control over decision making within the marriage is unequally shared between partners.

This is because the customary institution, which represents the primary source of legitimacy for most marriages in Ghana, does not view women and men as equal partners in marriage. Generally, the woman is expected to be subservient and obedient to the husband, and the husband is expected to exercise maximum control to keep the house in order. Derry and Diedong (2014), observes that a prime example of this is the traditional right of men to

discipline their wives through beating. However, this beating should be reasonable, such that it does not cause awful physical injuries or death. Given this cultural foundation, it is not surprising that domestic violence was seen as a normal practice and a means of maintaining order in the household.

To control domestic violence, the government of Ghana in February 2007 passed the Domestic Violence (DV) Act 732 which mandates the Domestic Violence and Victims Support Unit (*hence* DOVVSU) to fight domestic violence in all its forms and to set up a victim support fund to advance that cause (GDHS, 2008). The passage of the DV Act has since criminalized most acts of violence against women and children, and has fundamentally changed the perception of Ghanaian women on domestic violence, including, making it criminal for husband to use force their wives into having sex without consent. This has provided a fundamental pathway to empower women by granting women in the household, the right to make choices and decisions that best represent their individual interests without fear of abuse from their partners.

Evidence from the literature confirms this assertion. For example, Derry and Diedong (2014) using survey data from the Upper West Region of Ghana found that proximity of a household to the police or the DOVVSU is negatively related to the occurrence of violence within that household and that physical violence has been on a decrease since the passage of the law.

On the back of this information, the paper explores domestic violence laws as an exogenous instrument, which confers bargaining power on women independent of child outcomes. This helps deal sufficiently with any potential endogeneity of the main regressor.

#### **4. Research Design**

##### **Data and Sampling Techniques**

The study is based on micro level data on Ghana from the 2008 Ghana Demographic and Health Survey administered by the United States Agency for International Development (USAID). The survey, which is based on a nationally representative household sample, provides data for 11,778 households. The survey employed two-stage sample design. The first stage involved selecting 412 sample points from an updated master sampling frame constructed for the 2000 Ghana Population and Housing Census, using systematic sampling with probability proportional to size. The second stage involved systematic sampling of 30 of the households listed in each cluster.

On the data collection, three separate questionnaires were used to collect information from the selected sample, namely, the Household Questionnaire, the Women's Questionnaire and the Men's Questionnaire. This paper uses data from the Women's Questionnaire, which was used to collect information from all women age 15-49 in half of the selected households. These women were asked questions about themselves and their children born between 2003

and 2008, on topics including but not limited to education, media exposure, wealth, vaccinations and childhood illnesses, marriage, occupation and husband's background characteristics, childhood mortality and domestic violence. For the purpose of this research, I give a brief overview of the key variables of interest as presented in the DHS survey in the following section:

**a. Attitude towards Wife Beating and Domestic Violence**

To capture the empowerment effect of gender equity, the survey collects data on women's attitude towards wife-beating and other forms of violence as a proxy for women's status in the household. Respondents were asked whether a husband is justified in beating his wife under a series of circumstances: when wife burns the food, when wife argues with him, when wife goes out without telling him, when wife neglects the children, and when wife refuses to have sex with him. Per the structure of the survey, responses that suggest a justification of wife beating by husbands is seen as a reflection of the woman's low status and empowerment within the household. Such views show the acceptance of cultural norms that give men the right to use force against women (GDHS, 2008).

**b. Household Decision Making Module**

In addition to measures that sought to capture women's view on domestic violence, the survey collected data on direct measures of women's empowerment. Respondents were asked about who makes the final decisions on the following issues: respondent's own health care, making large household purchases, making household purchases for daily needs, and visiting her family or relatives. Having a final say in the decision-making process is the highest degree of autonomy. Women are considered to participate in a decision-making if they usually make that decision alone or jointly with their husband. Such information provides insight into women's control over their environment and their attitudes towards gender roles, both of which are relevant to understanding women's ability to make independent decisions about their own health care and that of their children (GDHS, 2008).

**c. BMI Measurements of Children**

The nutritional status of young children provides a useful gauge for assessing their future health and development prospects. But many under-five children in developing countries are often exposed to the risks of childhood illnesses and nutritional deficiencies, which significantly affect their long-term health development (GDHS, 2008). This paper uses the Body Mass Index (BMI) of children as a measure of their health status. The BMI which is measured as weight adjusted for height is calculated as weight in kilograms divided by the square of height in meters. The BMI is important because it reflects both current and past nutritional investment in children (GDHS, 2008). Again, the World Health Organization (2006) notes that differences in children's weight and height growth, from birth to age five are more influenced by nutrition and healthcare than genetics or ethnicity. Even though genetic factors matter for child height, Martorell and Habicht (1986) explain that they only become more critical in adolescent years.

The GDHS data captures the BMI as a Z-score. The BMI Z-score can be understood as the number of standard deviations of child's BMI, from the average BMI of her reference group. The World Health Organization uses the Multi-Centre Growth Reference, which comprises more than 8,000 children from Brazil, Ghana is, India, Norway, Oman and the USA, selected because they grew up in an environment that is deemed optimal for a child's growth (WHO, 2006). In this data, the Z-score is mathematically given as,

$$\text{Z-score} = \frac{X_{ij} - \mu_{ij}}{\sigma_{ij}},$$

Where  $X_{ij}$  represents the observed height-adjusted weight (BMI) of child of age  $i$  and gender  $j$  whilst the  $\mu_{ij}$  and  $\sigma_{ij}$  represents the mean and the standard deviations of the reference group with age  $i$  and of gender group  $j$ . Based on the classifications of the World Health Organization (2006), a child whose BMI is below -2 standard deviations of the reference group's average BMI is considered too thin or underweight for her age and gender while a child is said to be overweight if her if her BMI exceeds +2 standard deviations of the reference group's average BMI. In this paper, we expect mother's bargaining power to be positively associated with a child's BMI or health outcome.

## 5. Estimation Technique and Methodology

This paper uses the 2-Stage-Least-Square Instrumental Variable (2SLS-IV) estimation approach. Per this technique, I build three different models at different stages of the estimation process. The first model, which is the most parsimonious model, uses to estimate the relationship between Child's BMI Z-score captured as  $\text{HealthStatus}_{ij}$  of child  $i$  in household  $j$ , and the mother's degree of say, in making decisions on the daily needs for the home, which is captured as  $\text{MumPower}_{ij}$ . This is represented mathematically as:

$$\text{HealthStatus}_{ij} = \alpha_0 + \alpha_1 \text{MumPower}_{ij} + \alpha_2 \text{FamilyWealth}_{ij} + \alpha_3 \text{MumEduc}_{ij} + \varepsilon_{ij}.$$

Based on the data, I create a dichotomous variable for the main regressor. That is, in measuring women's bargaining power, a woman who either takes household daily purchases decision alone or jointly with the husband is given a value of 1 whilst women who have no say at all in making purchases for household daily needs is given a value of 0. Whilst women who makes decisions alone possess absolute power on making daily household consumption goods decision, the data does not state specifically what degree or proportion of power is exercised by women when they make decisions jointly with the husband. For the purpose of this paper, we assume that in making joint decisions, women best represent their interests and that of their children.

I expect  $\alpha_1 > 0$  so that women's bargaining power is positively related to a child's BMI Z-score.  $\alpha_2$  represents the wealth index of the family. It is a dummy variable with a value of 1 if the household is poor whilst  $\alpha_3$  captures whether the woman has ever received formal

education greater than or equal to primary school and the stochastic term  $\epsilon_{ij}$ , represents the collective impact of unobserved factors on the child's BMI Z-score.

The second model, which represents the first stage of the 2SLS-IV estimation, uses the logistic regression to estimate the probability that a woman will have bargaining power, given her attitude to wife beating. Here, a woman who think wife beating is justified assumes a value of 0 whilst a woman who think it is not justified assumes a value of 1.

$$\text{Logit } (\text{MumPower}_{ij}) = \gamma_0 + \gamma_1 \text{Dviolence}_{ij} + \gamma_2 \text{MumEduc}_{ij} + \gamma_3 \text{MumEmplo}_{ij} + \epsilon_{ij}.$$

Guided by the literature I expect  $\gamma_1 > 0$ , that is women who reject domestic violence should be associated with bargaining power.  $\gamma_2$  and  $\gamma_3$  controls for the impact of the woman's education and participation in economic activity in determining her bargaining power whilst the error term,  $\epsilon_{ij}$ , captures the effects of unobserved factors on women's bargaining power. If the hypothesis holds, in the second stage of estimation, I replace **MumPower** with the predicted value of **MumPower** in the second stage of the regression model. This yields the following model:

$$\text{HealthStatus}_{ij} = \alpha_0 + \alpha_1 \text{PredictedMumPower}_{ij} + \alpha_3 x_{ij} + \alpha_4 x_{ij} + \alpha_5 x_{ij} + \epsilon_{ij}.$$

My a priori expectation is that  $\alpha_1 > 0$ , and is different from the  $\alpha_1$  in the model which means that women with bargaining power have children who are likely to have more weight than their reference group. In the third model, I include a set of controls, as robustness check, primarily, mothers educational and health characteristics, participation in economic activity, access to mass media, household income, demographic and father characteristics, which may affect child health through unobserved channels. The controls are briefly outlined in the ensuing section.

### **Mother's Education**

The literature is well replete with evidence on the positive associations between child development and maternal education. Education offers an important channel for empowering women with the knowledge, skills and self-confidence necessary to participate fully in the development process (Promoting Gender Equality, 2013). Educated women are able to make informed decisions on their health and that of their household members. Given the pivotal role maternal education or the lack thereof, plays in child health development, this paper includes a measure that captures whether the mother in question has ever received any form of education. This dummy is constructed from the data by assigning 0 women who had no education and 1 to those who have obtained either primary, secondary or tertiary education. The model does not include measures that captures the individual effects of the different levels or stages of education on child health outcomes. Again, there is a possibility that the impact of maternal education is underestimated because educated mothers tend to have more surviving children and thus the sampling of living children may result in an over-representation of children of educated mothers (Desai and Alva 1998). However, since educated women tend to

be associated with lower fertility rates than uneducated mothers, I hope that, at best, the two effects compensate each other.

### **Household Wealth Index**

The model also controls for the general effect of the household income level on the probability that the child is anemic. This is done by including the wealth index variable, which is a composite measure of a household's cumulative living standard, calculated by using easy-to-collect data on a household's ownership of selected assets, access to water and sanitation facilities. This index is important because it allows me to tease out the relative impact of household income on child health. In the GDHS data, based on the composite score, households are classified under 1 of 5 categories in an ascending scale of income namely, poorest, poorer, middle, richer and richest. Based on this, I create a dummy to capture poverty which assumes a value of 1 if household is poorer or poorest and 0 if household is not

### **Father's Educational Characteristics**

Father's educational characteristics can influence child's health through multiple channels. Educated men are less likely to subject their wives to domestic violence and hence lead to greater empowerment of women, which in turn, translates, into better child outcomes. Again, educated fathers are on average healthier and are more likely to produce and raise healthy children. For instance, Thomas (1994) finds a positive association between child health and higher father's educational attainment. By not controlling for father's education, the impact of mother's empowerment on child outcomes may be over-estimated. It is therefore important to tease out the relative impact of father's education by including a variable that captures this measure. In this paper, I control for father's educational characteristics by including two dummies that capture whether the woman's partner or husband has had any formal education.

## **Empirical Findings**

### **OLS Estimates**

Table III presents the summary of empirical findings from both the initial OLS and the Instrumental Variable estimates. The results suggest that all the predictor variables apart from mother's age, participation in economic activity and household wealth are significant in explaining the variation in Child BMI. Specifically, the OLS estimation suggests that women who take part in making decisions regarding daily household purchases have children whose Body Mass Index are about 0.15 standard deviations (SD) greater than the average BMI of their reference group and this is significant at about 5%. The OLS estimates also show that a unit increase in a mother's own Body Mass Index (proxy for maternal health) is associated with an average of 0.04 standard deviations increase in her child's BMI whilst increases in mother's years of education and child age also increase child BMI by about 0.19 and 0.09 standard deviations respectively.

### **First Stage Logistic Estimation**

The first stage IV estimation results are summarized in Table II. The results of the first stage estimation are consistent with our a priori expectations; women who do not believe that domestic violence is justified are likely to have the power to make decisions on daily household purchases, either alone or with the husband. The co-efficient of the domestic violence variable is 0.85, in the absence of controls and is highly significant below 1%. After controlling for woman's education and her participation in economic activity in the past one year, the co-efficient of the domestic violence variable falls to 0.68 but still remains highly significant. Again, our endogeneity concerns are shown to be consistent with the first stage estimation, which shows that women with female children tend to have lower bargaining power whilst women with healthy children (higher BMI Z-scores) tend to have more bargaining power.

### **Second Stage Estimation**

After replacing mother's bargaining power with the predicted values of mother's bargaining power (which is domestic violence) from the first stage IV estimation, we find that child Body Mass Index increases by about 2.5 SDs for women who have bargaining power and remains highly significant. This is about 2.35 SDs higher than the co-efficient of the OLS estimation. In this first model of the second stage estimation, we still control for mother's characteristics of health (BMI), years of education, age, and participation in economic activity over the past 12 months. We also include child age and household poverty to control for the unobserved influences of these factors on child health. The results suggest that an increase in a mother's BMI is associated with about 0.05 standard deviations increase in child BMI. An additional year in a child's life also leads to about 0.09 SD increase in the child's BMI. These findings are all consistent with the literature. Mother's participation in economic activity is surprisingly found to be negatively related to child health outcome and is statistically significant.

Whilst we cannot say much about causality, we assume that happens if women's participation in economic activity, keeps them away from children, to the extent that it becomes detrimental to child health. The results also suggest that an increase in a woman's age is negatively related to the health outcome of her child and it is statistically significant. Even though this result comes as a surprise, it could also reflect the fact that older women are less acquainted with the recent domestic violence laws, and are more in tune with the dictates of the norms and traditions, which limit their participation in household decision -making regarding their own health and that of their children. Poverty also surprisingly remains insignificant as a determinant of child health outcome in both OLS and second stage IV regressions.

In the second IV model, we control for the unobserved influences of father's educational characteristics (uneducated father) and age as well the possible impact of rural residency on

child health. The results, which are also summarized in Table III, suggest that father's age, educational attainment and rural residency have no significant impact on child health. However, the co-efficient of the previous variables change. This may suggest that, in the presence of an ageing uneducated father in a rural household, mother's bargaining power increases child BMI by some additional 0.6 standard deviation over the reference group, which is consistent with the literature. Under these controls, a mother's age and participation in economic activity remain significant and negatively related to her child health whilst child age continues to be positive and significant as well but with higher co-efficient.

### **Hausman Test for Endogeneity**

To test whether the suspected endogenous variable is indeed endogenous and whether our instrumental variable is exogenous, we employ the Hausman test for endogeneity. To do this, we run a reduced form of the baseline regression with Mother's Power as dependent variable. This yields the model.

$$\text{MumPower} = \pi_0 + \pi_1 X_{1ij} + \pi_2 X_{2ij} + \pi_3 X_{3ij} + \pi_4 X_{4ij} + \pi_5 X_{5ij} + \pi_6 X_{6ij} + \pi_7 X_{7ij} + \varepsilon$$

Where  $X_1$  is the domestic violence dummy,  $X_2$  is woman's education in years,  $X_3$  is Woman's BMI,  $X_5$  is Child Age,  $X_5$  is dummy for whether the woman is working,  $X_6$  is the woman's age in years, and  $X_7$  is the household wealth dummy whilst  $\varepsilon$  is the error term. Since we suspect that the MumPower variable suffers endogeneity from unobserved reverse causation and omitted variable bias, we include the residuals from the reduced form equation in the structural form regression below,

**HealthStatus** =  $Z_0 + Z_1 X_{1ij} + Z_2 X_{2ij} + Z_3 X_{3ij} + Z_4 X_{4ij} + Z_5 X_{5ij} + Z_6 X_{6ij} + Z_7 X_{7ij} + Z_8 y_i + \mu$ , where  $Z_1, Z_2, \dots, Z_7$  are the explanatory variables in the baseline IV regression, while  $Z_8$  is the residuals of the reduced form model. The model is run on the null hypothesis that the  $y_i$  is statistically insignificant and  $Z_8 = 0$ . If the null hypothesis holds, then MumPower is exogenous and does not need IV estimation. However, our Hausman test results, summarized in Table 3.0 of the Appendix section, shows that the reduced form residuals are statistically significant and thus we reject the null hypothesis that the mother power is exogenous. This also confirms that domestic violence dummy is a good instrument for the mother's bargaining power variable.

### **Conclusions**

This paper set-off to investigate the impact of the women's bargaining power on child health outcomes. To achieve this, we build a model of intrahousehold bargaining with perceptions of women regarding domestic violence and marital rape, and its implications for child health outcomes using the 2-SLS Instrumental Variable technique in order to circumvent endogeneity resulting from omitted variable bias and unobserved reverse causality between the dependent variable and main regressor. Our Hausman test for endogeneity confirmed this as a good instrument and the IV estimates showed that impact of women's bargaining power on child health is underestimated by the biases in the OLS estimation. We also found consistent with the

literature that the years of education obtained by a woman and her health status directly mattered for the health of her child. Whilst, father's illiteracy and rural residency and poverty in the household do not matter directly for child health, per our sample, we find that the impact of women's bargaining power on child health tend to increase in households where father has no education.

This paper provides strong empirical evidence for women empowerment in order to drive investments in child health especially in countries where strong patriarchal family structures that prevent the effective participation of women in the household decision-making process. The paper shows that a simple, well-carved legislation that protect women from domestic violence and abuse could tremendously improve women's bargaining positions and allow them to independently, make decisions that are in the best interest of themselves and their children.

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## APPENDIX

**Table 1.0 Results of OLS and IV Estimations**

<b>Variable</b>	<b>OLS Estimates</b>	<b>2SLS- Model 1</b>		<b>2SLS-Model 2</b>
		<b>Instrument = Domestic Violence</b>		
Mother's Power	0.148** [0.076]	2.528*** [1.231]		3.080* [1.177]
Mother's BMI	0.037*** [0.008]	0.046*** [0.011]		0.051*** [0.014]
Mother's Education	0.185*** [0.073]	0.143 [0.095]		0.134 [0.116]
Mother's Age	-0.004 [0.005]	-0.022** [0.012]		-0.036** [0.016]
Mother Working	-0.068 [0.115]	-0.643** [0.331]		-0.778* [0.448]
Child Age	0.094*** [0.025]	0.091** [0.032]		0.098*** [0.037]
Household Wealth (if Poor)	-0.060 [0.074]	0.127 [0.397]		0.036 [0.154]
Non-Educated Father				-0.098 [0.122]
Father's Age				0.009 [0.007]
Residence (if Rural)				0.170 [0.139]
Observations	1563	1563		1471
R-Squared	0.04	...		...
F-Stat /Wald Chi <sup>2</sup>	9.29***	42.13***		39.63***
*** Significant at 1%    ** Significant at 5%    *Significant at 10%				

**Table 2.0 Results of First Stage Logistic IV Regression**

Variable/Predictor of Woman's Power	Co-efficient	P-Value	Std. Error
Domestic Violence (No Controls)	0.085***	0.000	0.019
Domestic Violence (With Controls)	0.085**	0.002	0.027
Woman's Years of Education	0.032	0.147	0.022
Woman Working	0.235***	0.000	0.038
Woman's Age	0.007***	0.000	0.001
Child Gender (if Female)	-0.05**	0.025	0.021
Child BMI	0.84**	0.087	0.008

**Table 3.0 Hausman Test for Endogeneity**

Reduced Form Model (Dependent =Mother's Power)		Structural Equation (Dependent= Child Health)	
Variables	Co-Efficient [P-Value]	Variables	Co-Efficient [P-Value]
Domestic Violence <sup>1</sup>	.361 [0.004]**	Mother's Power	1.553[0.009]**
Woman's Years of Education	0.543[0.642]	Woman's Years of Education	0.171[0.019]**
Woman's BMI	-0.013[258]	Woman's BMI	0.039[0.000]***
Child Age	0.021[0.147]	Child Age	0.086[0.001]***
Woman Working	1.241[0.000]***	Woman Working	-0.438[0.023]**
Woman's Age	0.037[0.000]***	Woman's Age	-0.012[0.046]**
Household Wealth	-.309[0.009]**	Household Wealth	0.027[0.740]
***Significant at 1%, **Significant at 5% and * at 10%		Reduced Form Residuals <sup>2</sup>	-0.584[0.017]**
<sup>1</sup> Domestic Violence is statistically significant		<sup>2</sup> Residuals are statistically significant	
$H_0 = \text{Residual} = 0$ i.e. Mother Power is exogenous		Since The Residuals in the Structural Equation is statistically significant at 5% we	
$H_1 = \text{Residual} \neq 0$ , i.e. Mother Power is endogenous			

**Table 4 .0 Summary Statistics**

Variable	Sample Size	Mean	Std. Dev.	Min	Max
Child BMI Z-score	1759	-0.54	1.27	-3.94	5.89
Child Gender Dummy (2 if female, 1 if male)	3299	1.48	0.50	1	2
Child Age in Years	3128	4.39	5.08	0	30
Woman's Age	4916	28.99	9.70	15	49
Mother Power Dummy	2948	0.78	0.41	0	1
Woman's BMI	4814	23.42	4.69	12.18	57.61
Woman's Educated Dummy (1 if Yes , 0 if No)	4916	0.75	0.44	0	1
Woman Working Dummy (=1 if yes, 0 if No)	4916	0.78	0.42	0	1
Domestic Violence (Dummy)	4916	0.83	0.38	0	1
Father's Education Dummy (1 if not educated, 0 if yes)	4916	0.83	0.38	0	1
Father's Age in Years	2902	40.23	11.12	18	85
Household Wealth Status (1 if poor, 0 if not-)	4916	0.409	0.49	0	1
Residence Dummy (1 if Rural, 0 if Urban)	4916	1.56	0.50	0	1